

## DOCKETED

<b>Docket Number:</b>	17-BSTD-01
<b>Project Title:</b>	2019 Building Energy Efficiency Standards PreRulemaking
<b>TN #:</b>	221571
<b>Document Title:</b>	Natural Resources Defense Council Comments on the Staff Workshop on the Express Terms for the 2019 Building Energy
<b>Description:</b>	N/A
<b>Filer:</b>	System
<b>Organization:</b>	Natural Resources Defense Council
<b>Submitter Role:</b>	Public
<b>Submission Date:</b>	10/20/2017 3:49:58 PM
<b>Docketed Date:</b>	10/20/2017

*Comment Received From: Natural Resources Defense Council*

*Submitted On: 10/20/2017*

*Docket Number: 17-BSTD-01*

**NRDC Comments on the Staff Workshop on the Express Terms for the 2019 Building Energy Efficiency Standards**

*Additional submitted attachment is included below.*



## **NRDC Comments on the Staff Workshop on the Express Terms for the 2019 Building Energy Efficiency Standards**

October 20, 2017

The Natural Resources Defense Council (NRDC) appreciates the opportunity to comment on the California Energy Commission (CEC)'s Staff Workshop on the Express Terms for the 2019 Building Energy Efficiency Standards on October 4-5, 2017.

The 2019 Building Energy Efficiency Standards are an important policy tools to help California implement its climate and energy goals, and a milestone toward these goals. By requiring that the annual electricity use of residential homes is offset by on-site solar generation, the 2019 code is a major step toward zero net energy (ZNE) and very low carbon buildings.

NRDC strongly supports the commission's efforts and direction on this proceeding and offers the following comments.

### **Envelope**

NRDC commends CEC for incorporating many of the code changes proposed in the Codes and Standards Enhancement (CASE) Reports into the Express Terms, including major residential new construction building envelope updates. These include updates to the U-factor requirements for high performance walls and attics, windows, and doors, as well as a prescriptive requirement of quality insulation installation. CEC should adopt these requirements in the 45-day language.

NRDC calls on CEC to maintain the requirement for upgraded high performance walls (HPWs), namely those required to have a U-factor of 0.043 (in climate zones 1 and 11-16). As long as reputable analyses available – such as the CASE Report – show upgraded HPWs as cost effective in certain climate zones, CEC is required by California's loading order to mandate HPWs in those areas prior to or contemporaneously with a requirement for on-site renewable energy generation.

As we have commented, NRDC strongly supports this "efficiency-first" approach: energy efficiency has some inherent advantages over renewable energy, such as continued energy and climate benefits when the sun is not shining but electricity demand is high. Renewable energy generation is an important part of reaching ZNE in residential construction, but should not come at the cost of missed energy efficiency opportunities.

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NRDC also supports the proposal from the North American Insulation Manufacturers Association (NAIMA) to improve the Section 150.0(c) mandatory above grade wall features by increasing to R-15 cavity insulation in 2x4 walls and R-20 cavity insulation in 2x6 walls.

## **Solar**

NRDC supports CEC's commitment to ending the photovoltaic (PV) compliance credit of 2016 by requiring separate compliance with the energy efficiency and PV energy design rating (EDR) requirements in the 2019 code. We strongly encourage the Commission to maintain separation of EDR requirements in the 45-day language and into the final adopted code.

In addition, NRDC applauds CEC's effort to establish the first requirement for on-site renewable energy generation in the code's history. PV is a cost-effective way to offset onsite electrical use over the course of the year and the Building Energy Efficiency Standards are an important way to expand California's distributed generation capacity. NRDC calls on CEC to refrain from providing any compliance credit toward the energy efficiency EDR for PV, even if it exceeds the minimum requirement in Part 6.

Offering a compliance pathway for community shared solar electric generation systems adds important flexibility to CEC's PV requirement, further solidifying the societal benefits of PV generation. CEC has outlined six requirements for community shared solar and community shared battery storage installations used for compliance with the code: availability for enforcement agency inspection, energy performance greater than or equal to that of rooftop solar, dedicated building energy savings benefits, durability, additionality, and accountability and recordkeeping. NRDC supports these criteria and requests CEC add two additional criteria:

1. Community solar projects should also be relatively local so that they bring similar transmission cost avoidance benefits to distributed generation, and
2. They should have similar customer financial benefits to ensure cost-effectiveness and bill savings, and to make decarbonization measures such as electrification of space and water heating accessible to homeowners.

