CALIFORNIA SOLAR ENERGY INDUSTRIES ASSOCIATION

April 28, 2014

Mary D. Nichols
Board Chairman
California Air Resources Board
1001 I St.
Sacramento, CA 95814

RE: Comments on the First Update to the Climate Change Scoping Plan

The California Solar Energy Industries Association (CALSEIA) submits these comments on the "Proposed First Update to the Climate Change Scoping Plan: Building on the Framework," issued by the California Air Resources Board (CARB) on February 10, 2014, and the associated Environmental Analysis, issued on March 14, 2014. Specifically, CALSEIA recommends inclusion of solar water heating (SWH) market development in the Key Recommended Actions for the Energy Sector in the Scoping Plan Update.

We greatly appreciate CARB's leadership in implementing the Global Warming Solution Act and the Board's ongoing commitment to achieving the aggressive long-term goals of that landmark legislation. As you write in the draft Scoping Plan Update:

> Achieving the low-carbon future described in these studies will require that the pace of GHG emission reductions in California accelerate significantly. Emissions from 2020 to 2050 will have to decline several times faster than the rate needed to reach the 2020 emissions limit.[1]

We have not done nearly enough. Fortunately, solar water heating still remains as an area with tremendous untapped potential. Continued policies to build a mainstream market for this technology can bring large rewards in emission reduction.

Solar Water Heating Is Essential Technology for a Low-Carbon Future

Heating water in homes and businesses accounts for 3.5%-4% of total statewide greenhouse gas emissions. Given the state target of reducing emissions to near zero by mid-century, we cannot afford to leave a solution to 4% of the problem untapped.

The California Public Utilities Commission has found that natural gas use for water heating totals 1,862 million therms in the single-family residential sector, 778 million

[1] Draft Scoping Plan Update, p. 37.

therms in the multi-family sector, and 279 million therms in the commercial sector, for a total of 2,919 million therms.[2] This results in 15.5 million metric tons of greenhouse gas emissions, 3.5% of the state total.[3]

Other estimates put the emissions from residential water heating even higher. The California Greenhouse Gas Inventory measures 27.5 million metric tons of GHG from residential natural gas usage.[4] The California Energy Commission estimates that 44% of residential natural gas usage in this state is for water heating.[5] This results in greenhouse gas emissions from residential water heating of 12.1 million metric tons. Adding the multi-family and commercial figures from the CPUC decision noted above brings the total to 17.7 million metric tons of CO2, 4.0% of the state total.

Solar Water Heating Is Effective at Reducing Emissions

Solar water heating can reduce greenhouse gas emissions from domestic and commercial water heating by an estimated 6.2-6.7 million metric tons.

KEMA-Xenergy estimated that solar water heating can reduce natural gas usage by 971 million therms from the residential sector and 219 million therms from the commercial sector.[6] This combined 1.2 billion therms is equivalent to 6.4 million metric tons of greenhouse gas emissions.

Added to this, replacing electric water heaters with solar water heating systems in the residential sector would result in 1,125.5 gigawatt-hours of electricity savings, according to the KEMA-Xenergy study. This equates to an additional 0.3 million metric tons of GHG emission reduction, for a total of 6.7 million metric tons.[7]

The National Renewable Energy Laboratory conducted a study in 2007 with very similar results. That study found the technical end-use energy savings potential of solar water heating in California to be 105 trillion BTU of natural gas and 11 trillion BTU of electricity and propane.[8] This is equivalent to 6.2 million metric tons of greenhouse gas emissions.

Using rooftop solar collectors to heat commercial pools can reduce emissions further.

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[2] CPUC, Decision 12-01-022 in Rulemaking 08-03-008, January 21, 2010, citing information from California Center for Sustainable Energy, "Solar Water Heating Pilot Program: Interim Evaluation Report," January 16, 2009.
[3] Using a conversion factor of 0.005302 million metric tons CO2/therm from U.S. EPA, "Calculations and References," downloaded from www.epa.gov/cleanenergy/energy-resources/refs.html.
[4] California Air Resources Board, "Greenhouse Gas Inventory Data – 2000 – 2011," October 2, 2013.
[5] California Energy Commission, "Residential Natural Gas Consumption by End Use," available at energyalmanac.ca.gov/naturalgas/residential_use.html.
[6] KEMA-Xenergy, prepared for Pacific Gas & Electric, "California Statewide Residential Sector Energy Efficiency Potential Study: Final Report," April 2003.
[7] Conversion factor of 0.53 lbs-CO2/kWh, from 2011 data in U.S. Energy Information Administration, "Detailed State Data," available at www.eia.gov/electricity/data/state.
[8] National Renewable Energy Laboratory, "The Technical Potential of Solar Water Heating to Reduce Fossil Fuel Use and Greenhouse Gas Emissions in the United States," p. 10.

