AIR-CONDITIONING, HEATING, & REFRIGERATION INSTITUTE
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California Air Resources Board
1001 I Street
P.O. Box 2815
Sacramento, CA 95812

Re: AHRI Comments to California Air Resources Board 2022 Scoping Plan Update - Building Decarbonization Workshop

Dear California Air Resources Board Staff:

These comments are submitted in response to the California Air Resources Board (CARB) December 13, 2021 presentation on California's 2022 Scoping Plan Update, State Strategy for the State Implementation Plan (SIP), and California Green Building Standards (CALGreen) Code.

AHRI represents more than 300 air-conditioning, heating, and refrigeration equipment manufacturers. In North America, the annual output of the HVACR and water heating industry is worth more than $44 billion. In the United States, the industry supports 1.3 million jobs and $256 billion in economic activity annually.

AHRI's members include many of the nation's largest manufacturers of products, such as electric equipment used for space and water heating equipment for use in residential and commercial applications. As an industry, we believe there are important considerations that must be made by policymakers when assessing electrification and building decarbonization policies. AHRI hopes to be a resource and partner in California's decarbonization efforts.

AHRI appreciates the work CARB has put into its 2022 Scoping Plan Update and is eager to share feedback on its analysis and plans. AHRI understands that CARB especially requested feedback regarding the following.[1]

Zero NOx and carbon limit that would apply to sales of all new space and water heaters beginning in 2030 in the 2022 State SIP Strategy

Voluntary versus mandatory standards as well as building types and end uses for CALGreen code new construction

[1] December 13, 2021 2022 Scoping Plan Update - Building Decarbonization Workshop. Accessed via https://ww2.arb.ca.gov/resources/documents/sp22-buildings-ws

What building end uses and building types should be prioritized for building decarbonization through electrification efforts?

Are there model policies from other jurisdictions or specific policies that should be prioritized as California considers a path forward to equitable building electrification?

What complementary policies are the most important to advance in the near - term and how should they be prioritized?

AHRI High-Level Recommendations

AHRI recommends that California consider the following options to maximize greenhouse gas reductions while maintaining affordable access to critical societal needs for life-saving air heating and cooling and water heating at a sufficient temperature to decontaminate as a primary principle.

- Funding related to additional installation and operating costs of air- and water-heating equipment with a lower carbon footprint should be considered especially for families with limited means and small businesses.
- The number of installed air- and water-heating units (the installed base) is much greater than new installations in California. Many older units have much lower energy efficiency than new units sold today. From a cost-benefit perspective, California may want to consider incentivizing early transitions to more efficient equipment, especially while additional capacity is being added to the electric grid.

AHRI supports the use of voluntary standards in the CALGreen code for new construction.

Building codes, such as the International Energy Conservation Code (IECC), deliberately contemplate hundreds of proposals to maximize energy conservation. They ensure certainty for homeowners, the environment, homebuilders, and the entire supply chain.

Additional AHRI Recommendations

AHRI recommends that California take the following steps, which are described in greater detail below:

- conduct emissions and cost savings analyses consistent with the full spectrum of product efficiencies and commercially available technologies in North America;
- use available data sources (EIA, CBECS, etc.) to establish a baseline distribution of fuels and equipment within the state at the household and individual commercial building level;
- shift building codes to performance-based requirements and require that existing large commercial buildings track energy usage or greenhouse gas emissions;
- ensure that any recommendations demonstrate cost effectiveness and equity for all residents, especially taking into consideration the availability of products and cost of transition;

- consider grid reliability and capacity as it impacts critical services provided by HVACR and water heating equipment for all residents, especially those in rural communities;
- adopt an incentive program to encourage the adoption of emissions-reducing appliances, and update its study of market efficiency to include a market shift anticipated by programs that incentivize improved efficiency equipment;
- Ensure policies are complementary and not in conflict with other policies;
- follow a technology agnostic approach; and
- adopt the latest version of ASHRAE 90.1 or its equivalent into its building codes.

AHRI recommends that California conduct emissions and cost savings analyses consistent with the full spectrum of product efficiencies and commercially available technologies in North America.

AHRI appreciates California's diligence in developing comprehensive modeling inputs to help capture the full spectrum of products installed in the state. A thorough analysis of electricity generation capabilities and limitations is an important step in determining a pathway to minimize greenhouse gas emissions. For example, in locations where coal or other high carbon intensity energy sources are used in generating electricity, building electrification would result in an increase in greenhouse gas emissions. Accordingly, the creation of market-based incentives to upgrade the current mix of heating equipment could be beneficial.

Performance-based decarbonization policies that do not favor certain technologies over others will prevent inadvertent emission increases while electricity generation still relies on carbon-intensive power plants. For example, dual-fuel heating systems are comprised of an electric heat pump and a natural gas furnace. The heat pump is used to meet the heating load of a building until the equipment reaches its heating capacity, at which point the gas furnace is used to meet the supplemental building heating load and to maintain the heating setpoint temperature. Incorporating these systems into decarbonization policy in California is a critical step to avoiding increased emissions while also ensuring sufficient heating in colder climates.

