DOCKETED	
Docket Number:	18-IEPR-09
Project Title:	Decarbonizing Buildings
TN #:	223995
Document Title:	CALSSA Comments on CEC Decarbonizing Buildings Workshop
Description:	N/A
Filer:	System
Organization:	California Solar & Storage Association (CALSSA)
Submitter Role:	Public
Submission Date:	6/28/2018 3:26:29 PM
Docketed Date:	6/28/2018

Comment Received From: Kelly Knutsen
Submitted On: 6/28/2018
Docket Number: 18-IEPR-09

CALSSA Comments on CEC Decarbonizing Buildings Workshop (18-IEPR-09)

Additional submitted attachment is included below.

June 28, 2018

Commissioners McAllister and Hochschild
California Energy Commission
1516 Ninth Street
Sacramento, CA 95814

Re: CALSSA Comments on CEC Decarbonizing Buildings Workshop (18-IEPR-09)

Dear Commissioners McAllister and Hochschild:

The California Solar & Storage Association (CALSSA) appreciates the opportunity to submit comments on the California Energy Commission's (CEC) Workshop on Decarbonization. In general, CALSSA strongly supports the bold forward-looking vision for achieving decarbonized homes and buildings, and appreciated the opportunity to present the potential and opportunities that solar thermal technologies offer for meeting the state's ambitious goals.

I. Introduction

The California Solar & Storage Association is a trade association of 500 businesses involved in the local solar and storage industry in California. Our membership comprises installers, manufacturers, financers, consultants, and others. We represent companies on policy matters and assist with common business development opportunities.

The California Solar & Storage Association supports CEC's efforts to develop decarbonization strategies for CA homes and businesses.

II. Solar Thermal Background

Solar thermal technologies capture the sun's energy to heat water and air for homes, businesses and industrial processing. A solar water heating system works in concert with existing water heaters, essentially pre-heating the water for use, and creating a seamless experience for the consumer. When combined with chillers, solar thermal can also provide air conditioning. Solar thermal technologies reduce natural gas or electricity use, help consumers save money on utility bills, reduce greenhouse gas emissions, and support California-based manufacturing and installation jobs. In fact, there are eight solar thermal manufacturers in California: ACR Solar International Corp. – Carmichael; FAFCO – Chico; Gull Industries – San Jose; Heliodyne, Inc. – Richmond; Morley Manufacturing, Inc. – Grass Valley; SolAqua, Inc. – Palm Springs; SunEarth – Fontana; Suntrek Industries, Inc – Irvine. Solar thermal is a well proven and simple technology with adequate and scalable technical competencies in CA for manufacturing, installation, operation and maintenance, and is readily available right now to meet the state's decarbonization goals.

The potential for solar thermal to reduce California's greenhouse gas emissions is great, and could help reduce between 1-2 percent of the state's greenhouse gas emissions. California homes and businesses use 2.5 billion therms of natural gas annually to heat water, according to the California Air Resources Board.[1] This is comparable to roughly 3% of total statewide greenhouse gas emissions[2] and approximately equal to the total storage capacity of natural gas in the state.[3] The California Energy Commission estimates that 42% of residential natural gas usage is for heating, or roughly 1 billion therms.[4] Solar thermal can reduce a significant portion of this natural gas use—between 50% to 80% for an average residential solar heating system, or

---

1 California Air Resources Board, "Climate Change Scoping Plans Appendices," available at http://www.arb.ca.gov/cc/scopingplan/document/appendices_volume1.pdf

2 Using a conversion factor of 0.005302 metric tons CO2 eq/therm from U.S. EPA, "Calculations and References," downloaded from www.epa.gov/cleanenergy/energy-resources/refs.html, and 2014 total CA greenhouse gas emissions of 441.5 million metric tons CO2 eq, http://www.arb.ca.gov/cc/inventory/data/data.htm.

