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Please see attached comments.

Additional submitted attachment is included below.

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June 11, 2020

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(submitted electronically to Docket 19-DECARB-01)

Re: AHRI Comments to California Energy Commission's Building Decarbonization Assessment May 7, 2021, Draft Staff Report - California Building Decarbonization Assessment *[Docket Number 19-DECARB-01]*

Dear CEC Staff:

These comments are submitted in response to the California Energy Commission (CEC) May 7, 2021, Draft Staff Report - California Building Decarbonization Assessment.

AHRI represents over 315 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 CEC has put into its Draft Staff Report and is eager to share feedback on its analysis and conclusions.

A systemwide GHG emission approach is useful when assessing building decarbonization.

AHRI agrees with CEC and recognizes the considerable effort it has put into understanding the effects of decarbonization in California. Systemwide approaches to understanding the effects of decarbonization are necessary to uncover the complex relationships between buildings, equipment, fuel, and energy consumption. For example, a discrete analysis focusing on switching furnaces for heat pumps may ignore the impacts of additional refrigerant needed to service the new heat pump coming online. It is also critical that California address the source of fuel generation for the electric grid as mandated in SB 100.[1] The 2021 SB 100 Joint Agency Progress Report outlines the

[1] "The 100 Percent Clean Energy Act of 2018," Senate Bill 100 (SB 100, De León)

significant efforts California is undertaking to meet the greening goals.[2] The systemwide approach developed by CEC is a better measure for the effects of buildings interacting with the grid and the State's broad decarbonization mandates. AHRI is eager to review and provide feedback on the specifics of this approach.

Existing policies and activities put California on track to achieve a near-40 percent reduction in overall buildings-related emissions by 2030, but this systemwide framing understates the need and opportunity for reductions of direct emissions. A higher target for 2030 would put buildings on a trajectory to approach the state's 2045 climate goals.

AHRI hopes to be supportive of CEC's energy efficiency and emission reduction goals but cautions CEC regarding the need to ensure compliance with both legal and regulatory requirements. Additionally, costs must be considered. Improving energy efficiency, saving money, and improving air quality are the main purposes of California's Energy Code, Title 24. Increasingly, Title 24 compliance has raised the cost of buildings and renovations in California. In its analysis, CEC has justified significantly increased first cost with the reduction in consumer's energy bills. In both commercial and residential sectors, owner-tenant relationships complicate the straightforward payback of certain measures, such as the 2019 requirement for inclusion of onsite solar production in single-family homes and multi-family buildings that are up to three stories high.

AHRI cautions CEC to only finalize this report after the planned August adoption of the 2022 building code. Indeed, AHRI has expressed concern with CEC's proposed approach to electrification of buildings through the removal of certain equipment types to meet Code through the prescriptive path. Indeed, there are federal preemption issues related to proposed changes to single family, multifamily, and non-residential sections regarding space heating, space cooling, and water-heating systems. These proposals have removed options for certain equipment with federal energy efficiency standards to comply with the energy code using the prescriptive pathway. With these proposals, CEC is considering the prescriptive and performance pathways to be separate; however, they are not severable. The prescriptive path sets forth specific requirements that HVAC systems and equipment must meet to comply with the Code if a building does not comply with the performance-based compliance paths. The concept of compliance to energy codes through multiple pathways using minimum efficiency equipment is a fundamental aspect of the Energy Policy and Conservation Act (EPCA).[3] Equipment efficiency has increased dramatically under EPCA and has contributed significantly to the reduction of emissions.

Newly constructed buildings have the lowest decarbonization costs. The Energy Code will continue to advance efficiency in newly constructed buildings in each successive code cycle, including increasing emphasis on the use of heat pumps.