Projects with these characteristics will combine the individual benefits of rooftop PV with the societal benefits and cost effectiveness advantages of community solar. There is no certification program that guarantees these requirements in California to date, but NRDC supports CEC's proposal to establish an application process for entities to create community solar programs.

In addition, CEC has outlined the exceptions for compliance with the mandatory PV EDR. NRDC tentatively finds these exemptions to be defined narrowly and clearly enough to minimize the number of exemptions and to avoid abuse, but encourages CEC to continue considering possible loopholes that emerge from these conditions.

We also strongly encourage CEC to establish alternate requirements that ensure that buildings that are not suitable for solar PV don't get a free pass. NRDC recognizes that not every building is suitable for PV. However, without any alternate requirements, the chances that builders or homeowners will abuse of the exception process will increase. Alternate requirements will ensure that buildings that are not suitable for solar PV still do their fair share for energy savings and carbon reductions, for example through community solar, higher efficiency, or grid flexibility. We suggest the following alternate requirements (one of the following).

1. Community solar, as discussed;
2. Mandatory envelope performance measures including HPA, HPW, QII, and windows and doors, that cannot be traded off for other measures;
3. Air tightness: require 3 ACH50<sup>1</sup> with HERS testing. Air tightness reduces infiltration, keeping the heat out in summer and cold out in winter, reducing heating and cooling loads, and increasing the demand flexibility potential of buildings;
4. Higher efficiency HVAC and hot water equipment, including zoned heat pump/ACs with full<sup>2</sup> demand control capability
5. Grid flexibility measures, such as battery, pre-cooling, and grid-connected electric water heating.

These options are not subject to federal preemption because they are compliance options, not the prescriptive baseline in the code. At least one of them needs to be cost-effective, which several of them, and potentially all of them, are.

## **Water Heating**

### **NRDC supports CEC's proposal to add a prescriptive compliance option for electric heat pump water heaters, but requests that CEC extends this proposal to the performance path.**

NRDC supports CEC's proposal to add a prescriptive option allowing heat pump water heaters (HPWH) compliant with NEEA Advanced Water Heater Specification Tier 3 or higher. The option is an important step toward leveling the playing field for all-electric buildings, and for paving the way toward zero emissions buildings in California.

Currently, one of the main obstacles to all-electric buildings is that electric water heaters are at a disadvantage compared to the gas-fired prescriptive option, as even high-performance heat pump water heaters (NEEA Tier 3 certified or higher) are given a worse compliance score than the prescriptive instantaneous gas water heater, despite using lower source energy and being responsible for significantly

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<sup>1</sup> Air changes per hour under 50 Pa pressure

<sup>2</sup> By "full" we mean the ability both to change the timing of load through storage that pre-cools or heats and also defers cooling or heating, AND the ability to absorb excessive generation usefully and efficiently.

lower GHG emissions. This is because TDV is purely an energy cost metric, it does not account for source energy or GHGs. As a result, builders would need to offset the water heater compliance deficit with other measures, which would reduce the flexibility trade-off options they have to achieve the compliance budget and would potentially increase the cost of construction.

While we welcome CEC's proposed prescriptive HPWH option, we note that it does not appear to apply to the performance path, where these HPWH would continue to be compared to the gas tankless water heater.

**NRDC requests that CEC expand this prescriptive option to the performance path**, to provide a fully independent compliance path for electric water heating. This is important because the performance path allows flexibility for builders, for example by trading off some envelope efficiency measures for a higher performance gas tankless condensing water heater. This is main the reason the performance path is used in roughly 90 percent of projects. For all-electric buildings to be on a true level playing field with mixed fuel buildings, builders need to have access to the same tradeoffs with HPWHs that are higher performance than the minimal NEEA Tier 3 prescriptive option.

A NEEA Tier 3 HPWH performance path baseline is fully justified for two reasons: 1) CEC is already proposing it as a prescriptive option; 2) It has lower source energy than the gas baseline (to be demonstrated through the use of the software when available).

