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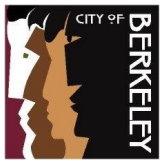
Joint Comments on Dec 8th Workshop on Heat Pump Baselines, PV and Storage Requirements

Additional submitted attachment is included below.



Dear Commissioner McAllister and Energy Commission Staff:

On behalf of the Natural Resources Defense Council (NRDC), Beyond Efficiency, the Building Electrification Initiative (BEI), Buro Happold, City of Berkeley, Community Energy Labs, Ecotope, EHDD, Feldman Architecture, Guttmann & Blaevoet, IDeAs Consulting, Integral Group, Interface Engineering, Leddy Maytum Stacy Architects, Mithun, ZGF Architects, and 350 Humboldt, who are advocating for affordable and equitable building decarbonization and clean air policies to help mitigate the climate crisis, we respectfully submit the following comments in response to the California Energy Commission's (CEC) December 8, 2020 workshop on heat pump baselines and photovoltaic/battery storage requirements in multifamily and non-residential buildings under consideration for the 2022 Title 24 Standards.

We appreciate the CEC's continued efforts to establish heat pump baselines in Title 24 that promote zero-emission electric construction in the code's performance path. These efforts are critical to accelerating building decarbonization in alignment with California's broader emissions reduction goals. Building electrification combined with clean electricity is a critical component to meeting the state's emissions and air pollution goals. It also has a lower first cost than gas construction, and is cost-effective for consumers. We are already seeing the devastating effects of climate change accelerating under our eyes, such as the massive and widespread wildfires that are becoming the new normal. It is therefore critical that the 2022 Title 24 Standards promote zero-emission electric construction and at a minimum do not hinder local efforts throughout the state to advance decarbonization through all-electric reach codes.

We appreciate the CEC's work, the modeling conducted to date, and the proposal to set a heat pump space heating baseline for as many building types as feasible. We recognize that a significant effort has gone into these proposals and that the CEC is working hard to align the code with the state's decarbonization priorities. While the proposals are a major step in the right direction, we have the following requests in priority order in response to the December 8th workshop:

1. **The CEC should ensure the 2022 code at a minimum does not hinder electrification in building types that have typically used central boilers for space heating.**

   The CEC has not proposed heat pump baselines for large non-residential buildings that currently have a boiler system as the baseline space heating system type. Our understanding is that this is because heat pump boilers cannot yet be modeled appropriately in the compliance software, and the only electric option for boilers, electric resistance, isn't a suitable baseline. However, continuing to set only a gas baseline in effect prevents the use of the performance path for these buildings, leaving the more costly and more cumbersome prescriptive path, which severely restricts options for electric buildings. This is currently a major challenge for builders wanting to implement advanced energy efficient electric solutions for these buildings, and an obstacle for local governments who are leading on building decarbonization through local codes.

   We recommend the CEC further analyze alternative electric space heating baseline system types for medium and large office buildings to find a single all-electric space heating baseline that meets cost-effectiveness criteria. While modeling capabilities for heat pump boilers need to be developed as soon as possible, in the meantime we recommend that the CEC consider a baseline of a variable air volume (VAV) system with electric reheat combined with onsite photovoltaic (PV) as the baseline system type for medium and large office buildings.

   Based on the CEC's modeling of VAV systems with electric reheat and modeling of PV

systems, as well as a study by UC Berkeley and Taylor Engineering,[1] VAV+electric reheat+PV is likely to be cost-effective and have a lower TDV than the current baseline. Pairing electric reheat with onsite PV makes sense, as the time of PV production and the time of reheat energy use generally coincide for an office.

Wherever a single electric baseline is not feasible, at a minimum we recommend that the CEC set dual electric and mixed fuel baselines for building types that do not have an updated electric preferred baseline. These independent baselines should at a minimum be fuel-neutral so as not to discourage efficient electrification.

Already 40 California cities have adopted standards that require or strongly encourage all electric new construction. Maintaining a state code that continues to penalize certain building types for going all electric would be misaligned with these local policies and the state's overall decarbonization goals.

