

Comment Received From: David Calabrese
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Daikin Comments-CEC Title 24-2022-15-day Express Terms

Additional submitted attachment is included below.



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July 28, 2021

Mr. J. Andrew McAllister, Ph.D.
Commissioner
California Energy Commission
1516 Ninth Street
Sacramento, CA 95814-5512
Re: Docket No. 21-BSTD-01

(Submitted electronically to Docket 21-BSTD-01: Daikin Comments on 15-Day Language of Proposed Draft 2022 California Energy Code)

Dear Commissioner McAllister:

Daikin U.S. Corporation (“Daikin”) hereby submits the following comments in response to 15-Day Language of Proposed Draft 2022 California Energy Code. Daikin U.S. Corporation is a subsidiary of Daikin Industries, Ltd., the world’s largest air conditioning equipment manufacturer. The Daikin Group includes Daikin Applied, Daikin North America LLC, and Goodman Manufacturing Company, L.P.

I. Introduction

As mentioned in our comments letter to the 45-day language, Daikin supports the Commission’s efforts to accelerate building electrification and decarbonization through the improvements made to Title 24, Part 6, to help the state meet its greenhouse gas (GHG) reduction goals. Daikin believes that heat pumps are the proven technology to achieve substantial GHG reduction in both residential and nonresidential buildings and appreciates that Section 150.1(c)6 sets prescriptive baselines to mandate the installations of either air-source heat pumps (“heat pumps” hereinafter) or heat pump water heaters (HPWHs) in each climate zone. However, while Daikin understands that the baselines were set based on cost-effectiveness tests, Daikin would like to reiterate that it is unclear about how the cost-effectiveness was calculated and how heat pumps and HPWHs were allocated to each climate zone as its baseline. In addition, the 15-day language

further reduced the baseline allocation to heat pumps including the ones installed in Single Family Buildings in climate zone 10 as well as in Office, Financial Institution, and Library Building Spaces in climate zone 16. Therefore, the section likely undermines the performance of heat pumps in the given space heating applications, observing the zone allocations. Daikin is now more concerned given that the heat pump baseline is allocated to even fewer climate zones. Please see Section II for details.

In addition, the CEC Title 24 15-day language continues to propose the modification to the economizer requirement by lowering the air handler cooling capacity threshold from 54,000 Btu/h to 33,000 Btu/h in Section 140.4(e) as proposed in the same section of the CEC Title 24 45-day language. As a result, air handlers of commercial HVAC systems with cooling capacity greater than 33,000 Btu/h will require an economizer installation. Exception 6 to Section 140.4(e)1 addresses air handlers with cooling capacity less than 54,000 Btu/h coupled with ventilation provided by a dedicated outdoor air system (DOAS) with exhaust air heat recovery in accordance with Section 140.4(p) as well as two subsections A and B to follow. This exception does not address air handlers with cooling capacity greater than 54,000 Btu/h. Several variable refrigerant flow (VRF) air handlers (hereinafter referenced as “indoor units”) have cooling capacities greater than 54,000 Btu/h¹. Therefore, Daikin reiterates our concern about the new provision and submits our comments as below. Please see Section III for details.

Lastly, Daikin wants to emphasize that we support AHRI’s comments made in Section D. Fan Power Budget – Sections 140.4(c), 170.2(c)(4)(a)(i) of the letter they posted to the docket.

II. Climate Zone-based Heat Pump Baselines

Single Family Buildings

As mentioned above, Daikin continues to emphasize that the baseline allocations to heat pumps undermine their heating performance. Moreover, the 15-day language further reduced the allocations in Section 150.1 (c)6 (new prescriptive requirements for heat pumps) by switching

¹ Example of VRF air-handler/indoor unit product offerings:

<https://www.daikinac.com/content/resources/submittal-data-sheets/vrv-indoor-units/>



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climate zone 10 baseline from heat pumps to HPWHs. In the 45-day language, climate zone 10 had a heat pump baseline along with climate zones 3, 4, 13, and 14. NRDC submitted a wholesale base cost comparison of a baseline code-compliant gas furnace/AC system and a heat pump system to the pre-rule making docket, and the comparison presents that the former is 14% more expensive than the latter. The gap increases to 29% in regions of the state where ultra-low NOx furnaces are required, including the South Coast and San Joaquin Valley air 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.” This study alone suggests that heat pumps should be considered as baselines at least in all regions that do not require dual-fuel heat pumps or cold climate heat pumps; in other words, heat pumps should be qualified as baselines for climate zones 3, 4, 5, 6, 7, 8, 9, 10, 12, 13, 14, and 15.

