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Daikin Comments - Heat Pump Goals Supply Chain and Programs

Additional submitted attachment is included below.

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April 19, 2021

Mr. J. Andrew McAllister, Ph.D.
Commissioner
California Energy Commission
1516 Ninth Street
Sacramento, CA 95814-5512
Re: Docket No. 22-DECARB-01

(Submitted electronically to 22-DECARB-01: Daikin U.S. Corporation's Comments on Heat Pump Goals, Supply Chain, and Programs

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Dear Commissioner McAllister:

Daikin U.S. Corporation ("Daikin") hereby submits the following comments in response to request for comments pertaining to the CEC Heat Pump Goals, Supply Chain, and Programs. Daikin is a subsidiary of Daikin Industries, Ltd., the world's largest air conditioning equipment manufacturer. The Daikin Group includes Daikin Applied Americas, Inc., and Daikin Comfort Technologies North America, Inc.

I. Introduction

Daikin supports the Commission's efforts to drive building electrification and decarbonization through the accelerated market adoption of air-source heat pumps ("heat pumps" hereinafter) by pursuing the state's goal to install at least six million heat pumps by 2030. Daikin believes that heat pumps are one of the key proven technologies to achieve substantial greenhouse gas (GHG) reduction in both residential and nonresidential buildings. As Daikin presented during the Staff Workshop on Heat Pump Goals, Supply Chain, and Programs on April 5, 2022, we would like to make suggestions on the following key two questions to aid the state to meet the heat pump installation goal: 1. What do manufacturers need from California to scale? and 2. What are barriers for distributors and retailers?

II. What do manufacturers need from California to scale?

For contractors to help California scale and meet the heat pump goal, Daikin suggests that the state considers the following:

1. **Specify the types of heat pumps California hopes to see**

   Daikin would like the state to provide greater specificity to the heat pump goal. There are three types of specificity Daikin believes are needed. The first involves a breakdown of what percent of six million heat pumps the state desires to see as heat pumps for space heating versus heat pump water heaters. The second one is development of a guideline for contactors to sufficiently conduct load calculations, design, sizing, duct review etc. for each CA Climate Zone. Finally, the third one is a list of specific HVAC-related technologies the state wants to see advanced while achieving the heat pump goal. Daikin believes that such technologies should include variable speed heat pumps, AHRI 1380-based peak load management, fault prediction/detection, cloud-based communication to end users, contractors, and utilities to accelerate fuel switching among existing systems, and use of low GWP refrigerants.

   In particular, Daikin believes that prioritizing variable speed heat pumps can significantly contribute to the state heat pump goal because of the following reasons:

   1) Energy and peak load performance superiority to reduce running cost:
      The United States Environmental Protection Agency (U.S. EPA) notes that variable speed equipment, and modulating systems specifically, provide additional customer comfort advantages by adjusting the compressor speed in real time to match cooling/heating, provide greater energy efficiency performance, and provide unique advantages for demand response.[1] The Electric Power Research Institute (EPRI) states variable speed HVAC systems yielded a "cooling energy savings range of between 22% and 32% for California compared to a 14 SEER single-speed baseline system."[2] According to computer simulations, validated also by EPRI, when variable

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[1] U.S. EPA, ENERGY STAR Residential Air Source Heat Pump and Central Air Conditioning Equipment Version 6.0 Discussion Guide dated August 3, 2018, https://www.energystar.gov/sites/default/files/

[2] Electric Power Research Institute, Program on Technology Innovation: Next Generation Residential Space Conditioning System Evaluation: Summary Final Report of CEC EPC-14-021 Project, dated March 7, 2022, https://www.epri.com/research/programs/063638/results/3002023618

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speed HVAC equipment reduces its cooling capacity by 25% it results in a 43% reduction in power consumption.[3] In other words, the reduction in cooling capacity is smaller than the one in power consumption single-speed equipment while the reduction in those criteria is close to linearly correlated to single-speed equipment. Therefore, variable speed HVAC can retain superior comfort during Demand Response events.

2) Potential further reduction in initial cost:

Heat pumps, even without relying on variable speed technology, have already demonstrated being more cost effective than gas furnace/AC systems. NRDC submitted a wholesale base cost comparison of a baseline code-compliant gas furnace/AC system and a heat pump system to the 2022 Title 24 pre-rulemaking docket, and the comparison presents that the former is 14% more expensive than the latter. The gap increased to 29% in regions of the state where ultra-low NOx furnaces are required, including the South Coast and San Joaquin Valley air quality management districts. In addition, the comparison states that installation cost "would typically be higher for gas appliances due to the installation of three, instead of two, pieces of equipment, as well as venting and installation of a second fuel type."[4]

Furthermore, variable speed heat pumps, when combined with R-32 low GWP refrigerant, will further advance variable speed heat pumps' cost effectiveness advantages. Though widescale adoption of R-32 is still awaiting approval in the Uniform Mechanical Code as well as the International Residential Code for the use of A2L refrigerants to be accepted in California, 160 million units of variable speed heat pumps with R-32 have been installed globally.[5] Additionally, the cost of R-32 is lower than R-410A and R-454B. As of the writing of these comments, R-32 costs $4.11/lb,

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[3] HRAI and AHRI, Letter to U.S. EPA Regarding ENERGY STAR Residential Air Source Heat Pump and Central Air Conditioning Equipment Version 6.0 Discussion Guide dated September 21, 2018, https://www.energystar.gov/sites/default/files/AHRI_HRAI_Comments_CAC_ASHP_Discussion%20Guide_09%2021%202018.pdf

