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CALSSA comments on Oct 6 2020 Workshop on 2022 Building Energy Efficiency Standards

Additional submitted attachment is included below.

CALIFORNIA SOLAR + STORAGE ASSOCIATION
smart local energy

October 20, 2020

Subject: 19-BSTD-03 – CALSSA's comments on October 6 Workshop on 2022 Building Standards

Dear California Energy Commissioners and staff:

Thank you for the opportunity to submit comments on the Energy Commission's workshop on October 6, 2020, discussing the 2022 building energy efficiency standards. Our comments are below.

Increasing compliance credit for energy storage

In the 2019 building standards, the Energy Commission allowed energy storage systems to receive envelope compliance credit. The landmark policy was designed to familiarize builders with the nascent technology, while bringing the advantages of energy storage to homes and the grid.

In the 2022 building standards, the Energy Commission should increase the amount of envelope compliance credit available to energy storage to further pave the way for batteries to become a prescriptive requirement in the 2025 building standards. Increasing the available compliance credit has been effective at later creating a prescriptive requirement. In the 2016 standards, the Commission increased the compliance credit available to rooftop PV, which prepared the building and solar industries for the PV mandate in the 2019 standards.

Energy storage-ready homes

We support the Commission's plans to require new homes to be "energy storage ready." The requirements could save more than $2,500 when the homeowner adds an energy storage system at a later date. In the future, we expect nearly every solar energy system to include a battery due to the financial, environmental, resiliency, and grid benefits. Until that time, requiring new homes to be energy storage ready is an important and visionary step to encourage adoption of the technology.

We appreciate the Commission working with the industry to design the requirements, and we look forward to continuing working together.

PV mandate for high-rise residential and commercial buildings

We support the proposal to require solar PV for new commercial and high-rise residential buildings, and we believe sizing based on 40 percent of exports is appropriate. For low high-rise buildings (e.g. four and five stories), the Commission could design the PV requirement similar to the current requirement for three-story multifamily homes, which is to size the system using the prescriptive requirement or the solar access zone, with a threshold based on

a certain wattage per square foot of conditioned floor area. (See Exception 4 of section 150.1(c)(14) of the building standards.)

Constructing flat roofs on which solar panels can be tilted south, as opposed to sloped roofs with portions that face north, should enable systems to meet the energy needs for many commercial buildings despite high loads generated from multiple floors. Adding tracking components to the solar installation on a flat roof can further maximize the solar energy generated on a multistory building. Also, carports are a common location for solar on commercial properties, and we expect many developers to meet the PV requirement via carports for commercial buildings with parking lots.

We support the Commission's plans to base the sizing requirements on the projected load profiles of different types of buildings (high rise multifamily, offices, retail/wholesale, educational, and warehouses).

Solar water heating

For water heating, the workshop contained three problems.

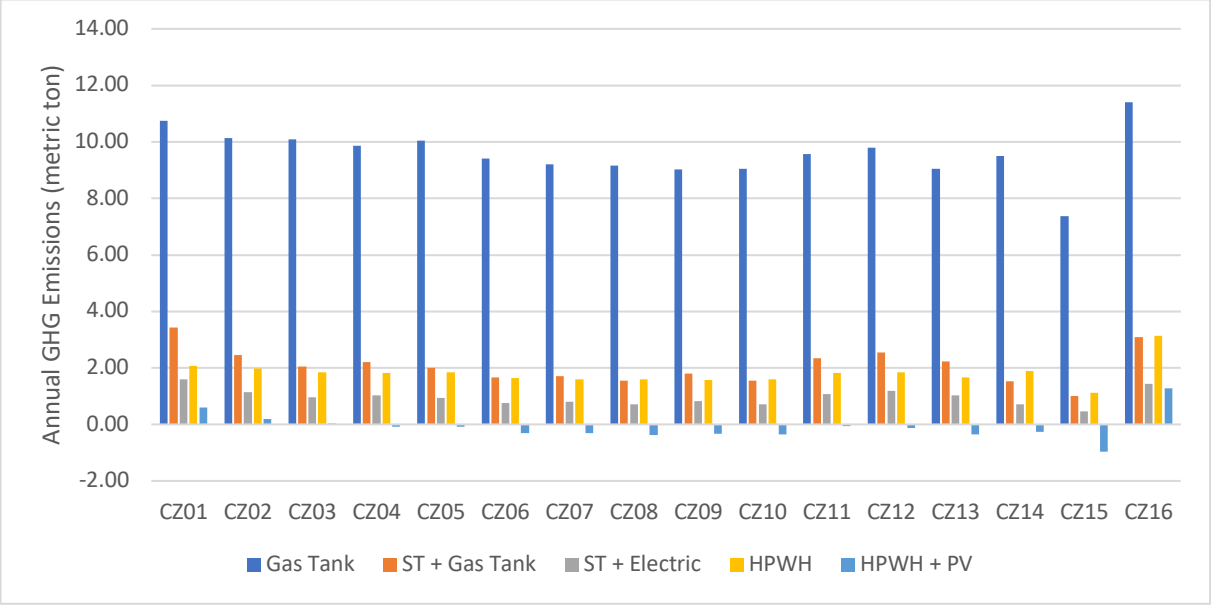
- The draft proposal would exempt solar water heating (SWH) from the prescriptive approach for multifamily properties with heat pump water heaters (HPWH), even if they are installed without additional PV.
- Workshop presenters discouraged systems that use both solar water heating and heat pumps.
- Homes in Climate Zone 15 may not have sufficient roof space for additional PV to power HPWH, and SWH is a better option for that area.