As stated in the 45-day language, Daikin believes a major barrier to heat pump adoption is the market’s reliance on air conditioners (ACs) for cooling and gas furnaces for heating. As such, creating pathways from cooling-only ACs, by instead requiring heat pump condensing units as dual-fuel heat pumps, supports both effective and transitional use of gas furnaces, and boosts the install base of heat pumps to support the long term decarbonization goals. This approach can be accommodated and effective especially climate zones with cold winter in California. Daikin also believes that cold-climate heat pumps can sufficiently provide space heating in all regions in California. Therefore, Daikin suggests that Section 150.1 (c)6 should require the use of dual-fuel or cold-climate heat pumps in climate zones 1, 2, 11, and 16.

Multifamily Buildings

The same notion outlined above applies to multifamily buildings. The prescriptive requirements for dwelling unit space conditioning systems for multifamily buildings are defined in Section 170.2(c)3A. Section 170.2(c)3Ai notes that the system should be a heat pump for climate zones 1 through 15 and a gas furnace/AC system for climate zone 16, where the building has three or fewer habitable stories. In addition, Section 170.2(c)3Aii notes that the system should be a heat pump for climate zones 2 through 15 and a dual-fuel heat pump for climate zones 1 and 16, where the building has four or more habitable stories. Daikin reiterates that the use of dual-fuel or cold-climate heat pumps for climate zone 16 should be required in Section 170.2(c)3Ai and that the

dual-fuel heat pump should remain as the baseline for climate zones 1 and 16 in such buildings. Daikin also recommends that the dual-fuel heat pump baseline can be substituted with the use of a cold-climate heat pump.

Nonresidential buildings

The same notion also applies to nonresidential buildings. Section 140.4(a)2 defines the prescriptive requirements for space-conditioning systems in nonresidential buildings. In Section 140.4(a)2(B), gas furnace/AC systems are required in Retail and Grocery Building Spaces in climate zones 1 and 16. Daikin reiterates that dual-fuel heat pumps, instead of gas furnace/AC systems, should be the prescriptive baseline system for this section allowing the substitution of cold-climate heat pumps. Also, in Section 140.4(a)2(F), while the 45-day language accepted dual-fuel heat pumps in addition to gas furnaces in Office, Financial Institution, and Library Building Spaces in climate zone 16 when the cooling capacity is less than 65,000 Btu/hr, the 15-day language no longer accepts dual-fuel heat pumps in the climate zone. Daikin suggests bringing back dual-fuel heat pumps as the baseline and to remove gas furnace/AC systems. Also, as mentioned in the other building type sections, Daikin requests that dual-fuel heat pump baselines are allowed to be substituted by cold-climate heat pumps.

Dual-fuel heat pump systems are set as the prescriptive baseline system in Retail and Grocery Building Spaces in climate zones 1 and 16 (Section 140.4(a)2(C)) as well as in Office, Financial Institution, and Library Building Spaces in climate zone 16 (Section 140.4(a)2(G)) when the cooling capacity is greater than 65,000 Btu/hr. A dual-fuel system is also set as the baseline system in School Building Spaces in climate zones 1 and 16 (Section 140.4(a)2(D)). Using the forementioned notion, Daikin continues to suggest that these sections be modified to allow cold-climate heat pumps to be used as the substitute for dual-fuel heat pumps.

Concluding this section, as the full market acceptance of heat pumps cannot be achieved overnight, Daikin suggests the state should be pursuing building electrification aggressively. Daikin believes mandating heat pumps in new buildings through Title 24 is an effective and significant first step to achieve the state's goals. A delay until the 2025 version of the building code will make meeting California's long term carbon neutrality goals more difficult.

