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on Request for Information - Flexible Demand Standards

Additional submitted attachment is included below.



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October 29, 2021

Mr. J. Andrew McAllister, Ph.D.
Commissioner
California Energy Commission
1516 Ninth Street
Sacramento, CA 95814-5512
Re: Docket No. 20-FDAS-01

(Submitted electronically to Docket 20-FDAS-01: Daikin Comments on Request for Information-Flexible Demand Standards)

Dear Commissioner McAllister:

Daikin U.S. Corporation (“Daikin”) hereby submits the following comments in response to the Request for Information on Flexible Demand Appliance Standards (FDAS). 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

Daikin appreciates the California Energy Commission’s (CEC) work towards a clean and equitable energy future for California through implementation of innovative energy policies. Daikin also agrees that decarbonizing the state’s existing residential and commercial buildings will require a variety of measures including energy efficiency, demand flexibility, strategies to reduce carbon intensity of end-use equipment and appliances, and deployment of behind-the-meter clean energy resources. Therefore, Daikin believes that the development of FDAS requirement by Senate Bill 49 will play a vital role in the state’s building decarbonization efforts. Furthermore, for the bill to maximize benefits, Daikin also believes that available appliances in Phase 1 should not be limited to just thermostats. The full potential for HVAC systems can be realized if Table 1 also includes a pathway for demand response (DR)-Ready HVAC systems rated in accordance with

AHRI Standard 1380-2019 (Demand Response through Variable Capacity HVAC Systems in Residential and Small Commercial Applications¹), as such systems incorporate the appropriate controls solutions to support the overarching objectives of SB49. As an HVAC systems manufacturer offering a variety of controls solutions, Daikin hereby submits the following comments to some of the questions listed in the RFI document.

II. **AHRI Standard 1380-2019:**

In response to **Question 4** (What other flexible demand approaches are available for staff to consider? Please include regencies to publicly available sources.), Daikin reiterates the request of incorporating AHRI Standard 1380-2019 into CEC's FDAS.

As indicated in one of Daikin's previous comment letters submitted to CEC², Daikin believes that FDAS should provide an incentive pathway for products meeting those standards to facilitate cost-effective and widespread adoption across the state of California³. The letter also explained that emphasis should be placed primarily on two-stage and variable speed HVAC systems in particular. This is because these products are much more consumer friendly and more likely to facilitate increased participation in flexible demand programs since such products are able to provide partial levels of comfort during a DR event. For such products, AHRI Standard 1380-2019 prescribes performance requirements that can be easily referenced in incentive programs. Tables 3 and 4 of AHRI Standard 1380-2019 specify communication, discovery, and management requirements based on communication protocols such as OpenADR 2.0b, which is addressed in Table 3 of the RFI document.

As such, Daikin once again would like to point out that the incorporation of AHRI Standard 1380-2019 into FDAS is critical to successfully carrying out its objective and can assist in doing so sooner than not including AHRI Standard 1380-2019 in Phase 1. Table 3 should include the standard as one of the demand approaches.

¹ https://www.ahrinet.org/App_Content/ahri/files/STANDARDS/AHRI/AHRI_Standard_1380_I-P_2019.pdf

² [Daikin US Comments - SB 49 - Flexible Demand Appliance Standards](#): Section II. (Docket: 20-FDAS-01, TN#: 236608, Submission date: 2/3/2021) <https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=20-FDAS-01>

³ The importance of an incentive approach is also summarized in SEC. 2., Sections 25402(c)(1)(A) and 25402(f)(4), of SB-49.



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III. HVAC equipment

As mentioned in the previous section, Daikin believes FDAS should emphasize two-stage and variable speed HVAC systems as products capable of meeting those standards to facilitate cost-effective and widespread adoption in the state of California. Such HVAC-based demand control requires functionality beyond the simple turning-on/off of HVAC equipment, which leads to superior “flexibility.” For instance, with variable speed HVAC systems, AHRI-1380-2019 defines that input power needs to be limited to a maximum of 70% of the Rated Load Power in a general curtailment scenario and 40% in a critical curtailment scenario. Under such scenarios, variable speed HVAC systems are able to continue running during the DR events instead of being periodically shut down. In addition, variable speed HVAC systems’ efficiency increases as its load reduces below 100%. As a result, their cooling/heating capacities are not reduced as much as the power reductions for such HVAC systems. Therefore, end users enjoy superior comfort. Yet, these flexible demand controls cannot be accomplished solely by the use of thermostats. In our opinion, DR-ready HVAC systems satisfying the provisions of SB49 require both thermostats **AND** HVAC equipment.

As a reference material to validate the effectiveness of using variable speed HVAC systems, Daikin would like to point to “Development and Testing of the Next Generation Residential Space Conditioning System for California,” whose summary has been posted in Docket 19-ERDD-01⁴. The Next Generation Residential Space Conditioning System includes variable speed HVAC systems. Figure 1, which is taken from the report and was analyzed by the Electric Power Research Institute (ERPI), shows capacity reduction in relation to power input reduction.

