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Attachment 5d

October 29, 2019

MEMORANDUM

To: Gabriel Taylor, Peter Strait (California Energy Commission)
From: Farhad Farahmand, Abhijeet Pande (TRC)
CC: Shellie Woodworth (City of Mountain View), John Supp (Silicon Valley Clean Energy)
Re: **Interpretation of Cost Effectiveness Analysis as it Relates to All-Electric Reach Code Proposal**

As part of an amendment to the California Building Standards Code, the City of Mountain View is seeking a requirement for all new construction buildings to be all-electric with limited exceptions for nonresidential buildings. Certain categories of nonresidential buildings such as hazardous processes, industrial processes, and laboratories that require natural gas for operational and process reasons are proposed to be exempt.

This memo serves to clarify the cost-effectiveness justification of these proposals as required by California Code of Regulations (CCR), Title 24, Part 1, §10-106 and request the Energy Commission's preliminary approval of this justification. If approved, this interpretation will be included with Mountain View's application to the Energy Commission.

The statewide investor owned utility codes and standards program developed a new construction cost effectiveness analysis for all California climate zones which included all-electric measures as part of multiple packages. These analyses have been attached, and:

- ◆ Were performed for both residential and nonresidential buildings
 - ◆ The residential prototypes included 4 end-uses in analysis: space heating, water heating, cooking, and clothes drying. These assumed savings from avoided natural gas infrastructure to and within the residence.
 - ◆ The nonresidential prototypes included 2 end-uses in analysis: space heating and water heating. These also assumed savings from avoided natural gas infrastructure to and within the building.
- ◆ Found that it is cost-effective to construct all-electric buildings compared to the 2019 Standards ACM baseline, including all end-uses analyzed, partially due to upfront cost savings associated with foregoing a natural gas connection to the building.

Mountain View's code proposal would allow the construction of code-compliant all-electric buildings which has been shown to be cost-effective compared to a code-compliant mixed-fuel building using the TDV cost-effectiveness metric.

We seek your preliminary confirmation that the existing cost effectiveness studies completed are sufficient to support Mountain View's proposal.

- ◆ In residential buildings, a proposed building with electric space- or water-heating is already compared to a standard building with these electric end-uses. Thus, no cost effectiveness criteria is explicitly required for the electrification of these end-uses.
- ◆ In nonresidential buildings, the prototypes examined in the cost effectiveness analysis only included space heating and water heating electrification. Other end uses targeted in the Mountain View ordinance are unregulated appliances such as cooking, clothes drying which are not modeled in Title 24 compliance calculations. Adding requirements for these end uses to be electric does not impact the TDV budget for the building or compliance with Title 24.

These will however impact the overall first cost of the code-compliant all-electric building as well as operational impacts. These impacts however are likely to be insignificant compared with the net present value savings of around \$15,000 for the retail, and \$1.3M for hotel occupancies.¹ Electric cooking and clothes drying first cost difference compared to natural gas versions are between \$800-\$2000 per appliance.² Operational cost increases are around \$2,000 per appliance over the building's lifetime.³ Thus the added first and operational costs for electric appliances are unlikely to be greater than the significant cost savings resulting from eliminating natural gas infrastructure. We thus propose that existing cost-effectiveness studies should be sufficient to justify Mountain View requirements.

Any guidance on this approach and/or code language format is much appreciated.

¹ These cost figures are interpolated for the 0% code-compliant all-electric prototypes. The nonresidential reach code cost effectiveness analysis did not isolate an energy code compliant all-electric package, but presented results for a federal code minimum building (which was not energy code compliant in this jurisdiction's climate zone) and for a cost-effective package of energy efficiency measures (which was found to be energy code compliant by a large margin in the jurisdiction's climate zone).

² Induction cooking prices can vary widely, based on online retailer search. Lower cost induction cooktops are available. Clothes dryer costs attained from two sources:

- 1) 2019 Cost-effectiveness Study: Low-Rise Residential New Construction, prepared for IOU Codes and Standards Program by Frontier Energy and Misti Bruceri & Associates (August 2019).
- 2) Residential Building Electrification in California, prepared for SMUD, LADWP, and PG&E by E3. (April 2019)

³ Figures for cooking and clothes drying appear to be similar:

- 1) Cooking figure based on range top technology assessment by Fishnick.
https://fishnick.com/equipment/techassessment/5_range_tops.pdf
- 2) Clothes drying figure based on aforementioned E3 study from April 2019.