III. Economizer Requirements

California will hurt the adoption and use of highly efficient VRF systems in the state by not excepting VRF systems from the additional economizer requirements. Based upon comments during DOE negotiated rulemaking, VRF is a very energy-efficient technology and consistently outperforms conventional systems by 20-50%, from an energy efficiency perspective². Daikin suggests the lost energy savings of non-use of VRF would significantly outweigh the minimal energy savings of application of economizers in this small band of applications.

Installation of Economizers with VRF Systems

Daikin reiterates that imposing an economizer requirement for VRF indoor units raises significant and severe installation barriers. Typically, VRF indoor units are categorized as either: (1) ducted indoor units; or (2) non-ducted (i.e., ductless) indoor units. Definitions for these categories can be found in AHRI Standard 1230³. For ducted indoor units, the ductwork is often limited with little-to-no ducting for return or supply air within a single zone. For ductless indoor units, return air and supply air are passed through the indoor units without any ductwork. Figure 1 provides with a visual representation of the two indoor unit categories. Daikin reemphasizes that VRF ductless indoor units are physically unable to incorporate the use of economizers.

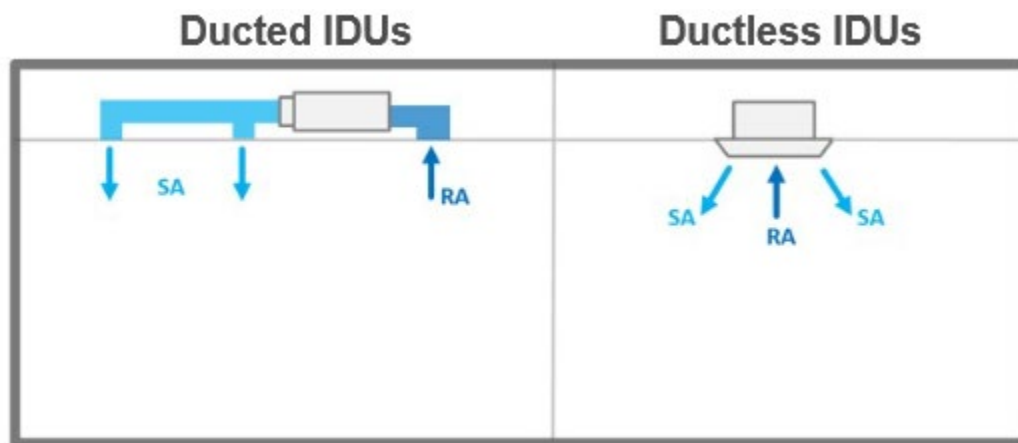


Figure 1. Ducted and Ductless VRF Indoor Units

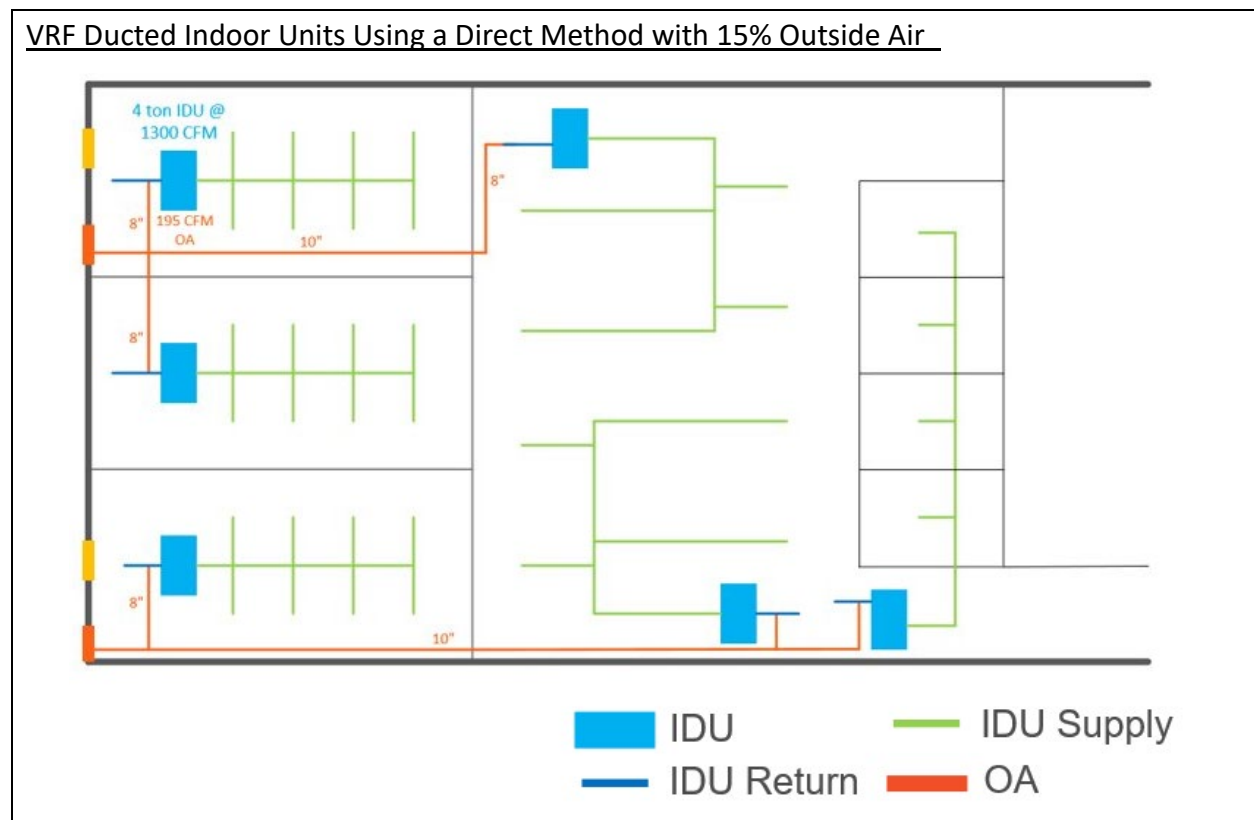
² <https://www.regulations.gov/document?D=EERE-2018-BT-STD-0003-0023>

³ Section 3, Definitions, under AHRI Standard 1230:

https://www.ahrinet.org/App_Content/ahri/files/STANDARDS/AHRI/AHRI_Standard_1230-2021.pdf

Furthermore, economizer installations with VRF ducted indoor units would lead to an increase in: (1) penetrations in the building roof and/or walls; (2) ductwork; and (3) system power input. These ducted indoor units are generally installed in their intended space conditioning zone, which may not be close to the building perimeter walls. Therefore, economizer installations with ducted indoor units present considerable complexities. Conventional packaged HVAC systems do not face the same complexities as the ventilation air is directly connected to these packaged systems with minimal impact to their installation.