⁴ California Energy Commission, Electric Power Research Institute, and Western Cooling E - EPC-14-021 - Development and Testing of the Next Generation Residential Space Conditioner for California (Docket 19: ERDD-01, TN#: 227429, Submission: 3/26/2019) <https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=19-ERDD-01>

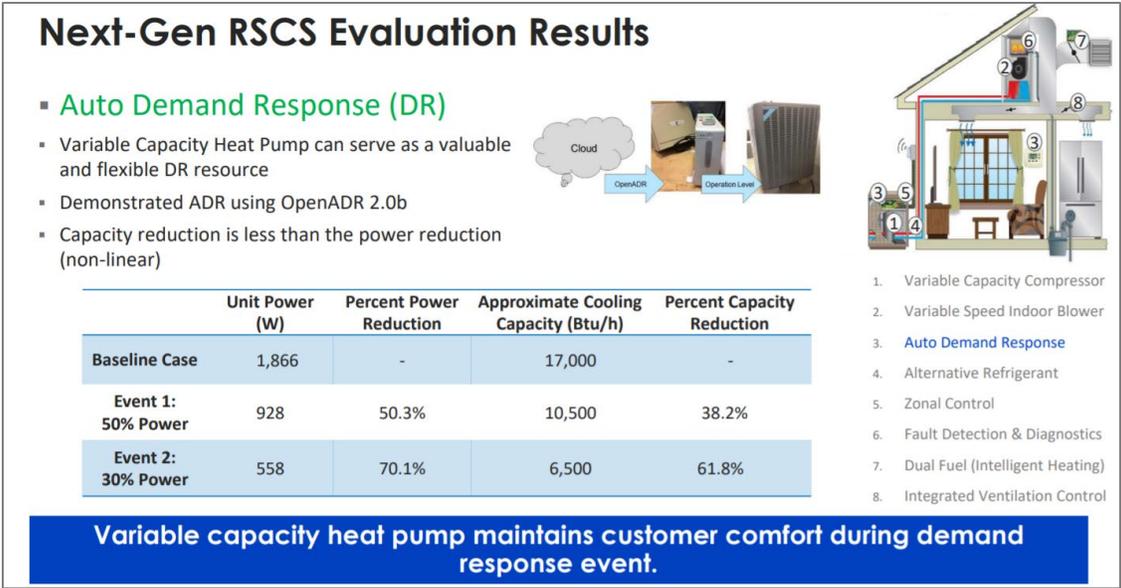


Figure 1: HVAC Equipment Efficiency at Various Part-Loads

Table 1 in the RFI includes only thermostats and no HVAC equipment. Also, Daikin would like to point out that CEC’s “The introduction to the Flexible Demand Appliance Standards,” issued in December 2020 in Docket 20-FDAS-01, highlights in Table 1 that both the U.S. Environmental Protection Agency (“US EPA”) via its ENERGY STAR® program as well as the Air-Conditioning, Heating, and Refrigeration Institute (“AHRI”) include HVAC equipment in their Flexible Demand Appliance Frameworks. Therefore, in response to **Question 2** (What additional appliances should be considered for future FDAS development beyond the first three proposed phases and why?), Daikin requests that CEC consider both Daikin’s comment letter as well as US EPA and AHRI’s equivalent frameworks and include DR-ready two-stage and variable speed HVAC equipment (both heat pumps and air conditioners), rated in accordance with AHRI Standard 1380-2019, as part of Phase 1.

Inclusion of such equipment in Table 1 should also be reflected in Table 2. The addition should incorporate the scope of AHRI Standard 1380-2019 into the table. The standard covers single-phase and 3-phase air conditioners and heat pumps with two-stage or variable speed compressors under 65,000 Btu/h. Any equipment that meets this criterion fits within the scope, and equipment with single-speed compressors and/or over 65,000 Btu/h is out of scope.

Furthermore, according to the American Society of Heating, Refrigerating, and Air-conditioning Engineers (ASHRAE), the average lifetimes of residential air conditioners and heat pumps are 15



years⁵. In other words, the average lifetime for air conditioner and heat pump equipment have the same length as the appliances with the longest lifetime in Table 5. This indicates that provisions of SB49 can be met for a longer or the same duration by both air conditioners and heat pumps relative to other available product options, if included in Phase 1.

Equipment Item	Median Years
Air conditioners	
Window unit	10
Residential single or Split Package	15
Commercial through-the wall	15
Water-cooled package	15
Heat Pumps	
Residential air-to-air	15
Commercial air-to-air	15
Commercial water-to-air	19

Figure 2: Air Conditioners and Heat Pumps Life Expectancy

IV. **DR-ready HVAC systems**

Also in response to **Question 4** (What other flexible demand approaches are available for staff to consider? Please include references to publicly available sources.) reflecting Daikin comments in Section II. and III., Daikin would like to emphasize that the most effective approach to execute flexible demand control of HVAC comes from systems (two-stage or variable speed HVAC equipment in addition to thermostats), not by each of the appliances individually. Such an approach not only provides demand control flexibility on the grid side but also superior comfort on the end user side. And the superior comfort is critical to accelerate user enrollment in utilities’ DR programs. Therefore, Daikin requests that CEC considers “HVAC systems” as an effective flexible demand approach.