[2] California Energy Commission. (2021) SB 100 Joint Agency Report CEC-200-2021-001. Accessed via https://www.energy.ca.gov/sb100#anchor_report.
[3] 42 U.S. Code § 6297

AHRI encourages CEC to proactively forecast likely scenarios for new construction, especially as marginal improvements from Title 24 are likely to decrease. AHRI understands that funding for Title 24 improvements are subsidized by California utility customers.[4] Costs are likely to affect a disproportionate share of the smaller customer base especially on a CO_2 equivalent basis.

CEC should incorporate the market shift anticipated by federal programs that incentivize the purchase and use of more efficient equipment into its business as usual (BAU) case.

Efficiency improvements also come from federal mandates. California should update its study of market efficiency to include a market shift anticipated by programs that incentivize improved efficiency equipment as the federal equipment efficiency requirements and incentives will likely lead to a market shift that California should include in its assumptions. For example, 57 of the Department of Energy's environmental conservation standards in effect in 2019 are estimated to have already saved 54.64 cumulative quadrillion BTUs of energy, nationally.[5] With California serving as the U.S.'s largest economy, these savings are significant within the state.

Separately, CEC should incorporate incentives to update outdated technologies in existing buildings which can provide a fast-paced oversized impact compared to limiting changes to new buildings.

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. We encourage California to modify its modeling from 100% high-efficiency products to that which can be accomplished through incentives as prescriptive regulations on efficiency are preempted by federal law (42 U.S.C. 6297).

Reducing building-sector GHG emission will require large investments in existing buildings.

There are a very small percentage of new buildings built annually compared to existing stock.[6] To impact GHG emissions quickly, AHRI strongly supports incentives for

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[4] From https://title24stakeholders.com/. "This program is funded by California utility customers and administered by Pacific Gas and Electric Company (PG&E), San Diego Gas & Electric Company (SDG&E®), Southern California Edison Company (SCE), Los Angeles Department of Water and Power (LADWP), and Sacramento Municipal Utility District (SMUD) under the auspices of the California Public Utilities Commission."

[5] U.S. Department of Energy. (2019) 2019-07-26 Energy Conservation Program: Procedures, Interpretations, and Policies for Consideration of New or Revised Energy Conservation Standards for Consumer Products; Notice of data availability. Section II. Site National Energy Savings From Prior DOE Rulemakings

[6] CBECS estimates that 5.9 million U.S. commercial buildings contained a total of 97 billion square feet as of 2018. The number of commercial buildings increased by 6%, and commercial square footage increased by 11% since the CBECS was last conducted in 2012. U.S. Energy Information Administration. (2018) Commercial buildings have gotten larger in the United States, with implications for energy. Accessed via https://www.eia.gov/todayinenergy/detail.php?id=46118.

retrofitting existing buildings. Replacement of old equipment for newer, more energy efficient equipment can substantially improve building efficiency and drive deep decarbonization in California. CEC should also ensure its assumptions and modeling analysis of the existing building stock are as accurate as possible to ensure that policy recommendations achieve decarbonization goals. For example, the report noted that half of the building stock in California was constructed before state energy codes went into effect in 1978 (page 97). While many of these homes are also likely to have been upgraded since construction, upgrading older equipment to even minimally-compliant efficient products will contribute significantly to decarbonizing direct emissions from buildings. It is important to note that there is no mandate that California homeowners and residents upgrade equipment and that incentives are a critical tool to encourage investment.

California's BUILD and TECH building decarbonization pilot programs are good examples of programs that raise awareness of building decarbonization technologies and applications, test program and policy designs, and gain practical implementation experience and knowledge necessary to develop a larger scale approach in the future. As AHRI mentioned in comments to CEC on June 29, 2020,[7] barriers stem from the building code have not yet been enabled to allow for the equipment CPUC is incentivizing. Additional funding to programs like this help ensure usefulness and success. This funding should be made available for switching of any equipment, not just switching to high efficiency products.