[4] Natural Resources Defense Council, NRDC Comments - Price comparison of heat pumps vs gas furnace and AC systems https://efiling.energy.ca.gov/GetDocument.aspx?tn=235580&DocumentContentId=68513

[5] Why is R-32 the right choice to replace R-410A?, https://www.r32reasons.com/

R-410A costs $5.03/lb and R-454B costs $12.89/lb.[6] Furthermore, since R-32 requires lower charge amount compared to R-410A and R-454B, use of R-32 can reduce refrigerant charge size by up to 40% compared to R-410A[7], while the reduction is up to 10% versus R-454B.[8]

3) Superior cold climate performance:
Daikin believes that variable speed heat pumps will play a crucial role in providing sufficient heating capacity in cold climate zones in California. To ensure heat pumps are able to provide sufficient heating capacity in other cold climate regions, the Northeast Energy Efficiency Partnerships (NEEP) has launched its Cold-climate Air Source Heat Pump Program. NEEP's Cold-climate Air Source Heat Pump Program's requirements have been adopted by various incentive programs across the United States, including New York State's "NYS Clean Heat Program".[9] Its specification document requires that heat pumps meet the below parameters in order to be listed as part of the program, and Daikin would like to highlight that the parameters include requiring heat pumps to be variable speed in order to ensure sufficient cold climate heating performance[10]:

- For Non-Ducted systems: HSPF >10
- For Ducted systems: HSPF >9
- COP @5°F >1.75 (at maximum capacity operation)
- SEER >15
- Number of capacity stages: ≥3 unique stages
- Lab testing results OR engineering data for each system must be reported through the "Cold Climate Air-Source Heat Pump Performance Information

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[6] Typical cost as described in EPA Affordability AIM Act Subsection i Factors October 2021 (https://www.regulations.gov/document/EPA-HQ-OAR-2021-0643-0032)

[7] Based on Daikin's internal calculations: https://www.daikinapplied.com/news/news/R-32

[8] ACHR hosted Podcast - Refrigerants Transition from R-410A – Light commercial and Residential AC markets (participants: Chemours, Carrier, Danfoss, Emerson)

[9] NYS Clean Heat (https://cleanheat.ny.gov/)

[10] NEEP Cold Climate Air-Source Heat Pump Specification (Version 3.1) (https://neep.org/sites/default/files/media-files/cold_climate_air-source_heat_pump_specification-version_3.1_update_.pdf)

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Tables" in the same specification document. Incomplete tables will not be considered.

Models rated under AHRI 210/240 with voluntary base pan heater engagement that do not meet the HSPF requirement shall qualify if the identical model without a base pan heater meets the HSPF requirement (and all other applicable requirements).

2. **Create an HVAC Industry Leadership Council**

   This leadership council would consist of contractors, distributors, and manufacturers and will aid in developing the aforementioned guideline. Once the council is created, it would provide CEC staff with essential knowledge about heat pump products and their application to any planning activity as well as would help align industry with California's goal. Daikin believes that the leadership council could focus on tackling issues such as developing a simple/free/mobile HP permitting process and creating a utility rate structure for owners who switch from fossil fuel to HP in order to help normalize energy bills.

3. **Create a heat pump technology adoption roadmap and work with the industry**

   A heat pump technology adoption roadmap would refer to the specificity of the heat pump goal defined in the above item 1 and illustrate how and when each of the specific steps should be achieved. The technology adoption roadmap is a standard tool used by change agents to influence speed of adoption. In consequence, Daikin perceives that it will accelerate heat pump competency and thus accelerate adoption in California.

   Manufacturers such as Daikin need to influence behavior change across all parties: contractors, distributor territory managers, and beyond. The technology roadmap becomes useful level-setting tool that groups of people can use to identify bottlenecks, opportunities, and generally create workplans. As a result, Daikin believes that, for such groups of people working to fulfill California's heat pump goal, the roadmap could provide helpful means of organizing and focusing work efforts.

III. What are barriers for distributors and retailers?

There are two critical barriers Daikin would like to address here:

1. **Insufficient number of workers for contractors and distributors**
   For over a decade, the HVAC industry has experienced challenges in attracting the next generation of workforce. Daikin requests that the state of California seeks program initiative and other considerations to stimulate overcoming the challenges.

2. **Heat pumps' accessibility to low-income households**
   Daikin has learned that a combination of cash rebates, state income tax credits, and relatively low-cost retail financing work well at encouraging homeowner adoption of heat pumps. However, Daikin has also learned that such participation tends to largely apply to upper and middle-income homeowners. Daikin encourages initiatives designed to make heat pumps available to all.

   For homeowners who qualify for public assistance programs, there are plans to expand programs which directly pay for the installation of heat pumps. Yet, a large fraction of contractors and distributors are not experienced with working for such programs. Therefore, the programs are likely under their radar as business opportunities. Daikin encourages any entities that are working on direct install programs to help the HVAC industry to learn about these opportunities and guide them on how to participate. Without a simple intervention like this, these important direct installation programs will likely struggle to obtain traction.

   Lastly, it is worth mentioning that we also need to ensure stimulating the purchases of heat pumps among middle-income homeowners to achieve the six million heat pump goal. Thus, Daikin strongly encourages CEC to continue seeking mechanism to effectively meet the needs such as partnering with the California Public Utility Commission to explore a massive rollout of statewide tariffed on-bill financing programs.

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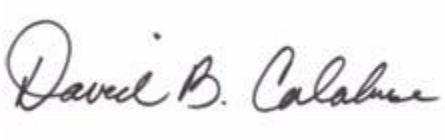
IV. Conclusion

Daikin 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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