More research is needed to determine the extent of this potential. PK Data reports that there are 46,000 commercial pools in California, and that 63% of commercial pools are heated.[9] Solar water heaters can displace natural gas consumption from this market segment.

Sustained Incentives Are Needed to Develop a Mainstream Market

The primary state program to provide incentives for the solar water heating market has been the CSI-Thermal program, part of the California Solar Initiative. The program authorized $250 million for customer incentives to install SWH systems as part of AB 1470 in 2007. The program did not begin, however, until the CPUC rulemaking resulted in Decision 10-01-022 in 2010.

Results of the program have been slow, primarily due to the fact that the program was designed during a spike in natural gas prices, resulting in incentive levels that have not been sufficient to move the market. The program was also rolled out during a historic economic downturn. A petition in 2012 resulted in an increase in incentive levels, and a petition is expected in 2014 to raise them further.

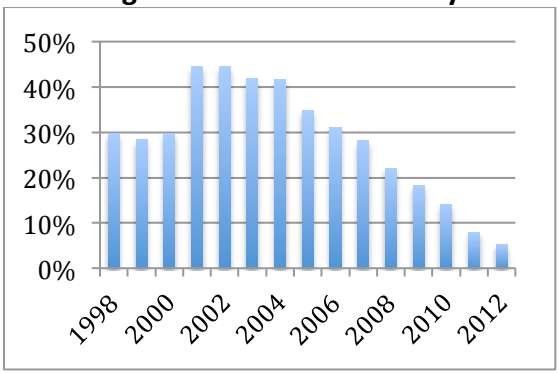
The drive to develop a mainstream market for solar water heating can take valuable lessons from PV market transformation. Development of the California solar photovoltaic market has been a great success. The state has created a mature industry through fair rules and strong incentive programs. There are now more than 200,000 installed systems, with 47,000 Californians employed by the industry.

Development of the solar water heating market has not experienced this transformation. Clearly the cost of natural gas is a major factor, but the state incentive program has also lagged behind its PV counterpart. The greenhouse gas reduction benefits of solar water heating are far higher per system than those of PV and SWH is a more efficient use of roof space than PV, yet market dynamics have hindered widespread adoption.

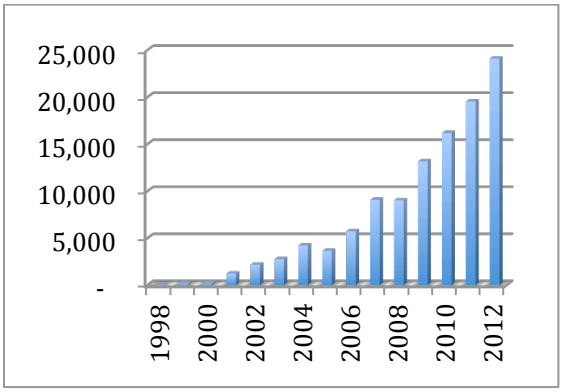
PV incentive programs covered 28%-44% of installed system costs for ten years before the market took off. For the first three years of state incentives, market growth was very small. In the fourth year growth became much more robust, at least in part due to public angst resulting from statewide rolling blackouts associated with multiple issues in California's electricity markets, but also because of a substantial increase in state incentives. Even with widespread support for PV, it was only in the tenth year that total installations increased to 9,000 – a level that would make up a significant portion of the target in the first step of the CSI-Thermal program.

[9] PK Data, "Pools by State," 2011.

Percentage of PV Price Covered by State Incentives[10]



California PV Installations Per Year[11]



CALSEIA believes a similar level of sustained support is needed to transform the SWH market. This has not yet happened.

In the first four years of the CSI-Thermal program, incentives for residential installations have covered only 15%-19% of total installed costs. Incentives for multi-family/commercial installations have been 29%-41% – closer to the levels in the early years of the PV program – but have been in place for less than four years, and at their current increased levels for less than two years.[12]

CALSEIA appreciates CARB's acknowledgment of the need to invest in market transformation, saying in the draft Scoping Plan Update, "Any technology or infrastructure change comes with initial costs."[13] The costs to develop a market for solar water heating can bring tremendous benefits in greenhouse gas reduction.