The U.S. Department of Energy (DOE) and the California Air Resources Board (CARB) have estimated lifetimes of equipment in their appliance rulemaking technical support documents (TSD), and Standardized Regulatory Impact Assessments (SRIA), respectively. CEC should use this information to update the building characteristics of homes in California that have likely experienced efficiency improvements due to the retirement of old equipment. In this analysis, these lifetimes would also benefit from probabilistic analysis. AHRI supports CECs comments from the May 21, 2021 Commissioner Workshop expressing a desire to incorporate probabilistic lifetimes. This can be easily accomplished through the use of a Weibull function to create a distribution of equipment failure rates and building replacement.

Weibull functions[8] are a type of survival function used by many industries and researchers,[9] including DOE[10] to estimate product failure rates over time. Weibull curves can be fit to individual types of products by defining a scale and shape of the function

[7] AHRI Comments June 15, 2020 Joint Agency Workshop on the Building Initiative for Low Emissions Development (BUILD) Program, Docket 20-DECARB-01. June 29, 2020
[8] Weibull, W. (1951) A Statistical Distribution Function of Wide Applicability. Journal of Applied Mechanics, 18, 293-297.
[9] Welch, Cory and Roger, Brad. Navigant Consulting, Inc. (2010) Estimating the Remaining Useful Life of Residential Appliances. Accessed from https://www.aceee.org/files/proceedings/2010/data/papers/1977.pdf
[10] U.S. Department of Energy. (2016) 2016-12 Final Rule Technical Support Document: Energy Efficiency Program for Consumer Products: Residential Central Air Conditioners and Heat Pumps. Accessed from https://www.regulations.gov/document/EERE-2014-BT-STD-0048-0098

based on the average product lifetime and the rate of product failure. Previous research on product lifetimes can be used to estimate its scale. The shape parameter is deduced by the rate at which product failure occurs. Analysis from DOE[11] found that a shape of 2 was appropriate for air conditioning equipment and serves as a useful reference for other types of HVACR and water heating equipment. Implementing a Weibull function in either Excel or R is relatively straightforward and AHRI can assist CEC in incorporating this important feature.

Due to these potential modeling improvements, AHRI recommends that CEC reanalyze the energy savings from decarbonizing existing buildings before proposing overly prescriptive policies.

Equity considerations are paramount and require collaboration amongst agencies, local governments, utilities, and community groups. Decarbonization initiatives should involve environmental justice communities throughout the effort and reflect their needs and priorities.

AHRI supports CEC efforts to ensure its decarbonization policies are equitable for all of California's residents. As noted earlier, incentives for replacing existing equipment for newer, more efficient equipment is a low-cost and extremely cost-effective path for achieving building decarbonization goals. This incentive also adds a benefit of not requiring building remodeling when installing similar types of equipment. Other energy options should also be explored, especially for rural communities. For example, propane may be a lower-cost option for some communities compared to the incorporation of new gas infrastructure, especially for rural communities.

Traditional energy efficiency – gas and electric – can continue to provide emissions reductions very cost-effectively, but the potential for gas energy efficiency will decline if building electrification becomes a major strategy.

AHRI supports consumer choice in the use of equipment and building energy. Gas and electric efficiency improvements are often the most cost-effective methods for reducing energy intensity of buildings. CEC should remain cognizant of the challenges consumers may face if gas customers are stranded without incentives or resources to switch to electric energy in the future.

Accelerating efficient electrification of building end uses in both new and existing buildings represents the most predictable pathway to achieve deep reductions in building emissions. An information campaign could familiarize consumers with high-efficiency electric appliances.

AHRI strongly supports efforts to educate customers about the benefits of energy efficiency improvements. CEC may find the AHRI Directory of Certified Product

[11] *ibid*.

Performance[12] a valuable resource summarizing the performance of HVACR and water heating equipment.

Additional analysis of reliability impacts of increased electrification is needed, including the role of load flexibility as both a building decarbonization and reliability resource.

AHRI supports enhanced analysis of the impacts of increased electrification. For example, shifts to heat pump equipment will increase winter peak load demand and stress on the electric grid. Load flexibility should be closely analyzed as it can serve as a potential tool to mitigate electricity competition during peak hours and can help to ensure the longevity and reliability of the electricity grid.