The CASE report on the All-Electric Multifamily Compliance Pathway recommends that the Energy Commission allow heat pump water heaters as an alternative to solar water heating in the all-electric baseline.[1] This would provide less savings and lower performance to property owners.

CALSSA has produced new research on environmental benefits and cost-savings of solar water heating. The study found that solar water heating with electric resistance backup achieves greater greenhouse gas reduction than heat pump water heaters and has a shorter simple payback period. Solar water heating with electric backup reduces GHG emissions 90 percent on the typical multifamily building. This compares to an 81 percent reduction with heat pumps.

[1] Section 2.3.1 under "8. Domestic Water-Heating Systems. B. For system serving multiple dwelling units" on page 39.

Figure 1. Annual GHG Emissions for Multifamily Water Heating Configurations



Simple payback periods for SWH with electric backup are at or below 10 years in five climate zones. For HPWH, payback is 15 years or longer for all climate zones, and is beyond twice the system life in more than half of the climate zones. With SWH at scale, systems provide paybacks well within the analysis period in most markets. In a mature market, heat pumps deployed standalone can compete in select territories (Climate Zones 7, 10, and 14), but the low annual savings in other markets places them out of reach. The addition of PV as a lower cost electricity supply opens heat pump technology up to almost all climate zones, but is not as cost effective as the deployment of SWH technologies.

Table 1. Simple Payback for Multifamily Water Heating Configurations (no incentives)

	Multifamily - Current Market				Multifamily - Mature Market			
Climate Zone	ST + Gas Tank	ST + Electric	HPWH	HPWH + PV	ST + Gas Tank	ST + Electric	HPWH	HPWH + PV
CZ01	12	20		19	8	13	44	16
CZ02	11	14		16	8	9	45	13
CZ03	11	13	43	15	7	8	34	12
CZ04	8	10	44	15	8	7	35	12
CZ05	11	18		21	11	12		18
CZ06	12	15		24	11	10		20
CZ07	9	8	15	16	9	6	12	13
CZ08	12	14		23	11	10		19
CZ09	13	18		24	12	12		20
CZ10	9	8	16	16	9	6	12	13
CZ11	12	14		15	8	7	39	12
CZ12	9	10	49	14	8	7	39	12
CZ13	13	28		19	13	20		16
CZ14	9	8	17	16	8	5	13	13
CZ15	14	15	44	17	13	10	34	14
CZ16	10	15		26	7	9		21

For these reasons, we request the Energy Commission recognize solar water heating with electric resistance backup as an important component of electrification. Title 24 should not

allow heat pump substitution in the prescriptive method, and the calculator in CBECC-Res should allot appropriate compliance credit to the technology in the 2022 building standards.

In addition, the findings of the CASE report on the All-Electric Multifamily Compliance Pathway discourages pairing solar water heating with heat pumps because heat pump manufacturers objected to the reduction in efficiency from feeding pre-heated water into a heat pump.[2] We suggest the Commission take a more holistic approach to designing this component of the building standards. Rather than looking at the heat pump in isolation, the Energy Commission should be considering the water heating efficiency of a combined hybrid system.

Products exist today that include solar collectors and heat pump compressor loops into a single system, and more are under development. Such hybrid systems were not part of the workshop discussion but are an important approach for water heating electrification. The Energy Commission should be careful not to discourage this technology development.