3 California natural gas storage capacity is 266 bcf, or 2.7 billion therms, from Energy Information Administration, available at https://www.eia.gov/pub/oil_gas/natural_gas/analysis_publications/ngpipeline/undrgrnd_storage.html

4 California Energy Commission, "Residential Natural Gas Consumption by End Use," available at energyalmanac.ca.gov/naturalgas/residential_use.html.

up to 840 million therms annually in CA.[5] That is equivalent to 4.4 million metric tons of CO2 (eq), [6] or roughly 1% of the state's annual CO2 emissions.

Another estimate of the solar thermal potential starts from the CA greenhouse gas emissions. According to the CARB website,[7] the 2015 CA total greenhouse gas emissions was 440 million metric tons of CO2 (equivalent), and the CA residential sector 6% of total, or 26 million metric tons of CO2 (eq). There are roughly 12 million housing units in CA.[8] Solar water heating systems could save on average 130 Therms annually per housing unit which equates to 1.6 billion therms annually, or 8.5 million metric tons of CO2 (eq).[9] This approach shows roughly 2% of total CA CO2 emissions could be met with solar thermal installations. The potential is large for industries, commercial buildings and multifamily housing as well. Given this high potential, it makes sense that when analyzing cost-effective energy saving measures, the EPA-convened California Home Energy Retrofit Coordinating Committee stated, "the single largest and most consistent opportunity in multifamily housing is reducing the energy consumed to heat domestic water."[10]

III. California Solar Initiative—Thermal Program

In 2007, AB 1470 (Huffman) created the California Solar Initiative – Thermal (CSI-Thermal) rebate program to support the deployment of solar thermal systems, and in 2017 the program received a two-year extension to December 31, 2019, with AB 797 (Irwin). The CSI-Thermal program is funded by natural gas ratepayers, and the rebates are only awarded once the project is completed and is shown to meet the high standards of the rebate program. Due to low natural

---

5 Department of Energy, http://energy.gov/energysaver/estimating-cost-and-energy-efficiency-solar-water-heater.

6 Using a conversion factor of 0.005302 metric tons CO2 eq/therm from U.S. EPA, "Calculations and References," EPA calculator

7 https://www.arb.ca.gov/cc/inventory/data/data.htm

8 Closing California's housing gap, McKinsey Report, available at: https://www.mckinsey.com/featured-insights/urbanization/closing-californias-housing-gap.

9 Using a conversion factor of 0.005302 metric tons CO2 eq/therm from U.S. EPA, "Calculations and References," EPA calculator

10 "Improving California's Multifamily Buildings: Opportunities and Recommendations for Green Retrofit & Rehab Programs," California Home Energy Retrofit Coordinating Committee, 2011, p 20.

gas prices and a slow regulatory response to set rebate levels at levels that could compete with those low natural gas prices, the CSI Thermal program had a slow start. However, since mid-2015 when the program was finally primed for success, the number of projects dramatically increased. Indeed, the amount of natural gas saved annually from solar thermal installations on multifamily housing doubled between 2016 and 2017.

Overall the CSI-Thermal program has reduced natural gas usage across the state by more than 7.3 million annual therms since 2010, equal to the annual amount of natural gas used to heat water for nearly 41,000 California homes. The program has reduced nearly 39,000 metric tons of annual CO2 emissions—the equivalent of taking 8,300 cars off the road—helping our state meet its greenhouse gas emissions goals. These are real savings, but just a fraction of what the program can accomplish if the state continues its support. Now that the program is finally working as originally intended, the state should extend it for a long enough period of time for the industry to invest in growth. In so doing, the state will be supporting manufacturing and installation jobs, and helping lower energy bills, especially for low-income households.

IV. Decarbonization of Buildings

The presenters at the Workshop outlined the many benefits of decarbonization, such as reducing natural gas use and fully electrifying our buildings. CALSSA encourages the CEC to incorporate the deployment of solar water heating technologies for water and space heating in its strategies to meet the goal of decarbonization of the homes and buildings in California. As we presented at the Workshop, according to a National Renewable Energy Lab analysis, solar water heating is the best available technology for reducing the greenhouse gas (GHG) impacts of heating water.[11] Solar water heating can reduce a significant portion of energy use for heating water -- 50% to 80% for an average residential solar heating systems, as stated above. This can reduce use of natural gas immediately before electrifying the entire building, and it will also reduce the energy use of an all-electric building. Solar water heating is versatile and is paired with a back-up source of hot water such as tankless gas backup, heat pump water heaters, or flexible electric water heaters.