Figure 2 shows a side-by-side comparison using sample building layouts of: (1) VRF ducted indoor units with economizers; and (2) VRF ducted indoor units with direct method to bring in outside air. As observed from these layouts, the number of penetrations, ductwork, and complexities increase significantly with the installation of economizers. Based on these additional ductwork, penetrations, and complexities, the estimated differential in installation cost between the two sample layouts can go up to 5X⁴.



⁴ Installation cost estimates based on data retrieved from RSMeans.

Section 140.4(q)2 for bypass or control to disable energy recovery. Daikin supports AHRI's recommendation about the new language to incorporate "6.5.6.1.2.2 Provision for Air Economizer or Bypass" as well as "Exceptions to 6.5.6.1.2.2" in Addendum cd to ASHRAE 90.1-2016 into Section 140.4(q)(2).

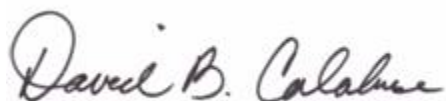
Bringing in Outside Air and the Use of Dedicated Outdoor Air Systems with VRF Systems

Outside air can be brought into VRF space-conditioned zones via a direct method, integrated method, and decoupled DOAS method. These approaches have their own advantages and disadvantages, and the choice is generally application and space dependent. The 15-day language continues to allow for decoupled DOAS method with space-conditioning systems to be exempted from the economizer requirements. For regions (climate zones) and applications that do not need 100% dedicated outside air to be brought into the space-conditioning zone, we request the CEC to consider providing an option for use of other approaches to bring in outside air, such as the direct or integrated outside air method.

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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