January 22, 2021

Ms. Tanja Crk
Office of Air and Radiation
Climate Protection Partnership Division
1200 Pennsylvania Avenue, NW
Washington, DC 20460

Topic: Water Coolers, Version 3.0 Specification, Draft 2

Dear Ms. Crk:

This letter comprises the comments of the Pacific Gas and Electric Company (PG&E), San Diego Gas and Electric (SDG&E), and Southern California Edison (SCE) in response to the United States (U.S.) Environmental Protection Agency (EPA) Version 3.0 Draft 2 Water Coolers Specification.

The signatories of this letter, collectively referred to herein as the California Investor-Owned Utilities (CA IOUs), represent some of the largest utility companies in the Western U.S., serving over 32 million customers. As energy companies, we understand the potential of appliance efficiency standards to cut costs and reduce consumption while maintaining or increasing consumer utility of products. We have a responsibility to our customers to advocate for standards that accurately reflect the climate and conditions of our respective service areas, so as to maximize these positive effects.

We appreciate the opportunity to provide comments on this draft. In our comments, we perform additional analysis on water cooler capacity and energy consumption, which ultimately supports the proposed ENERGY STAR® requirements for high capacity units. We provide additional comments on definitions and the qualified product list database. Lastly, we provide a comment on hot, cook, and cold units for the future development of requirements with On Mode Performance (OMP) draws. We urge EPA to consider the following comments.

1. **The CA IOUs estimate EPA proposed requirements for low and high capacity products are both feasible and a step forward in product efficiency.**

   In our review of the ENERGY STAR Water Cooler Draft 2 Version 3 dataset,[1] we note that EPA identified high capacity units in the dataset via daily power consumption, considering units drawing at or above 0.8 kilowatt-hours per day (kWh/day) as high capacity units.[2] We note that hot and cold water capacity, in units of 6 ounce (oz) cups per hour and gallons per hour (gph) respectively, are available in the California Energy Commission (CEC) Modernized Appliance Efficiency Database System (MAEDbS) advanced search.[3]

[1] https://www.energystar.gov/sites/default/files/Water%20Coolers%20Draft%202%20Version%203.0%20Data%20Package.xlsx.
[2] I.d., tab: "2. Version 3.0 Criteria".
[3] https://cacertappliances.energy.ca.gov/Pages/Search/AdvancedSearch.aspx , under category: Refrigeration Products, appliance: Water Dispensers.

Therefore, we first examine the prevalence of high capacity units in the MAEDbS dataset, to confirm the applicability of EPA's estimation method. We note the proposed definition of a high capacity unit: a product that provides at least 45 six oz cups of hot water per hour and at least 0.61 gph of cold water. In this MAEDbS dataset, we note that of 891 free-standing, air-cooled, bottle-type, hot- and cold-water coolers, 26 percent of units meet only the hot high capacity definition, 25 percent meet only the cold high capacity definition, and less than 1 percent meet both. See Table 1 for more information.

Table 1: High Capacity Limits in CEC MAEDbS Dataset, for Freestanding, Air-Cooled, Bottle-Type, Hot and Cool Units.

Description	Product Count	Dataset Percentage (%)
High Cap. Heating and Cooling	3 [B]	0.3
High Cap. Heating Only	235	26.4
High Cap. Cooling Only [A]	225	25.3
Low Cap. Heating and Cooling	428	48.0

Source: CA IOU analysis of CEC MAEDbS dataset, accessed December 23, 2020.
Note: Total product count 891 models.
[A]: Rounding adjustment performed on 1 unit, 0.6 gph, estimated to meet the high capacity requirement.
[B]: Two of three high capacity units eliminated after spot checks of product datasheets indicated data quality issues in rated capacities.

Further inspection of this data demonstrates an underlying reason few units reach the high capacity threshold: most units in this dataset with higher cooling capacity opt for smaller hot water capacity, and vice versa. See Figure 1 for this dataset sorted by ascending total capacity. We note that the most common cold water capacity is approximately 0.5 gph, with 1.0 gph for increased cold water capacity units. Similarly, hot water units are typically 22-23 six oz cups (approximately 1.0 gph), with increased hot water capacity units typically at or above the 45 6-oz cup threshold. This is supportive of both proposed high capacity definitions, as (1) hot water capacity is confirmed to be designed around 45 six oz cups of hot water, and (2) 0.61 gph is a cut point for cold water capacity, which successfully separates low and high capacity cooling units.