With 600 gallons of thermal storage, SWH systems provide a large thermal reservoir that a low capacity HPWH could supplement overnight when utility rates and building demand are at a minimum. In practice, the SWH system would carry the majority of the load from spring through early fall and the HPWH would provide heating on cloudy winter days during low-cost periods. Because the SWH system is providing a large storage capacity that is otherwise unutilized during these times, the HPWH portion of the system can be installed at fractional cost compared to a standalone HPWH solution. Solutions of this style are likely to grow and programs need to be flexible in allowing the deployment of multiple technologies for building decarbonization.

With warm water entering a HPWH, it has to work much less. The HPWH at some point has to lift the water temps to the set point and when rapid recharge is needed it operates poorly to achieve the set point. Supplying it with preheated water, probably with a solar fraction of 50-60 percent, improves overall system performance. SWH thereby makes the overall system use extremely efficient. SWH can effectively store energy created during the day for use in the evening to even out the top of the duck curve. These are hours when the electric grid does not want additional load from a heat pump.

Multifamily property owners in California typically rely on 199,000 BTU tankless water heaters. HPWHs cannot recover from heat usage as quickly as a large tankless heater. To soften the blow of less recovery strength, SWH with the extra reserve of stored hot water can keep customers satisfied with all electric housing.

Additionally, roof space on many single-family dwellings in Climate Zone 15 will be insufficient for solar needs to power typical loads that include water heating. Heating water with a combination of solar thermal and heat pumps powered by solar photovoltaics (PV) – compared to heating water solely with heat pumps powered by PV – has the advantage of optimizing available roof space. While the current 2019 building standards require on-site PV

[2] Section 3.2.2.2.6 under "System efficiency" on page 82.

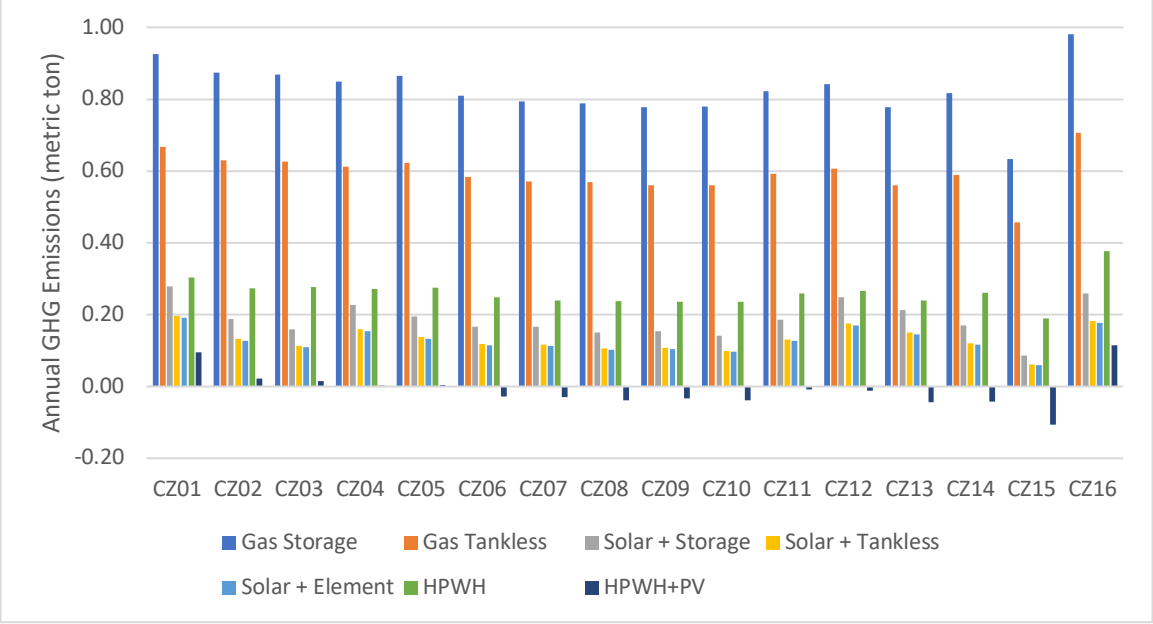
to generate energy equivalent to the building's total electric loads (assuming a mixed-fuel building), some single-family homes in Climate Zone 15 and some two- and three-story multifamily homes do not have sufficient suitable roof space for the needed number of PV modules, as evidenced by the exceptions to the new home solar mandate in Section 150.1(c)(14) of the building standards. Adding PV modules to the roof to meet the additional energy needs from heat pumps and other appliances under the all-electric baseline in the 2022 building standards will exacerbate the roof space limitations. Solar thermal helps alleviate these limitations because heating water with solar thermal collectors requires less roof space than heating water with a heat pump powered by solar PV.