We suggest two possible approaches to implement a NEEA Tier 3 HPWH as an electric baseline for the performance path:

1. **Through an ACM rule:** Implement a mechanism in the Alternative Calculation Method (ACM) and in the compliance software that gives the highest-TDV (lowest performing) NEEA Tier 3 HPWH the exact same TDV score as the prescriptive gas water heater. Then scale the TDV budget of the proposed HPWH based on its performance in the compliance software, relative to this NEEA Tier 3 baseline. This option is the simplest, and would give builders access to the same performance trade-offs with HPWHs as with gas water heaters, without violating preemption or trading off envelope efficiency any more than with the current gas water heater baseline.
2. **HPWH 2.0 + efficiency measures + solar PV:** This option requires determining a cost-effective package of additional efficiency measures that when used in combination with a HPWH 2.0, are equivalent to the gas tankless water heater baseline. Examples of such measures include:
  - Larger tank size than minimally required to meet user needs, as higher thermal storage generally reduces the use of the resistive element and therefore increases efficiency
  - Insulation blanket to reduce HPWH standby losses
  - Drain water heat recovery
  - Demand flexibility (grid connectivity to enable controls)
  - Solar thermal with a certain solar fraction.

A proposed NEEA tier 3 or above HPWH would match this baseline without any of these complementary measures, although they could still be used as flexibility options to trade-off against other costlier measures.

Providing a fully independent compliance path for electric water heating is perhaps the most important change CEC can make in this code cycle to remove barriers to the lowest source energy and lowest GHG water heating solution in new buildings in California. We urge CEC to fully implement its intended objective of providing independent compliance paths for mixed fuel and electric.

We were not able to perform an in-depth analysis of the proposed implementation to better assess how HPWH compare with gas water heaters because the latest research version of the software currently available is dated June 15 and does not seem to implement this water heating baseline proposal. We therefore respectfully request that a new version of the software is made available to stakeholders as soon as possible and that stakeholders be given an additional 2 weeks from the date the software is available, to comment on this particular topic.

**Electric water heating baseline and gas availability:** we request the CEC clarifies if the electric water heater baseline will be accessible whether gas is available or not. In the 2016 code, the propane baseline can only be used if gas isn't available. However, the electric space heating baseline can be selected irrespective of gas availability. We believe the latter should also apply to the electric water heating baseline in order to provide an independent compliance pathway for gas and electric water heating, but seek explicit confirmation from CEC.

**Baseline when gas is not available:** CEC should also specify that in cases where gas is not available, the alternative baseline is electric instead of propane, since the electric baseline is lower TDV, lower source energy and lower GHG than the propane baseline.

**Include option for insulation blanket in software:** Irrespective of whether an insulation blanket is used as part of the electric baseline, we recommend CEC includes the option to use an insulation blanket in the compliance software, and gives an appropriate credit to HPWHs installed with an insulation blanket. This will encourage installers to employ this time-tested and very low-cost energy efficiency measure when installing HPWHs.

#### **Proper Installation of Pipe Insulation (RA4.4.1)**

NRDC supports the strengthening of provisions requiring insulation of domestic hot water piping. However the new sentence added to this section should be modified as follows: All domestic hot water piping should shall be insulated as specified in Section 609.11 of the California Plumbing Code.

#### **Compact Hot Water Distribution System Credit (RA4.4.6)**

NRDC strongly supports the inclusion of a performance path credit for compact hot water distribution systems, laid out in Reference Appendix RA4.4.6. The criteria for determining eligibility can all be

calculated at the project design phase, and require no special drawings or on-site measurements. These are significant benefits that should greatly improve the likelihood that water- and energy-saving compact designs for DHW distribution systems will be installed in new residential building projects.

Suggested clarifications/corrections:

Revise language on Weighted Distance for clarity as follows: MasterBath = The plan view, straight line distance from the water heater to the furthest fixture served by that water heater in the master bathroom (feet). Make similar revisions for Kitchen and FurthestThird.

Table 4.4.6-2: Confirm the values shown in this table for 3-story homes. The “a” value for Non-Recirculating Distribution systems and the “b” value for Recirculating Distribution systems appear inconsistent with values in the table for 1- and 2-story homes, and may be typographical errors.

Revise Footnote 8 regarding point of measurement as follows: For example, a shower/tub combination would take the measurement from the ~~center~~ fixture supply outlet of the shower/tub, while a two sink lavatory in the master bath would take the measurement from the ~~center~~ fixture supply outlet of the furthest lavatory. Reference to the “center” of a fixture is unnecessarily imprecise; the water supply outlet is a preferable point of measurement, and just as visible in plan view.