On this topic, we encourage EPA to include additional supporting data on why 0.61 gph exactly is the proposed cut-point. In the webinar, EPA noted this cut-point was suggested by manufacturers, and we encourage EPA to document the underlying properties of the cold water cooler system that lead to this cut point over more simple limits such as 0.6 gph. Further, the EPA definition for low capacity water coolers should be amended to read "A water cooler with a cold-water dispenser capacity of less than 0.61 gph," to obtain the intended product group.

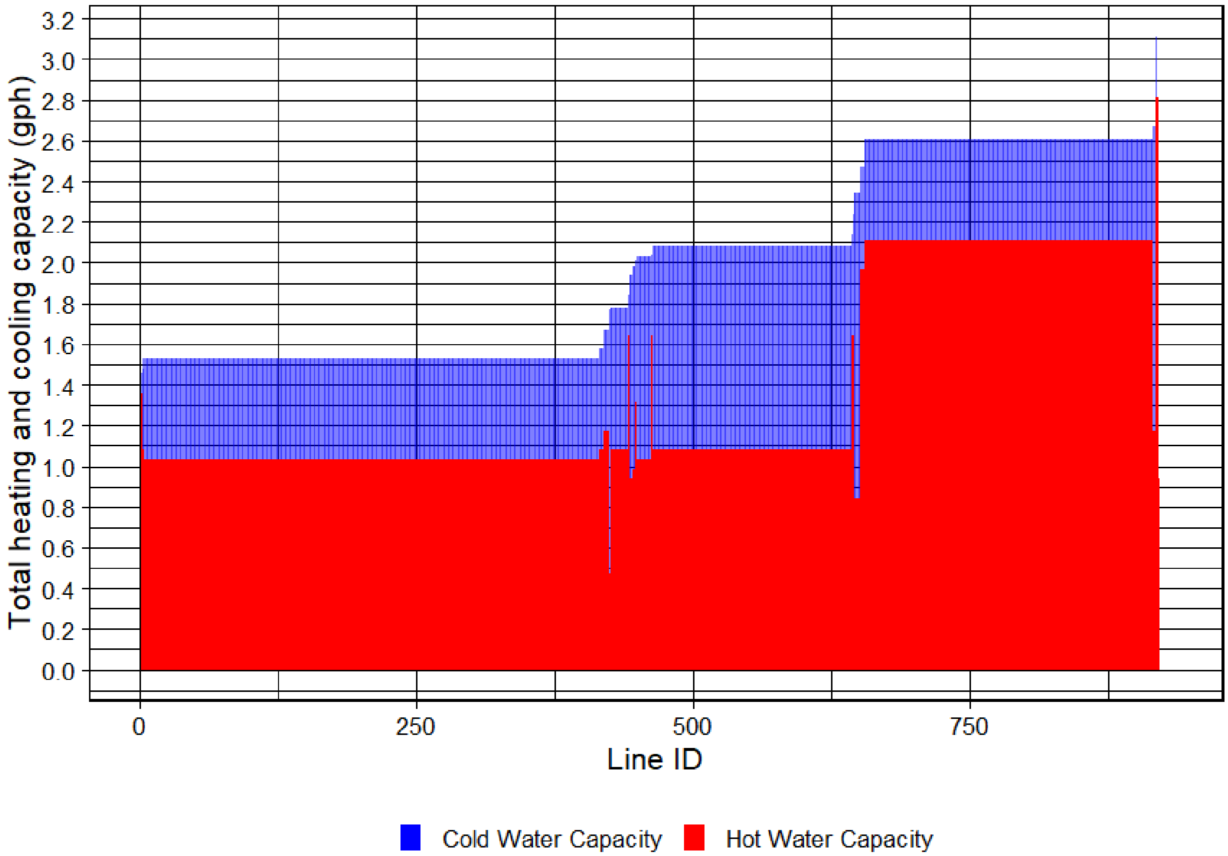

Figure 1: Hot and cold capacity per hour of freestanding, air-cooled, bottle-type water dispensers in CEC MAEDbS dataset, by unit ID number.
Source: CA IOU analysis of CEC MAEDbS dataset, 2020.
Note: Water coolers are sorted ascending by total capacity (heating plus cooling), where each vertical line (column of pixels) is a product.