Finally, when the Energy Commission values the energy savings from solar thermal systems for homes to meet the requisite energy design rating, the Commission should consider advantages of solar thermal absent from the CASE report on the "All-Electric Multifamily Compliance Pathway."

The CASE report states that "a solar thermal system can be practically sized to offset at most 70 percent of a building's DHW usage."[3] We believe this conclusion is based on incorrect or outdated information.

Modeling of SWH and HPWH for single family homes across all 16 California climate zones shows that the use of solar with electric element backup results in lower emissions than heat pump water heaters. Installing SWH while fuel switching from gas to electric backup results in an 91 percent reduction in GHG emissions, averaged across climate zones. Relying instead on heat pumps results in an average statewide emissions reduction of 81 percent.

Figure 2. Annual GHG Emissions Associated with Residential Water Heating Configurations



[3] Section 3.2.2.2.6 under "Operational cost" on page 82.

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All-electric homes

We support the comments from stakeholders at the workshop that the 2022 building standards require new homes to be all-electric. Whether the Commission creates an all-electric requirement or an all-electric baseline option, the load from the electric appliances should be met with on-site PV. As the relative cheapness of natural gas often prevents electrification from being cost effective, meeting the new electric loads with on-site PV can increase the cost-effectiveness of the electric appliances. Additionally, the cost of adding PV capacity to meet the additional electric loads is relatively low because the fixed costs (e.g. plan design, permitting) are already covered by the system required by the solar mandate.

PV mandate for occupied roofs

We do not support the possible exemption to the solar mandate for new homes with occupied roofs (flat patio areas). Much of the new housing stock in some communities, such as San Francisco, include flat roofs with patios. Builders should design these homes with solar.

One of the goals of the building energy efficiency standards is to encourage developers to rethink home design to lower energy usage, protect the environment, and reduce homeowners' energy bills. Allowing an exemption for occupied roofs would be counter to this goal. Additionally, since building an occupied roof adds a premium to the cost of the home, creating an exemption to the solar mandate for occupied roofs would have the essential result of allowing homebuyers with disposable assets to pay a premium to receive an exemption.

Builders have many cost-effective options to add solar to occupied roofs. They can construct the patio on a portion of the roof and install solar on another portion. San Francisco has paved the way for such designs with their Better Roofs Initiative, which requires solar and/or living roofs on 15-30 percent of the roof space for new construction. Other compliance options include an elevated solar system, such as a solar patio or solar shade structure, built above the rooftop patio, which provides the additional benefit of shade to the patio. Builders and solar installers also can mount the solar system onto the parapet, which provides the additional benefit of fall protection.

Community solar and storage

We believe community solar and storage should play a secondary role to on-site solar and storage in the building standards. Rooftop solar and storage are critical tools for transitioning the grid to 100 percent clean energy, decarbonizing our buildings and cars, making home ownership and rentals more affordable, and increasing resiliency. Standardizing clean energy technologies through building code is a sure way to create economies of scale, lower costs, and make the benefits of clean, renewable energy available to everyone.

For these reasons, and many others, the building standards should have a goal that every new building is constructed with rooftop solar and, when cost effective, an on-site energy storage system. Solar systems should be sized to meet the buildings' total projected loads. When that is not feasible, systems should be as large as possible.

When rooftop solar and storage can meet only part of a building's total projected loads, the building standards should encourage community solar and storage to meet the remainder of the loads. These community resources, if properly defined, can bring the benefits of local solar and storage to residents, businesses, and their neighborhood. Instances in which rooftop solar and storage may not be able to meet the building's total projected loads include buildings with shaded roofs, multifamily homes, commercial buildings with large loads, and single-family homes in Climate Zone 15.

Whether or not the Energy Commission agrees that community solar and storage should play a secondary role to on-site solar and storage in the building standards, CALSSA recommends changes to Section 10-115 so that community solar and storage maximize the benefits to customers, the environment, and the grid. In short, community solar programs should provide significant cost savings to the enrolled homes and allow customers to unenroll, and the community solar system should be new construction no larger than 5 MW located close to the homes enrolled in the program. Please see below for further information.

- Community-scale:
    - A qualifying community solar project should be no larger than 5 MW AC. This figure is in line with the building energy efficiency standards' FAQ, which states that "community-scale PV systems can range from a few kW to a few MW."[4] 5 MW is also in line with successful programs from across the country.[5]
    - Qualifying community solar and community storage projects should interconnect to the distribution system, which delivers electricity to end-users, rather than the transmission grid, which transports energy across long distances from generation to local distribution areas.
    - A qualifying project should fit into the built landscape whenever feasible.
- Close proximity to homes:
    - To maximize the benefits of local energy production, qualifying community solar and storage projects should be located in the community of the homes and businesses they are built to serve and separated from the premises by the shortest distance possible.