U.C. Davis conducted a study detailing that natural gas and other fossil fuels supply baseload and peak electricity demand in California. Due to the higher marginal emissions rate of this supply, additional electricity use will generate higher emissions than that of natural gas.[2] This should be incorporated into life cycle analyses of emissions of heating equipment.

[2] Nelson Ditcher, Aref Aboud, Analysis of Greenhouse Gas Emissions from Residential Heating Technologies in the USA p. 8-12 (2020).

AHRI recommends that California use available data sources to establish a baseline distribution of fuels and equipment within the state at the household and individual commercial building level, also differentiating between rural and urban communities.

California contains approximately 14.5 percent of all heat pumps installed across the country, based on AHRI's analysis of the U.S. heat pump market.[3] Residential buildings are powered primarily by natural gas in California (51% in 2019, according to the Lawrence Livermore National Laboratory (LLNL)).[4]

CARB can use its understanding of the baseline market of HVACR equipment to analyze the efficacy of its policies. With this knowledge, CARB will also be able to share how its market transformation can occur. AHRI looks forward to sharing data and resources with CARB to ensure this robust analysis is as accurate as possible.

AHRI strongly supports further development of California's study of the full range of HVACR equipment within the state, including all efficiencies and capacities of furnaces, heat pumps, and other potentially targeted products. This will allow the state to better understand the distribution of fuels and equipment used within the state, including the differentiation between rural and urban communities. This will allow California to create more effective policies that help achieve its goals where there are cost-effective market-based drivers for consumers to switch to new or more appropriate technologies. Use of this inventory will better estimate the energy savings potential the state can achieve.

AHRI recommends that California shift building codes to performance-based requirements and require that existing large commercial buildings track energy usage.

AHRI supports requirements for private commercial buildings greater than 10,000 square feet to track energy usage starting in 2023 where the benefit is more likely to justify the significant cost if energy modeling is unique to each building.[5] AHRI believes this will help California achieve its future goals.

[3] The installed base of HVACR and water heating equipment is publicly available from the Energy Information Administration (EIA) Residential Energy Consumption Survey (RECS) and Commercial Building Energy Consumption Survey (CBECS).

[4] LLNL Energy Flow Charts. Accessed via https://flowcharts.llnl.gov/commodities/energy.

[5] New York City Mayor Michael Bloomberg signed the Greener, Greater Buildings Plan in 2009 that required facility owners of private buildings over 50,000 square feet to annually benchmark energy. The area requirement for public buildings – 10,000 square feet – was considerably lower and conducted for public benefit rather than a cost justified emissions reduction measure. Only after a decade of benchmarking was the market ready to extend the requirement for private buildings to 10,000 square feet. Buildings with complex systems have greater opportunities to improve efficiency through lower-cost options, such as updates to the building automation system, whereas smaller buildings, with simpler systems, have few opportunities beyond schedule optimization and proper equipment maintenance.

AHRI recommends that California ensure that any recommendations demonstrate cost effectiveness and equity for all residents especially taking into consideration the availability of products and cost of transition.

AHRI encourages CARB to consider consumer equity in its decarbonization policies. Policies dependent upon building electrification for reducing emissions, if not carefully executed, are likely to inadvertently place an undue financial burden on low-income households.

HVACR and water heating equipment is often replaced on an emergency basis when equipment has failed beyond repair, especially for families with low to moderate incomes. The cost to update just the electrical panels required to support the adoption of heat pump water heaters is thousands of dollars. The need to upgrade electrical panels would often further delay the completion of the work, as additional contractors and code inspections may be required. In emergency situations, such delays in restoring a supply of heating and hot water would at a minimum be disruptive, and in many circumstances could render a home temporarily uninhabitable and thereby pose significant health concerns and additional financial hardship. When considered in combination with the higher cost of the new equipment, this unfairly increases the burden for families with little to no savings.

Even if 120V equipment is available for a standard home outlet, the use of such equipment would still add installation costs. A standard utility closet used to house a gas water heater typically does not have standard 120V outlets readily available. Because of this, an installation of a 120V heat pump water heater (HPWH) will still require an electrician to install an additional outlet for hookup. On top of this, with the push for electrification, it is very likely that the current panel will not have the available capacity to handle an additional line being run to it. Consequently, the consumer will still need to upgrade their current electrical panel and incur the additional costs and delays described above.

AHRI recommends that CARB perform a holistic cost-benefit analysis of any decarbonization policy and ensure that any recommendations are equitable to all California residents.

AHRI recommends that California consider grid reliability and capacity as it impacts critical services provided by HVACR and water heating equipment for all residents.

Separately, as decarbonization policies become more pervasive, load on the grid increases which could limit energy reliability in California. In addition, in rural areas where the electricity grid is already unreliable, families and businesses often must depend on other energy sources, including fossil fueled home generators, especially for heating and refrigeration due to frequent disruptions in power supply.

