AIR-CONDITIONING, HEATING, & REFRIGERATION INSTITUTE
we make life better®

2311 Wilson Boulevard Suite 400 Arlington VA 22201 USA
Phone 703 524 8800 | Fax 703 562 1942
www.ahrinet.org

October 22, 2021

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 – Draft Scenario Inputs and September 30, 2021 Workshop.

Dear California Air Resources Board Staff:

These comments are submitted in response to the California Air Resources Board (CARB) 2022 Scoping Plan Update – Draft Scenario Inputs and its workshops to assess progress towards achieving the Senate Bill 32 (SB 32) 2030 target and to lay out a path to achieve carbon neutrality no later than 2045.

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 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 seeks feedback regarding further hydrogen fluorocarbon (HFC) emission reductions and reducing carbon dioxide emissions through one of four scenarios presented. CARB especially requested feedback regarding the following.

1. Consideration of different scenarios[1]
2. Changes to modeling inputs in a given scenario
3. Technology or fuel options not presented that should be considered in the modeling.

---

[1] CARB's modeling includes:

- Assess progress toward 2030 target
- Develop carbon neutral scenarios for 2035 and 2045 based on alternative fuels and technologies to reduce fossil fuel consumption (e.g., end - use sector outcomes)
- Estimate need for carbon removal to achieve carbon neutrality
- Estimate any remaining GHG emissions in energy and industrial sectors
- Separate effort to develop Natural and Working Land sequestration potential and targets
- Quantify air quality, health, and economic impacts for each scenario
- Based on alternative scenarios evaluated, identify a single Scoping Plan scenario

CARB developed four draft scenarios in its September 30, 2021 Workshop:

- Alternative 1: Achieve carbon neutrality by 2035, with complete phaseout of combustion and no reliance on engineered carbon removal.
- Alternative 2: Achieve carbon neutrality by 2035, with full suite of technology options, including engineered carbon removal.
- Alternative 3: Achieve carbon neutrality by 2045, utilizing a broad portfolio of existing and emerging fossil fuel alternatives and achievement of Executive Order N - 79 - 20.
- Alternative 4: Achieve carbon neutrality by 2045, utilizing existing and emerging technologies, in line with recent agency reports (AB 74 carbon neutrality in transportation, SB 100 zero-carbon electricity grid).

AHRI Recommendations

AHRI reviewed CARB's research and recommends that CARB work to:

- conduct emissions and cost savings analyses consistent with the full spectrum of product efficiencies and 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;
- 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;
- follow a technology agnostic approach; and
- adopt the latest version of ASHRAE 90.1 or its equivalent into their building codes.

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

AHRI appreciates CARB'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, locations where coal or other high carbon intensity energy sources are a electricity-generation fuel, building electrification could result in an increase in greenhouse gas emissions and would benefit more from market-based incentives to upgrade the current mix of heating equipment.

Performance-based decarbonization policies that do not favor certain technologies over others will prevent inadvertent emission increases while electricity generation still relies on inefficient and 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 it reaches 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.

A study by U.C. Davis explains 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.

AHRI strongly supports further development of CARB's study of the full range of HVACR equipment within the state, including all efficiencies and capacities of furnace, heat pump, and other potentially targeted products, to better understand the distribution of fuels and equipment used within the state differentiating between rural and urban communities. This will allow CARB to create more effective policies that help achieve its goals in the instances 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 CARB 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.

Based on AHRI's analysis of the U.S. heat pump market,[3] California likely contains approximately 14.5 percent of all heat pumps installed across the country. 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 understanding, CARB will also be able to share how its market transformation can occur. AHRI looks forward to sharing data and resources with CARB to compare data to ensure this robust analysis is as accurate as possible.

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

---

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

[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.

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 that is unique to each building.[5] AHRI believes this will help California achieve its future goals.

AHRI recommends that CARB 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 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 or 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 would at a minimum be disruptive, and in many circumstances could pose health concerns. When considered in combination with the higher cost of the new equipment, this unfairly increases the burden for families that may have little or no savings and can least afford these changes.

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 its residents.

[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 CARB 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 failures in power supply.

Additional infrastructure will need to be built to support the significantly increased demand for electricity.[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) 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, groups like the Consortium for Energy Efficiency (CEE) have been successful in increasing the installation of higher efficiency equipment across the U.S. In 2017, demand side management (DSM) programs saved approximately 33,246 GWh of electricity.[8]

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 fuel-burning and electric new 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

[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. https://tedsenergytips.com/2019/01/06/what-are-the-biggest-electricity-consumers-in-a-typical-home/ (accessed Oct. 22, 2021).

[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 Department of Energy's federal preemption clause 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] CEE Annual Industry Report 2018 State of the Efficiency Program Industry (May 2019).

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 costs. 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 when considering the barriers to market transformation.

Also, in homes that do not have air conditioning, ducting 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 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, which would help ameliorate costs.

Additional HFC Measures

It appears that CARB is seeking to further reduce HFC emissions by approximately 2.5 million CO_2 equivalent units per year due the significant banks of HFCs in various buildings.

First, AHRI requests a meeting with CARB to walk through the additional reductions needed compared to the additional reductions that AHRI has committed to through the national program. In addition, AHRI strongly recommends that CARB enhance its refrigerant recovery program. Finally, AHRI recommends that state buildings commence using low global warming potential (GWP) refrigerants immediately to transition the installed base of equipment.

AHRI appreciates these opportunities to provide feedback and looks forward to further dialogue to identify viable options as a regulated industry.

Should you have any questions regarding this submission, please do not hesitate to contact me.

Respectfully,

Helen Walter-Terrinoni

Helen Walter-Terrinoni
Vice President, Regulatory Affairs
Air-Conditioning, Heating, and Refrigeration Institute
2311 Wilson Blvd, Suite 400
Arlington, VA 22201