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[10] Galen Barbose, Naïm Darghouth, Samantha Weaver,and Ryan Wiser, Lawrence Berkeley National Laboratory, "Tracking the Sun VI: An Historical Summary of the Installed Price of Photovoltaics in the United States from 1998 to 2012," July 2013. Numbers are for systems of 10 kW or smaller.

[11] Ibid.

[12] California Public Utilities Commission, "Decision 12-08-008: Decision Modifying Decision 10-01-022 to Adjust Incentive Structure in the California Solar Initiative Thermal Program," August 6, 2012.

[13] Draft Scoping Plan Update, p. 33.

Solar Water Heating Systems Are a Key Component of Zero Net Energy Buildings

The California Energy Efficiency Strategic Plan includes a goal for all new residential buildings to be net zero energy by 2020. The draft Scoping Plan Update envisions that this goal will be a key component of the state's long-term carbon reduction strategies. The draft update states:

> It will be essential to expand upon the Energy Sector zero net energy building goals and establish goals to achieve zero net carbon buildings. Achieving these goals would result in zero net carbon emissions over the course of a year from all GHG emission sources associated, directly and indirectly, with the use and occupancy of buildings. Zero net carbon buildings could utilize high-performance design solutions, generate renewable energy and heating on-site or locally, and employ other techniques to eliminate or offset GHG emissions from all GHG impacts (i.e., energy, water, waste, and transportation) associated with a building. Zero net carbon buildings are the next generation of buildings and could contribute significantly to achieving our long-term GHG emission goals.[14]

Given that gas-fired water heaters make up the vast majority of water heaters in California, widespread availability of solar water heating will be essential to achieving the state's zero net energy goals. According to NREL, "Rooftop PV and solar water heating are the most applicable supply-side technologies for widespread application of NZEBs."[15]

Emerging Applications of Solar Thermal Technologies Present Large Opportunities for Greenhouse Gas Reduction

Most of the focus to date on solar thermal technology has been on solar water heating, but emerging technologies for solar heating and cooling also show great promise.

- Solar heating and cooling applications in the food and beverage processing, agricultural, pharmaceutical, chemical, and pulp and paper sectors are just beginning to show movement in the market after long delay in the incorporation of "process heat" into rebate programs. Solar thermal technologies can allow manufacturing to increase production of goods and services while reducing the production of greenhouse gas emissions. Process heat applications do not consume solar heated water but use solar heated water to provide heat for industrial processes.
- Absorption cooling, desiccant cooling, and vapor compression cooling use the heat of the sun to drive mechanical processes to cool air – replacing or reducing the use of traditional air conditioners.

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[14] Draft Scoping Plan Update, p. 92.

[15] Shanti Pless and Paul Torcellini, National Renewable Energy Laboratory, "Net-Zero Energy Buildings: A Classification System Based on Renewable Energy Supply Options," (Technical Report NREL/TP-550-44586), June 2010, p. 3.

- Space heating systems use SWH collectors to provide radiant or forced air heating. These systems are most commonly used in combination with equipment to heat water for consumption, creating combination water heating/space heating systems.

These technologies could play a significant role in meeting the state's 2050 greenhouse gas reduction goals, but need additional policy support to develop into mainstream technologies. The CSI-Thermal program was expanded to include incentives for these technologies only last year, and thus the technologies have not received the sustained support that is necessary for an emerging technology to become mainstream.

Many industries have hot water and process applications where solar thermal can make a large impact. Helping the traditional solar water heating industry reach economies of scale will help these emerging technologies by reducing component costs and increasing market acceptance, and direct support of the emerging technologies will help developers gain real world experience to maximize the potential of the technology.

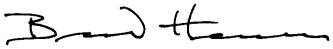
Recommendation: Include Solar Water Heating Market Development in the Key Recommended Actions for the Energy Sector

Given that it took several years to get the CSI-Thermal program up and running, and for several more years since then the program administrators and PUC staff have been adjusting incentive levels, the program has not reached the installation rate that will sufficiently drive down prices and create a mainstream market.

The California Air Resources Board should recycle the value of carbon allowances from the natural gas sector to boost market development of solar water heating technologies. This could be accomplished by extending Step One of CSI-Thermal, the first stage of the program before incentive levels have begun declining along with expected corresponding reductions in installation costs. The solar water heating industry simply has not reached the economies of scale necessary for those cost reductions. The state should expect that it will take a longer period of steady and substantial incentives to achieve a robust market.

CALSEIA appreciates the opportunity to provide these comments and urges the Board to accept the recommendations herein.

Respectfully,



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