**Clean Energy / Electric Ready:** NRDC encourages CEC to include “Electric Ready” requirements to facilitate future installation of heat pump water heaters and clothes dryers in new buildings where builders and customers may not be ready to install them right away. Implementing such requirements during initial construction while the different trades are onsite and these requirements can be included in the overall scope of work costs much less than retrofitting them later. It would significantly reduce the cost and complexity of upgrading the building to clean low-carbon high-efficiency electric appliances when these appliances need to be replaced. This is an important strategy to help California achieve its long-term climate goals which will require transitioning the vast majority of its building stock to electric space heating, water heating and clothes drying powered by clean renewable electricity.<sup>3</sup>

Such requirements may include an appropriate space that meets heat pump water heater requirements, access to a dedicated electric circuit of the appropriate gauge at that space as well as at the clothes dryer location, spare electric panel and service capacity for both appliances.

NRDC is interested in working with stakeholders to define specific requirements that don’t add significant costs upfront and will reduce the costs of future electrification, as well as making it easier particularly in emergency replacement situations.

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<sup>3</sup> E3 (Energy and Environmental Economics). 2015. *CA Energy Principals’ 2030 and 2050 Pathways modeling*. [https://ethree.com/public\\_projects/energy\\_principals\\_study.php](https://ethree.com/public_projects/energy_principals_study.php)



## **Energy Storage**

NRDC supports energy storage as an emissions-reducing technology that should be valued in Title 24. We encourage CEC to continue considering how to value battery and thermal storage in ways that do not adversely impact the requirement to comply with the full energy efficiency EDR requirement, such as the currently proposal to allow a 25% reduction in the capacity of the mandatory PV installation in homes with battery storage equal to or greater than 8 kWh capacity. NRDC suggests that CEC consider some additional incentives for battery storage, such as waiving the effect of building orientation on the compliance EDR score, in order to strengthen the incentive for builders and homeowners.

However, NRDC does not support the California Building Industry Association's recent proposal to provide compliance credit for battery storage "equivalent to the entire set of additional energy efficiency measures being sought in the 2019 update of the Residential BEES (i.e.: the 2019 HPA and HPW improvements beyond the 2016 levels, QII, windows, etc.)."<sup>4</sup> NRDC believes a credit against the energy efficiency EDR of this magnitude would amount to CEC abrogating its responsibility to require the most stringent building energy efficiency measures that are cost effective before, or simultaneously with, requiring on-site PV.

We also support CEC's proposal to include a thermal storage compliance credit in the performance path that will apply to electric water heating and pre-cooling. In the future, we look forward to CEC including those credits by some mechanism in the prescriptive path as well.

Grid flexibility is an essential strategy for achieving deep emissions reductions in the buildings sector. It is therefore important for the code to appropriately value such capabilities. Should there be discussion of expanding that compliance credit in any way, as was alluded to during the workshop, NRDC requests to be a part of those conversations.

## **CALGreen**

### ***Societal Cost of Carbon***

NRDC commends the commission for making CALGreen an integral part of its code development process; we see CALGreen as a key component of Title 24 and California's policies to reduce energy use and

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<sup>4</sup> California Building Industry Association. 2017. TN # 221506.  
[http://docketpublic.energy.ca.gov/PublicDocuments/17-BSTD-01/TN221506\\_20171013T163502\\_Robert\\_Raymer\\_PE\\_Comments\\_Draft\\_2019\\_Building\\_Energy\\_Efficiency.pdf](http://docketpublic.energy.ca.gov/PublicDocuments/17-BSTD-01/TN221506_20171013T163502_Robert_Raymer_PE_Comments_Draft_2019_Building_Energy_Efficiency.pdf)

emissions from the built environment. We support CEC's proposed 2-tier approach based on energy design ratings (EDR) for 2019 CALGreen – it has the merits of both simplicity and flexibility.

However, NRDC believes it is incumbent on CEC to add a feature to CALGreen that allows local jurisdictions to include a societal cost of carbon to their reach codes, to facilitate deep reductions in carbon pollution from California's new buildings. As municipalities and others look to minimize the climate impact of their buildings, they will look to CALGreen for guidance on doing so.

Thus far, CEC has not addressed ways to help California reach codes reduce greenhouse gas emissions directly. The purpose of many of California's climate and energy policies is ultimately to achieve ambitious and challenging carbon pollution reduction goals. As such, the Commission has a unique opportunity – and, indeed, a de facto obligation – to facilitate greenhouse gas reductions through its reach building codes. Leadership cities and counties across California are examining ways to cut their climate impacts and they will look to 2019 CALGreen as they develop their plans.