2. **We support CEC's proposal to set single electric baselines for high-rise multifamily and non-residential buildings where feasible and cost-effective, and recommend including additional building types that were not proposed in the December 8th workshop.**

   The CEC has proposed to set heat pump baselines for small offices, mid- and high-rise multifamily buildings, small schools, and warehouses (office spaces only). We support moving these space heating baselines to all electric.

   We also recommend that the CEC expand the proposed electric space heating baselines to all educational facilities and all multifamily buildings including low-and mid-rise. For multifamily buildings, the CEC's modeling has shown that electric space heating baselines are cost-effective for both mid- and high-rise multifamily. The CEC should set a single electric space heating baseline for all multifamily for consistency across this building type. Similarly, the CEC only presented results for small schools, for which the electric space heating baseline is cost-effective. We recommend that this electric space heating baseline be used for all educational facilities, given the predominance of all electric construction in this use type. For example, the University of California system requires new buildings to be all electric.

[1] Raftery P. et al., "Quantifying energy losses in hot water reheat systems," Energy and Buildings, 179, https://escholarship.org/uc/item/3qs8f8qx

3. **We recommend that CEC strengthen the proposed electric space heating baselines to be based on a heat pump without gas supplemental heat, in climate zones where this is cost-effective.**

   The CEC has proposed to set the baseline as an electric heat pump with gas supplemental heat for many building types. We recommend that the CEC instead use a heat pump with electric supplemental heat as the baseline where cost-effective. This change is important, because without it all electric buildings will still have to adopt additional measures in order to beat the partially electrified baselines, which would be out of alignment with local policy requiring all electric construction. The CEC's rationale for proposing heat pumps with gas supplemental heat as the baseline system type, as we understand it, is two-fold: 1) that electric supplemental heat will lead to increases in TDV (decreased efficiency) in some climate zones and 2) that setting a fully electric heat pump baseline would result in a defacto gas ban due to the challenge for gas-fueled buildings to meet the time dependent source energy metric. In other words, a building using gas would require advanced efficiency measures to offset its increased carbon emissions which may not be cost-effective.

   In response to the first concern, we recommend that the CEC consider pairing the heat pump with electric supplemental heat baseline with complementary efficiency measures to address the climate zones with slight reductions in TDV (i.e. those with less than a 2% increase in TDV). For climate zones with larger increases in TDV (i.e. climate zone 16 for several building types), the CEC should separate the baseline system for just this climate zone.

   In response to the second concern, we disagree that setting a fully electric space heating baseline would be an effective gas ban. This is because buildings could still comply via the prescriptive path which allows the use of gas for both space and water heating. The prescriptive path is used for many non-residential building projects today and so setting a fully electrified space heating baseline would just limit those buildings wishing to make performance tradeoffs.

4. **We support the proposal to update requirements for central heat pump water heaters and recommend CEC ensure that compliance targets leave enough space for multiple solutions and design options in the market, not just best-in-market.**

   Central heat pump water heaters are a critical technology for all electric multifamily buildings and we appreciate the work done by the CEC and IOU teams to date to better integrate central HPWH into the performance and prescriptive paths. The proposed Joint Appendix 14 (JA14) requirements will ensure minimum levels of equipment and system performance, while maintaining flexibility for designers to determine the specific system configuration under the performance path. Additional prescriptive requirements that specify the design configuration would only be required in the prescriptive path.

Our understanding is that best-in-market central HPWH are able to beat the existing system baselines. CEC should ensure that compliance targets leave enough space for multiple solutions and design options in the market, not just best-in-market, so that there is a reasonable range of cost-effective options for designers to select from. As the CEC continues to add functionality to the software (e.g. multipass) we recommend that it continue to evaluate these baselines to ensure that there are cost-effective performance compliance paths for central HPWH.

5. **We request that the CEC require buildings built with gas to be electrification-ready**. While some electrification-ready measures exist in the code today for water heating, they are limited and do not ensure that a building will have the needed infrastructure in place to electrify in the future.