[11] Table from Jeff Maguire and Tim Merrigan, National Renewable Energy Lab, March 10, 2016; included as an Appendix.

But there are barriers to its adoption. Natural gas is 85% of all water heating fuel consumption in California.[12]But natural gas prices are low; therefore, utility bill for heating water is low, and therefore the utility bill for heating water is low. There is also low awareness and lack of culture to use solar for heating water in the US (unlike other countries including China, Israel, and numerous EU countries). When a water heater breaks, the customer wants it replaced immediately, giving little chance to make the case for a more efficient water heater like solar water heating, or even solar water heating plus heat pump. We need programs and policies in place to present solar thermal options to consumers when they are replacing their water heaters, like they do in Australia.[13]

More work will be needed to help further deploy these technologies. We encourage the CEC to promote solar thermal technologies in all of the state's initiatives to meet our greenhouse gas emissions and decarbonization goals. We strongly encourage the CEC to include solar thermal technologies in the IEPR Decarbonization chapter. Solar thermal also helps new buildings meet Title 24 requirements, but we can strengthen the role for solar thermal in our building standards – both 2016 and upcoming 2019 building standards. We also encourage the CEC to work with the California Public Utility Commission to establish pathways for solar thermal to help meet our state's ambitious doubling of the energy efficiency as required by SB 350. One path could include solar thermal as an energy efficiency technology and eligible for the existing investor-owned utility energy efficiency incentives. The timing is urgent. In less than two years the federal and state incentives for solar thermal will decrease or expire. The CSI-Thermal Program is scheduled to expire in December 31, 2019, which will also coincide with the beginning of the ramp down of the federal Investment Tax Credit (ITC).

---

12 NREL report, "Break-even Cost for Residential Solar Water Heating in the United States: Key Drivers and Sensitivities."

13 Available at: https://www.sa.gov.au/topics/energy-and-environment/using-saving-energy/water-heaters

V. Conclusion

CALSSA greatly appreciates the hard work, public engagement and innovating thinking the CEC has put into development of the state's decarbonization pathways. We look forward to working with the CEC and stakeholders in utilizing the incredible greenhouse gas reducing potential for solar water heating technologies.

By: /s/ *Kelly Knutsen*
Kelly Knutsen

Kelly Knutsen, Ph.D.
Director of Technology Advancement
California Solar & Storage Association
426 17th St #700
Oakland, CA 94612
Telephone: (510) 548-2312
Email: kelly@calssa.org

Appendix

What is the best available technology for reducing the **greenhouse gas** (GHG) impacts of heating water?

	Sacramento		San Jose		Los Angeles	
Annual	Source Energy Use (MMBTU)	GHG Impact (kg CO2 equivalent)	Source Energy Use	GHG Impact (kg CO2 equivalent	Source Energy Use	GHG Impact (kg CO2 equivalent
SWH – tankless gas backup	6	294	5	281	4	226
SWH – gas tank backup	6	332	6	311	4	237
HPWH with PV	12	440	12	450	10	356
SWH – electric tank backup	13	486	13	486	13	486
Heat pump water heater	17	628	16	605	13	497
Electric resistance with PV	22	811	22	835	20	769
Gas WH - Tankless	13	761	13	770	13	734
Gas WH – Storage tank	18	1068	18	1073	17	1022
Electric resistance tank	32	1203	32	1216	31	1157

1. Solar water heaters
    - Gas backup – tankless
    - Gas backup – tank
2. Heat pump water heaters with grid-tied PV
3. Solar water heaters
    - Electric resistance backup
4. Heat pump water heaters (in homes where the HPWH is installed in an unconditioned garage)
5. Electric resistance water heaters with PV
6. Natural gas water heaters
    - Tankless
    - Tank
7. Electric resistance water heaters