Additional infrastructure will need to be built to support the significant increase in electricity demand.[6] This infrastructure will be particularly costly in rural areas and need to demonstrate reliability in severe winter weather and under high wind conditions. Additional electricity demand could require importation from other states, which in turn would likely result in higher marginal emissions and transmission losses from the grid.

AHRI recommends that California adopt an incentive program to encourage the adoption of emissions-reducing appliances and update its study of market efficiency to include a market shift anticipated by programs that incentivize improved efficiency equipment.[7]

AHRI supports incentive programs (including for training[8]) to encourage the adoption of high efficiency appliances, such as air source heat pumps (ASHP), water source heat pumps (WSHP), and ground source heat pumps (GSHP). Incentive programs have been effective in driving the adoption of high efficiency appliances in other jurisdictions. For example, organizations like the Consortium for Energy Efficiency (CEE) and Environmental Protection Agency (EPA) ENERGY STAR Programs have been successful in increasing the installation of higher efficiency equipment across the U.S. Funding is especially needed to increase market awareness of high efficiency equipment. California should also allocate funding to examine the current HVACR and water heating workforce to ensure the state can meet challenges of installation and maintenance workforce readiness.

CARB should study market efficiency to include a market shift anticipated by programs that incentivize improved efficiency equipment as the federal equipment efficiency incentives will likely lead to a market shift that CARB should include in its assumptions. For example, AHRI has found that owners of existing buildings can achieve substantial energy savings by replacing outdated technology with both new fuel-burning and electric space heating products. This replacement of equipment should also be incentivized.

AHRI recommends that CARB consider dual fuel heat pump/furnace systems as a necessary transitional strategy for building decarbonization. Dual fuel systems will help manage peak electrical loads while simultaneously reducing building source emissions as marginal electricity generation relies on gas "peaker" plants. Additionally, these systems do not require a heavy increase on electrical service panel load, thus reducing upfront installation

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[6] T.D. Inoue notes that the additional energy in winter months can double the electricity demand for a household for heating alone without heat pump water heating demand. Accessed via https://tedsenergytips.com/2019/01/06/what-arethe-biggest-electricity-consumers-in-a-typical-home/.

[7] Incentives for the adoption of high-efficiency appliances provides states with an effective means of driving the use of high efficiency appliances without adopting requirements that conflict with the federal preemption prohibitions in the Energy Policy Conservation Act, 42 U.S.C. § 6291 *et. seq*. and the Department of Energy's federal preemption regulation at 10 C.F.R. § 430.33, which were put in place to ensure that the unintended consequences of the creation of a patchwork of regulations do not develop across the country. Incentives can also be targeted to lower- and middle-income households to reduce the inequities noted above.

[8] Industry has observed challenges throughout the country related to workforce readiness when it comes to installation and maintenance of these type of products. California should provide time to train plumbers and technicians.

costs. California, before requiring any transition to heat pumps in existing homes, should evaluate the adequacy of the grid to respond to new winter electric load profiles with steeper peaks and should include the cost of an electric service panel increase that will be faced by consumers.

Also, in homes that do not have air conditioning, the need for new ducting installation will increase the cost to consumers. Beneficial electrification programs should consider these costs (e.g., electrical service panels and ducting) and prioritize whole-home and whole-building solutions to ensure any policy results in actual reduced greenhouse gas emissions.

AHRI recommends CARB ensure policies are complementary and not in conflict with one another.

It is important for CARB to consider policies from other jurisdictions, to ensure their compatibility. Manufacturers have limited resources to meet energy efficiency, air quality, and refrigerant policies and consumers will ultimately bear the burden of limited availability and non-optimized product if policies are in conflict. For example, manufacturers could spend significant time and capital on the development of interim solutions that could ultimately be eliminated by regulations. This investment could have been better spent on the development of compliant technology.

AHRI recommends CARB follow a technology agnostic approach.

All technology providing significant energy and environmental benefits should be evaluated, regardless of fuel type. Additionally, consumer choice, technological neutrality, and ultimate affordability in terms of both upfront and operating costs should be considered.

AHRI recommends that California adopt the latest version of ASHRAE 90.1 or its equivalent into California's building codes.

ASHRAE 90.1 is a model code that sets standards for HVAC equipment, boilers, and water heaters and is regularly updated to ensure its applicability to the latest technologies. Updating California's building codes with the latest version of ASHRAE 90.1 or its equivalent will maximize the efficiency of equipment and the relevance of building energy efficiency requirements within the state. Adopting the latest version of ASHRAE 90.1 would also introduce an opportunity to align building requirements among both state and local jurisdictions.

Conclusion

AHRI appreciates the opportunity to respond to CARB's 2022 Scoping Plan Update - Building Decarbonization Workshop. AHRI hopes these comments are supportive in the state's development of its decarbonization plans. We are also eager to meet at your earliest convenience to provide additional technical support.

Respectfully,

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