   Given the need for almost all buildings in California to electrify to meet California's long-term emission reduction targets, new buildings today should include the infrastructure that will enable drop-in electrification in the future. This will ensure that owners of buildings built with gas today won't be saddled with much higher retrofit costs later when those can be avoided for a fraction of the cost at the time of construction.

   Key electrification-ready requirements include:

   a. Require all in-unit gas equipment to incorporate an appropriately sized electrical circuit and dedicated slot(s) in the panel to power a direct replacement of the gas equipment. This should include cooking, space heating, clothes drying, fireplaces, and any in-unit water heating not captured in the current water heating readiness requirement. Where applicable, these requirements should apply to all residential buildings.
   b. For water heating: require dedicated space for a storage heat pump water heater and swing tank(s), if applicable, with plumbing connection stubs at the location. This requirement should apply to all residential buildings, with sizing requirements for multifamily central systems being determined using Ecotope's Ecosizer tool.[2] Space and plumbing-ready requirements are critical to ensure full water heater electrification-readiness.
   c. For space heating: require an appropriately sized electrical circuit and dedicated slot(s) in the panel to convert an AC to a heat pump. When a furnace is installed without AC, require a location for a future outdoor condensing unit to be identified on the building plans and an appropriately sized circuit installed at that location.

[2] https://ecosizer.ecotope.com/sizer/

6. **We support the proposal to require PV and battery storage for many building types.** We support the CEC's proposal to require PV and battery storage for the building types proposed. This measure will result in both emissions reductions, add to grid flexibility, and be cost-effective for consumers. *We strongly recommend that in addition to batteries, the CEC allow other types of energy storage, such as thermal storage, as a compliance option.*

We appreciate the opportunity to submit these comments and the hard work of CEC staff in developing the proposed changes.

Sincerely,

Pierre Delforge
Senior Scientist
NRDC
pdelforge@nrdc.org

Heidi Creighton, AIA, LEED Fellow, WELL Faculty, Fitwel Ambassador
Associate Principal
Buro Happold | Sustainability
Heidi.Creighton@BuroHappold.com

Jenna Tatum
Director
Building Electrification Initiative
jenna@beicities.org

Billi Romain
Manager, Office of Energy and Sustainable Development
City of Berkeley
BRomain@cityofberkeley.info

Tanya Barham
Founder & CEO
Community Energy Labs
tanyab@communityenergylabs.com

Jonathan Heller
President
Ecotope, Inc.
jonathan@ecotope.com

Scott Shell FAIA, LEED® AP BD+C, CPHC®
Principal
EHDD Architecture
Scott.Shell@ehdd.com

Jonathan Feldman, AIA, LEED AP
Founding Partner
Feldman Architecture
jfeldman@feldmanarch.com

Ted M. Tiffany, LEED AP BD+C
Principal
Director of Sustainability
Guttmann & Blaevoet
TTiffany@gb-eng.com

David Kaneda, PE, FAIA, LEED Fellow
Principal
IDeAs Consulting
dkaneda@ideas-c.com

Andréa Traber, AIA, LEED Fellow
Managing Principal
Integral Group
atraber@integralgroup.com

Hormoz Janssens, PE
Managing Principal
Interface Engineering, Inc.
hormozj@interfaceeng.com

William Leddy, FAIA
Principal
Leddy Maytum Stacy Architects
BLeddy@lmsarch.com

Hilary Noll, AIA, LEED AP BD+C
Sustainability Integration Leader
Mithun
hilaryn@mithun.com

Avideh Haghighi, AIA, LFA, LEED GA
Associate
ZGF Architects
avideh.haghighi@zgf.com

Katie Ackerly, AIA, CPHC
Principal
David Baker Architects
katieackerly@dbarchitect.com

Patrick Carr, Steering Committee
representative, 350 Humboldt
350humboldt@gmail.com

Dan Johnson, AIA
Sustainability Architect Leader
Beyond Efficiency Inc.
dan@beyondefficiency.us