Following the validation of the high capacity definitions, we then estimate the daily standby power consumption impact of membership of each high capacity category (i.e., hot, cold) for this dataset. We did so separately due to the low number of units meeting both limits. We constructed and fit a general linear model of the form:

$$Y(kWh/day) = Intercept\ (Conventional\ Unit) + High\_Cap\_Cooling\ (True/False) + High\_Cap\_Heating\ (True/False)$$

Equation 1: Linear Fit Model

The full results of this model are shown in **Appendix A**. The result from this model, with a suitable real-world fit,[4] estimates that a *typical unit* from the CEC MAEDbS dataset requires 0.75 kWh/day if low capacity, an additional 0.35 kWh/day if high capacity heating, and an additional 0.15 kWh/day if high capacity cooling. As ENERGY STAR identifies above average performance units, we evaluated the twenty-fifth percentile of this dataset for low-capacity units,

4 Adjusted R^2 of 0.74.

which is 0.7 kWh/day (approximate due to rounding), supporting EPA's proposed limit[5] of 0.68 kWh/day for low-capacity units.

This model fit result suggests that the EPA-proposed requirement of 0.8 kWh per day for high capacity units is challenging but practical. This is further corroborated by the CEC MAEDbS units[6] which would be anticipated to meet the proposed requirement level.

2. **The CA IOUs recommend EPA update the Qualified Products List with additional information, which can refine the future product analysis.**

During our analysis of this product, it became apparent that additional data in the public ENERGY STAR Qualified Products List (QPL) would be advantageous to product efficiency analysis and level setting. We identified the following items, listed in Table 2, including capacity, rated wattage, and storage tank capacity for both heating and cooling. We posit that this data would improve the ability to model and estimate the storage losses of these products, as current capacity ratings refer to the hourly production of the unit, not the storage capacity of heated or cooled liquid experiencing standby losses, which may lead to some noise in this data. For example, in one instance we noted two nearly identical units with equivalent hot water storage tank sizes (0.32 gallons), where one unit had a higher hot water capacity by supplying a higher rated wattage heating element.[7, 8]

Our best model fit of this CEC MAEDbS data with continuous variables for heating and cooling capacity (i.e., hourly capacity) was an Adjusted R-squared of 0.73, indicating some potential for explanatory data improvement (See Appendix A for more details). We estimate that storage capacity will lead to a more accurate standby model.

[5] https://www.energystar.gov/sites/default/files/Water%20Coolers%20Draft%202%20Version%203.0%20Data%20Package.xlsx, tab: "2. Version 3.0 Criteria".

[6] Two-thirds of CEC MAEDbS units meeting both high capacity criteria are eliminated after inspection of product cut sheets for data quality issues.

[7] For example: http://www.whirlpoolwatercoolers.com/media/custom/download/8LIECHK-SSF-WL%20WHIRLPOOL%20manual%20English.pdf , p. 5 is a 650 W heating element unit, whereas: https://manualzz.com/doc/52785441/whirlpool-7liech-scsss-wl-self-cleaning-commercial-water-... p.4 is a 425 W heating element unit.

[8] Several products compared in this datasheet: https://housewares.blob.core.windows.net/exhdir/original/catalog/0f142f87-43c1-45b1-a2e2-3078799b5c14.pdf p 5-8, 14-18.

Table 2: Recommended Additional Data Fields for ENERGY STAR QPL.

Data Field	Unit	Available
Cooling Capacity	gph	CEC MAEDbS
Heating Capacity	6-oz	CEC MAEDbS
Cooling System Rated Wattage	W (watt)	N/A[A]
Heating System Rated Wattage	W	N/A[A]
Cold Water Storage Tank Capacity	Gal or L (liter)	N/A[A]
Hot Water Storage Tank Capacity	Gal or L	N/A[A]
Touchless Water Dispensing Function (commercial units)	True (electronic) / True (mechanical) /False	N/A[A]

[A]: Commonly available data in product datasheets, but not present in the current ENERGY STAR QPL or CEC database.

