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NRDC Comments on CEC Staff Workshop on Building Envelope & Hot Water

Additional submitted attachment is included below.



NRDC Comments on CEC's Staff Workshop on Envelope Measures and Water Heating for the 2019 Zero Net Energy Residential Building Energy Efficiency Standards

June 16, 2017

The Natural Resources Defense Council (NRDC) appreciates the opportunity to comment on the California Energy Commission (CEC)'s Staff Workshop on Envelope Measures and Water Heating for the 2019 Zero Net Energy (ZNE) Residential Building Energy Efficiency Standards on June 1, 2017. The 2019 update to the California building energy code will be instrumental in achieving California's climate and energy goals, for example SB 350's goal to double California's energy savings from energy efficiency by 2030 and SB 32's aim to reduce the State's greenhouse gas emissions by 40% in 2030.

Pursuant to those goals, NRDC strongly supports the energy conservation measures proposed to improve the envelope performance of California homes. In this rulemaking, CEC has proposed to strengthen requirements for High Performance Attics (HPAs), High Performance Walls (HPWs), windows and doors, and quality insulation installation (QII). Together, the measures provide millions of dollars of benefits to California homeowners and will avoid significant consumption of electricity and natural gas.

NRDC strongly supports CEC's proposal to end the photovoltaic (PV) compliance credit in the 2019 Standards. NRDC supports energy efficiency, particularly of the building envelope, as the primary means to achieve energy savings in buildings, followed by on-site generation from renewable sources such as PV. In addition, NRDC vigorously supports reducing the climate impact of water heating – one of the largest loads in California homes – by both the measures proposed in this workshop and through electrification of water heating equipment.

Energy Conservation Measures

NRDC believes the 2019 Standards should require the most efficient energy conservation measures available, including the proposals to strengthen requirements for HPWs, HPAs, and windows and doors, and to prescriptively require QII. Energy conservation measures last a long

time and are much easier to include in a home during initial construction. Retrofitting homes with better-insulated walls, for example, is much costlier than installing HPWs from the outset.

In addition, energy conservation measures provide savings day and night, not simply when the sun is shining and the PV array is generating energy. CEC has not addressed offsetting non-electric energy use such as natural gas use in this code to achieve true ZNE. As such, California should maximize energy conservation measures to offset all possible non-electric fuel use. California utilities are also facing a growing challenge of grid load ramping up quickly as home and grid-scale PV productivity drops in the evening, often meeting this fast-changing load with inefficient, more carbon intensive natural gas peaking plants. In line with California's carbon emissions reduction goals, homes should be designed to be as efficient as possible to minimize this effect.

As noted in the CASE Reports, California's Energy Action Plan of 2003 requires that cost-effective conservation measures be prioritized over additional generation capacity. Since the 2019 Standards approach ZNE and include mandatory requirements for on-site renewable energy generation, all cost effective conservation measures should be required.

Ending the PV Credit

NRDC strongly supports CEC's proposal to include a target Energy Design Rating (EDR) score that may only be achieved through energy conservation measures. Such an approach will end the one-time PV credit available in the 2016 Standards, which was never intended to continue to the 2019 code and which we strongly agree should end.

The PV credit in 2016 was intended to provide flexibility to builders as they begin to install HPWs and HPAs. As CEC notes, innovation and progress in the deployment of HPWs and HPAs indicates that the PV credit is no longer needed. Several builders have begun installing these features widely, but some others have chosen to comply via the PV credit. NRDC believes this pattern suggests that the PV credit can and must end for these important envelope measures to be widely deployed.

Separating the energy efficiency EDR from the PV EDR is a good way to ensure homes are maximally energy efficient while still capturing the benefit of PV in pursuit of ZNE. NRDC supports CEC's approach of allowing extra energy efficiency EDR points to offset the PV EDR requirement but not the other way around, consistent with the rationale we have explicated.