⁵ ASHRAE Equipment Life Expectancy chart:

https://www.naturalhandyman.com/iip/infhvac/ASHRAE_Chart_HVAC_Life_Expectancy.pdf

Lastly, Daikin would like to reemphasize and point to “Development and Testing of the Next Generation Residential Space Conditioning System for California” to validate the effectiveness of using variable speed HVAC systems for flexible demand control.

V. Cybersecurity

In response to **Question 21** (What other documents should staff review regarding cybersecurity standards?) and **Question 22** (What minimum standards are needed for cybersecurity of flexible demand appliances?), Daikin recommended in the previously-referenced comment letter⁶ considering the following current California laws that we would like CEC to consider adopting and incorporating into Table 8:

- SB-327: California Information Privacy Law on Connected Devices
- California Consumer Privacy Act of 2018.3

Additionally, Daikin requests that CEC considers existing security provisions in communication protocols referenced in California’s 2019 Building Energy Efficiency Standards (Title 24, Part 6). For example, OpenADR 2.0b, which is included in Table 3 as one of the flexible demand approaches, specifies the necessary level of security essential to meet the U.S. cybersecurity requirements for data confidentiality, integrity, authentication, and message-level security.

VI. Thermostats

In response to **Question 24** (Electronic consent functions, opt-in or opt-out features, and error notifications.), Daikin offers our own app to end users who purchase our smart thermostat (Daikin One+ Smart Thermostat) as a free download. Upon first use, the Daikin app asks the end user for consent with our terms and conditions and acknowledging that specific data are collected through use of our thermostats and will be shared with Daikin.

Furthermore, Daikin One+ Smart Thermostats include a DR feature set. As thermostats are incorporated into utility companies’ DR programs, the features can be activated, thus allowing homeowners to opt in or out of programs on their own through the app.

⁶ [Daikin US Comments - SB 49 - Flexible Demand Appliance Standards](#): Section V. (Docket: 20-FDAS-01, TN#: 236608, Submission date: 2/3/2021) <https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=20-FDAS-01>



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It is important to point out that homeowners who enroll in utility DR programs normally have to log into the utility company's online portal for consent with the utility company's own terms and conditions in order to allow the utility company to control the homeowner's demand.

In response to **Question 25** (Methods to obtain customer consent prior to collecting consumer data.), as mentioned above, Daikin offers an app for Daikin One+ Smart Thermostat end users. Before any data is collected by Daikin, end users must agree to Daikin's terms and conditions and acknowledge their understanding that Daikin will collect certain data.

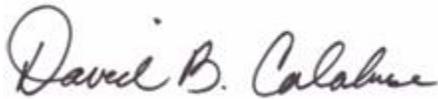
In response to **Question 30** (What percentage of thermostats have a scheduling function for automating thermostat operation?), Daikin has conducted customer surveys on approximately 5,000 Daikin One+ Smart Thermostat owners randomly selected across North America. Approximately 2,000 of them responded, and the result showed that approximately 55% of Daikin One+ Smart Thermostat owners were using the scheduling function. Daikin has submitted those survey results along with this comment letter.

Lastly, in response to **Question 32** (What percentage of thermostats sold or leased in California have an ability to receive and act upon simple OpenADR commands to alter the thermostat operating schedule?), Daikin would like to emphasize again that it is critical to incorporate AHRI 1380-2019 into utilities' DR programs since the standard defines how demand reduction should be communicated to two-stage and variable speed air conditioners as well as heat pumps. As also mentioned, variable speed equipment offers more flexible demand reduction and superior comfort to end users. Daikin One+ Smart Thermostats are capable of executing such demand reduction on our HVAC equipment. However, no aggregators that currently provide DR services to California's Investor Owned Utilities (IOUs), including EnergyHub, are able to effectively take advantage of such flexible demand reduction. In other words, demand reduction signals sent to Daikin One+ Smart Thermostats are currently of a binary nature and can only send on/off signals for variable speed equipment, just like those sent for single-speed equipment-based demand reduction. Daikin would like to point out that the aggregators urgently need to become capable of utilizing AHRI 1380-2019-based demand reduction signals. Daikin One+ Smart Thermostats' features can be updated remotely through cloud-to-cloud. Therefore, once the aggregators, such as EnergyHub, incorporate the capability, Daikin can activate the features on all currently-installed Daikin One+ Smart Thermostats within the relevant territory.

VII. 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,

A handwritten signature in black ink that reads "David B. Calabrese". The signature is written in a cursive style with a large initial 'D'.

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