The CARB-led effort to reduce refrigerant emissions to comply with SB 1383 is an important component of building decarbonization.

AHRI is pleased to see CEC's decarbonization efforts developing in concert with CARB's hydrofluorocarbon (HFC) regulations. More funding for incentives should also be introduced to initiatives like the Sacramento Municipal Utility District (SMUD) Low-GWP incentives program because the fund's small size has minimized its impact on retrofit equipment. This program enhances California's HFC phasedown efforts and AHRI encourages other jurisdictions to adopt and fund similar programs. These additional incentives would help to ensure that urban food deserts and small businesses do not face unnecessary burdens, especially as this these industries operates on small profit margins

The role of the gas system in achieving building decarbonization needs further assessment, including the roles of renewable gas, hydrogen, and engineered carbon removal. Gas system planning itself must optimize across transportation, industry, power sector, land use, and air quality elements.

AHRI appreciates CEC efforts to better understand these energy sources and is happy to assist in providing information on the use of these fuels in equipment. The Air-Conditioning, Heating, and Refrigeration, Technology Institute, Inc. (AHRTI), has performed extensive research on efficiency and emission reduction improvements applicable to the HVACR and water heating industry, including the use of hydrogen-enriched gas in equipment. Please do not hesitate to request information from the AHRTI's research that may be helpful.

The CPUC may wish to review the role incentives play in adding new gas infrastructure for buildings.

As before, AHRI supports incentive programs as the preferred mechanism for transitioning from older equipment to newer and more efficient equipment. Research on the role incentives play in added new gas infrastructure will help CPUC to better

[12] https://www.ahrinet.org/certification/directory

understand the relationship and develop the least cost solution for achieving California's decarbonization goals.

California must expand and train its clean energy construction workforce.

AHRI supports expansion and development of California's clean energy construction workforce. Buildings will also continue to become more technologically advanced and require additional specialized workforce training to ensure that clean energy is effectively used.

Building decarbonization efforts should work in harmony with the state's response to the housing crisis.

The California Department of Housing and Community Development (HCD)[13] recognizes that the state faces a shortage of 100,000 new homes each year. The COVID-19 pandemic's disruption of supply chains and strong construction demand has raised new building prices to historic highs.

Adding costs for decarbonization without providing the necessary incentives will only exacerbate the housing crisis California faces. Further, economic disparities limit the purchasing power of potential homeowners, especially for underserved communities without access to capital. As with CEC's efforts to review and analyze policies in a systemwide context, understanding the effect of decarbonization on California's housing crisis is crucial to ensuring the success of any program or policy recommendations.

Finally, and as mentioned in previous AHRI comments, CEC should share its R source code with the public.

AHRI appreciates CEC's use of the R programming language in its Fuel Substitution Scenario Analysis Tool (FSSAT). R is a powerful and flexible language that will enhance CEC's regulatory efforts. AHRI urges CEC to make available to the public the R source code used in FSSAT as this tool has the potential to negatively affect consumers and business if not properly used. In the case of CEC's FSSAT, the code used to build the tool deserves scrutiny from stakeholders to ensure its robustness and success.

While quantitative methods and modeling provide a veneer of objectivity, working with data and writing code to manipulate that data is still subjective. AHRI encourages CEC to share the code used in its tool to allow review of the methods used as well as public comment on those methods. This will help CEC ensure that:

1. The code does not discriminate against any population affected by future regulation;
2. CEC's entire analysis has been properly vetted by all stakeholders in the regulatory process; and
3. State of the art techniques can be identified and implemented in the tool.

[13] https://www.hcd.ca.gov/policy-research/housing-challenges.shtml

Sharing the R source code will also help to answer questions surrounding the underlying probability distributions, libraries used, and variable assignment in the FSSAT tool.

AHRI appreciates the opportunity to provide these comments. If you have any questions regarding this submission, please do not hesitate to contact me.

Sincerely,

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