High Performance Attics (HPAs)

HPAs are an important element of energy efficient homes and NRDC supports CEC adopting requirements that improve their performance and maximize their penetration in the market. HPAs consist either of insulation at the roof deck of the home or of heating, ventilation, and air conditioning (HVAC) ducts placed in conditioned space to improve the energy efficiency of those systems. Above deck insulation (“Option A”), below deck insulation (“Option B”), or ducts in conditioned space (“Option C”) are all prescriptive compliance pathways for HPAs. HPAs have seen a flurry of innovation recently as builders begin to certify homes to the 2016 Standards. While above deck solutions may often be simplest, below deck insulation is reported to be the most popular compliance option so far.

Above deck insulation, Option A, is a lesser-used but highly cost effective HPA compliance pathway. Wedge insulation is the predominant option for residential construction, offering low labor cost and complexity, good fire performance, and negligible moisture and mold concerns. Above-deck solutions avoid the need to install on the underside of the roof and the complications therein.

Options for below deck insulation, Option B, are several. The first and simplest is typical R-13 insulation batts wired or strapped to trusses. Another option is batts with stapling slots, making installation much easier at a modest price premium. Third is a new batt technology which allow installers to staple straight through the batts without compression issues. The latter offer the easiest installation, but come at a significantly higher material cost. They are still cheaper than spray foam or netted attics, however. As with all under deck solutions, fall protection and full under deck coverage are necessary.

Ducts in conditioned space, Option C, is also a promising opportunity to comply with the prescriptive HPA requirement. Taking ducting out of the attic reduces losses in HVAC ductwork as it exchanges heat with unconditioned air. Insulation manufacturers are developing solutions to facilitate this compliance pathway in advance of the 2019 Standards or earlier. One good option is to seal the ceiling by installing a smart vapor barrier and placing the furnace in a mechanical room.

NRDC agrees with CEC that California will benefit from a higher percentage of homes built with HPAs. Sun-setting the PV credit will encourage this beneficial technology, while the additional insulation levels required in the 2019 Standards revision are not expected to appreciably increase the complexity of HPA installation. CEC should prioritize improving the performance and increasing the market penetration of HPAs for the 2019 Standards.

High Performance Walls (HPWs)

NRDC supports CEC's proposal to strengthen requirements on single family home HPWs in Climate Zones 1 and 11-16 by reducing the prescriptive U-value from 0.051 to 0.043. As a cost effective measure without any major barriers to adoption, improved HPWs are an important requirement in 2019 as the State begins to require on-site power generation. Furthermore, the impact of this measure is projected to save 1.9 GWh of electricity in the first year of the 2019 Standards.

HPWs are a priority for new residential construction, as homeowners typically do not have cost effective opportunities to retrofit their homes with additional wall insulation or larger framing. HPWs contribute heavily to reducing HVAC loads in the home and contribute to the home's ability to act as a thermal storage device, as discussed below.

Quality Insulation Installation (QII)

NRDC strongly supports including QII as a prescriptive requirement in the 2019 Standards. As demonstrated in the CASE Reports, QII is critical to achieving in-the-field insulation performance and air sealing and provides major environmental and energy cost benefits. QII consists of HERS rater inspections of insulation installation and visual inspection of air barriers to ensure sufficient building tightness.

While insulation and air sealing inspection are firm steps in the right direction, NRDC believes blower door testing should be performed for all new homes to measure the air tightness level resulting from construction. Without blower door testing, documentation, and reporting, it will be impossible to analyze the impact of air leakage on energy use in California homes. Air leakage is one of the largest remaining opportunities for energy savings in the code, as reported by numerous energy analysts and builders and as corroborated by Passive House's strict air tightness requirements. Air tightness also offers co-benefits, such as indoor air quality improvements, and there is no current requirement for home air tightness in California. In many cases, new homes are likely to be built with air sealing results better than the 5 air changes per hour at 50 Pascals (5ACH50) used as the default tightness in CBECC-RES. Measuring air tightness will help builders demonstrate the quality of their home construction methods while helping CEC understand the energy impacts of air infiltration.