While the Commission has proposed a tier of CALGreen that would achieve full ZNE, achieving that metric is distinct from reaching carbon neutrality. In fact, natural gas use and the use of the grid as 'virtual energy storage' make it very likely that most ZNE buildings are not carbon neutral buildings. At its heart, the issue stems from the use of California's time dependent valuation (TDV) in measuring reach code compliance – TDV is an energy *cost* metric, not simply an energy or emissions metric. As such, qualifying for ZNE under TDV is distinct from achieving true carbon neutral residences. Local jurisdictions will look to CEC for guidance on moving past TDV's limitations and working towards true carbon neutral buildings. In addition, proper CEC guidance on reducing residential carbon emissions will provide a pathway for future code cycle revisions.

CEC mentioned at the April 20<sup>th</sup> ZNE workshop that it was considering offering an option in CBECC-Res to account for a societal cost of carbon (SCC). SCC aims to quantify the external cost of climate-damaging emissions and can differ based on different analyses of the cost to mitigate and adapt to climate change. In CALGreen, the value used for SCC could be set by each local jurisdiction, offering flexibility as individual governments pursue aggressive climate action. We strongly encourage CEC to finalize its proposal on the inclusion of SCC in CALGreen, and to share its proposal with stakeholders for review and discussion.

We encourage CEC to implement the SCC feature in a way that immediately allows local jurisdictions using reach codes based on a societal cost of carbon to comply with both Parts 6 and 11 of the building code. This should be feasible with only a single run of the compliance software. While this is not a problem when a reach code uses a percent-better-than-approach, or a lower EDR target, this is not necessarily the case for a reach code based on SCC. But single compliance modeling is important nevertheless to avoid undue burden on building professionals and extra costs to homeowners.

Further, NRDC respectfully requests that CEC share the hourly greenhouse gas schedule that the commission is planning to use to integrate SCC into CBECC-Res. We believe stakeholders will be able to

help CEC assess how SCC will affect various measures based on their load shapes, such as to determine the climate benefits of grid flexibility measures such as batteries, pre-cooling, and electric water heaters.

### ***Model Ordinance for Renewable Water Heating***

On May 5, 2017, NRDC and twelve other stakeholders including Acterra, Association for Energy Affordability, CALSEIA, City of Berkeley, Carbon Free Palo Alto, Design AVEnues LLC, Home Energy Analytics, MenloSpark, Sanden International, Sierra Club, Sonoma Clean Power, Stone Energy Associates, and Union of Concerned Scientists, filed joint comments asking CEC to add a “renewable water heating” option to its solar PV model ordinance. This would allow local jurisdictions to consider both options, and either adopt the solar PV ordinance alone or both options together depending on their situation and priorities.

CEC’s proposal aims to offset most of the electricity use in a dual-fuel building, but it does not address the energy used by thermal end uses such as water heating and space heating. Direct use of fossil fuels, primarily natural gas, for thermal end uses in residential buildings is responsible for a roughly equivalent amount of GHG emissions in California as all electricity used in these buildings.<sup>5</sup>

This is an overlooked opportunity to save energy and reduce GHG emissions, as several technologies are available today that can provide significantly lower-carbon hot water in buildings than with current natural gas systems. These include electric heat pump water heaters (HPWH), and solar thermal water heating.

We ask CEC to approve this renewable water heating model reach code as soon as possible to facilitate its adoption by local jurisdictions who are looking for leadership opportunities to cut GHG emissions from energy use in buildings. This will also help develop the market for HPWH statewide, increasing the adoption of low-carbon electric water heating options in new buildings throughout California.

We appreciate the opportunity to provide this input, and thank CEC for its careful consideration of our comments.

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<sup>5</sup> Jones C., Kammen D., “Bay Area Consumption-Based Greenhouse Gas Emissions Inventory”, Jan. 2016, <http://www.baaqmd.gov/research-and-data/emission-inventory/consumption-based-ghg-emissions-inventory>

Respectfully submitted,

A handwritten signature in blue ink, appearing to read 'Delforge'.

Pierre Delforge

A handwritten signature in black ink, appearing to read 'Alexander Hillbrand'.

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