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[4] California Energy Commission, *Frequently Asked Questions: 2019 Building Energy Efficiency Standards*, https://ww2.energy.ca.gov/title24/2019standards/documents/Title24_2019_Standards_detailed_faq.pdf, p. 4.

[5] Massachusetts' community solar projects are capped at 5 MW. See Massachusetts Department of Energy Resources, *225 CMR 20.00*, https://www.mass.gov/files/documents/2017/10/16/225cmr20.pdf; Minnesota's community solar gardens are capped at 1 MW. See Minnesota Statute 216B.1641, https://www.revisor.mn.gov/statutes/cite/216b.1641. New York community distributed generation projects are capped at 5 MW. See NYSERDA, *Order on Value Stack Eligibility Expansion (9/12/2018)*, https://www.nyserda.ny.gov/All%20Programs/Programs/NY%20Sun/Contractors/Value%20of%20Distributed%20Energy%20Resources. While, the California Public Utility Commission's Green Tariff/Shared Renewables Program (GTSR) sets the limit at 20 MW, this is out of line with other standards and larger than what we believe is community scale.

Examples for spaces for community solar installations include adjacent lots, the roof of the local school or big box store down the street, or the carport of the community center.
    - In terms of the grid, a qualifying community solar project should be placed on the same circuit as the customers they serve. If the same circuit is not an option, placing the community solar project within the same distribution planning area (DPA) can create some of the benefits of customer-sited solar to the community.[6]
- Unenrollment is allowed
    - Qualifying community solar and storage programs should allow subscribers to sell or release their shares without penalty, replace that generation or storage with new capacity on their own property, and receive standard NEM rates for the generation.
- Customer and community benefit:
    - Qualifying community solar and community storage programs should offer electricity bill savings commensurate with those offered by rooftop solar. Electricity bill savings are particularly important for lower-income customers.
    - Qualifying community solar and community storage programs should offer community benefits such as resiliency, reliability, grid support services (e.g. ancillary services), avoided transmission and distribution costs, economic development, workforce training opportunities, or environmental remediation.
    - Qualifying community solar and community storage programs should enable developers and third-party providers to offer subscriptions. Customers have benefited from competition by non-utility providers in the rooftop solar and storage market, and the community solar and storage market should include the same competition.
- Additionality
    - Qualifying community solar and community storage programs should require the build-out of new clean energy, commensurate to the new electric load it is intended to serve.
    - Existing resources or resources procured prior to implementation of the community solar or community storage programs should not qualify for compliance. If electricity demand grows (as a result of new construction) without increasing the overall quantity of renewable energy, then emissions will actually increase even if the new homes are highly energy efficient.

PV mandate for small homes

We recognize the difficulty for homeowners and builders to install cost effective rooftop solar on small homes. Some costs of solar systems are not based on system size (e.g., permitting, inspection, truck rolls, some hardware), which increases the dollar/watt installation cost of small systems and can negate the cost-effectiveness. For this reason, we suggest exemptions for homes for which the required PV capacity would be less than 1.5 kW. The installation cost of a 1.5 kW system is generally less than $5.00/watt, which is cost effective. This exemption should not be available to homes being built as part of a subdivision with 10 or more

[6] For a sense of scale, PG&E has 245 DPAs serving an average of 22,000 customer accounts. Community solar in publicly owned utilities that do not divide the grid into DPAs would use areas similar to the DPAs.

residences as solar built on multiple units can achieve economies of scale to lower some of the fixed costs.

Solar mandate for U-buildings

Over the past year, some members of the solar industry have been confused about whether the new home solar mandate applies to U-buildings. According to the 2019 building standards, the solar mandate applies to "all low-rise residential buildings" (see section 150.1(c)(14)), which is defined as a multifamily home, single family home, or "U-building, located on a residential site" (see definition of "Low-rise Residential Building" in section 100.1(b)). However, neither the prescriptive nor the performance approach are designed to size solar systems for U-buildings, including U-buildings with conditioned space. In the 2022 building standards, we would appreciate the Commission resolving the ambiguity concerning U-buildings and the solar mandate. While some U-buildings such as agricultural buildings might be appropriate for solar, especially in light of the new solar mandate for commercial buildings, other U-buildings such as fences are inappropriate for solar.

Thank you for consideration of our comments.

Sincerely,

Benjamin Davis

Benjamin Davis
Policy Associate
California Solar & Storage Association