HERS raters are trained to perform blower door testing, adding little time and cost to QII and other inspection-related activities. NRDC proposes that CEC require blower door testing, documentation, and reporting in the 2019 Standards. NRDC encourages CEC to consider mechanisms by which blower door testing may be found to be cost effective, including benefits

such as improved construction practices in homes expecting a blower door test, simpler indoor air quality management, and others.

Whole-Home Thermal Storage

NRDC supports CEC developing a metric to value the total thermal storage capability of homes, such as has been proposed by Passive House California in its May comments. Just like a tank water heater can act as thermal storage, so can the entire building. For example, well insulated homes can be pre-cooled before the hottest time of day and glide through that period without the air conditioning running, reducing peak energy consumption. Similarly, these homes could be pre-heated before early morning, often the coldest time of day and the time when many homeowners wake and turn up the heat. Homes with high performance shells thus represent a significant grid harmonization resource and should be valued in the Standards as such.

Appropriate thermal mass and conductance also help save energy outright: high-performance buildings benefit from greatly reduced heating and cooling loads, making them much easier to manage. For both reasons, buildings with high performance shells should be incentivized in the 2019 Standards.

Water Heating

NRDC supports CEC's proposals for compact hot water distribution design and drain water heat recovery. In addition:

We strongly support the development of an electric water heating baseline, currently absent from the code, to eliminate the code's bias against electrified water heating, which is inherent to California's time dependent valuation (TDV) based entirely on electric and gas retail rates. This measure is one of the most critical changes needed to better align the code with California's greenhouse gas reduction objectives. NRDC is encouraged by CEC's statements of intent to develop such as baseline and respectfully requests stakeholder engagement in that process. This electric baseline should provide a level playing field for high efficiency electric water heating technologies.

Electric water heating can offer energy savings, carbon reductions, and grid harmonization benefits, all three of which should be valued in the code. To that end, NRDC requests a schedule for adding a societal cost of carbon (SCC) to CALGreen to ensure its implementation and adoption in the 2019 cycle. Including SCC in CALGreen will help value the carbon emissions reductions earned from electrifying water heating.

We also support incentivizing grid harmonization strategies that promote load flexibility, to help integrate renewable energy (duck curve mitigation) as well as to encourage self-consumption of rooftop PV electricity for electric water heating. This will minimize societal costs of achieving California's Renewable Portfolio Standard (RPS) goals, maximize customer value of PV and electric water heaters, and minimize the costs of infrastructure upgrades required to handle backflows of distributed PV onto the grid.

To help absorb abundant and sometimes surplus grid renewables and mitigate the duck curve, CEC should better value load flexibility than is currently reflected in TDV. TDV 2019 assumes that there is no curtailment on the grid, despite many real-world examples of curtailment such as those in spring 2017. Because the load flexibility incentive is based on the difference in TDV values, CEC should update TDV values used for load flexibility to better reflect curtailment and low price situations than are reflected in TDV 2019. Alternatively, to avoid updating TDV at this stage in the code development process, CEC could give an equivalent credit to grid-interactive loads.

To encourage rooftop PV electricity self-consumption, CEC should better reflect the difference in value between self-consumption and exports. We expect that over the next 30 years, net energy metering rules (NEM) will evolve to more significantly differentiate the cost of self-consumed and exported PV electricity than currently in NEM2. CEC should make reasonable assumptions about this cost difference to send a more meaningful market signal and help the development of solutions that maximize PV self-consumption. Using NEM2 values would not appropriately reflect NEM compensation that building owners are expected to face over the next 30 years. In fact, NEM2 will likely already be obsolete by the time the 2019 Standards go into effect on January 1, 2020. We suggest CEC use the average of NEM2 (where the difference is equal to non-bypassable charges, or 2-3 cents) and the avoided cost of energy as represented in TDV (the TDV retail rate adder).

"Renewable water heating" model ordinance: NRDC has proposed a "renewable water heating" model ordinance as an add-on to CEC's proposed solar PV model ordinance. Our proposed ordinance is an important opportunity to help cities provide leadership on water heating emissions reductions. We encourage CEC to support local government leadership by endorsing this model ordinance in timely manner, and respectfully request that CEC shares its timeline for doing so.