Recent research reveals that touchless functionality for water coolers, especially commercial devices, has been increasingly requested by commercial end-users.[9, 10] As water cooler usage in a commercial setting is estimated to account for a significant materials sustainability benefit via reduction of disposable bottled water usage,[11, 12] we encourage EPA to evaluate whether this functionality requires a standby adder and identify these products on the QPL for ease of access to commercial end-users.

3. **The CA IOUs recommend additional research prior to additional incorporation of ASHRAE 18 standard.**

In our background research, we noted that the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) has withdrawn the standard ASHRAE 18-2008 (Re-affirmed 2013), noting that this standard has also lost its American National Standards Institute (ANSI) standard designation. On this topic, the ASHRAE Technical Committee cites “no reported sales” of this standard and a lack of support in the industry to revise the document as reasons for withdrawal and loss of ANSI designation.[13]

We recommend that EPA work with manufacturers and the industry organizations to re-instate this standard if EPA intends to incorporate methods or definitions from this standard by reference. Alternatively, we encourage EPA to construct definitions for water cooler capacity in full (i.e., without referencing ASHRAE 18), due to the potential loss of availability of this standard long term.

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9 https://www.amaneadvisors.com/content/uploads/2020/09/AAdvisors_Key-trends-impacting-Residential-Commercial-water-post-COVID.pdf, p 2, 2020.

10 Foodbev Media: Interview: The WCD Group discusses 2021 water dispensing trends, M. White, 2020.

11 https://westoahu.hawaii.edu/ekamakanihou/?p=8397, 2018.

12 https://sustainability.temple.edu/sites/sustainability/files/uploads/documents/How%20Temple%20Saves%20More%20than%20Just%20Water%20Bottles%20-%20FINAL.pdf , T. Wilson, 2014.

13 https://www.ashrae.org/news/esociety/public-reviews-february-2019, Heading: ASHRAE Standard 18-2008 RA-2013.

4. **The CA IOUs recommend cook water benefits are incorporated in a future OMP based power model.**

We thank EPA for responding to our earlier comments[14] regarding cook water draws, potentially addressing them in the OMP test methods. We agree with EPA's assessment that measuring the power consumption of this draw directly would be unnecessary,[15] as this would have a nominal near zero power associated. Based on this reasoning, we suggest an alternate approach where a nominal zero power draw is applied to the cook temperature water draws for these units, which would ultimately be rolled into a consumption estimate.

We are highly supportive of EPA development of the OMP methodology, as the service water coolers provide to consumers is the dispensing of hot, cook, and cold water to end-users. As the current ENERGY STAR metric is based solely on standby power, we believe this future metric development can bring the ENERGY STAR criteria more in line with field experiences of this product.

With field experience in mind, we recommend that EPA consult existing research alongside the development of OMP levels, to estimate draws per day by the temperature selected in residential and commercial settings. We note that the purchase of a hot, cook, cold unit at some level indicates the interest in this end-user in using the cook temperature functionality, so we recommend that an alternate draw schedule will be essential to matching the field performance of such a unit. From the OMP perspective, we anticipate the power consumed by a cook water draw will have approximately zero active mode energy associated with it, relative to a hot or cold water draw with the storage tank water temperature recovery. The end result of this consideration is the attribution of power benefits from cook temperature water in the daily energy use for these products.

We recommend a minor clarification to the definition of hot, cook, cold units. We note that the current definition requires that a product: "dispense hot, cold, and room-temperature water."[16] We also note that many hot and cold water cooler units are equipped with a switch to the heating element of the unit, so this unit is able to provide room temperature or hot water at different times. To resolve this technicality, we recommend the definition is updated to: "Units capable of simultaneously dispensing hot, cold, and room-temperature water."

[14] https://www.energystar.gov/sites/default/files/CA%20IOUs%20Comments%20Water%20Coolers%20Version%203.0%20Draft%201.pdf , Comment 3, p. 4.

[15] https://www.energystar.gov/sites/default/files/ENERGY%20STAR%20Water%20Coolers%20Draft%201%20Version%203.0%20Comment%20Matrix.pdf , p. 2, "Hot, Cook, and Cold Units".

[16] https://www.energystar.gov/sites/default/files/ENERGY%20STAR%20Water%20Coolers%20Draft%202%20Version%203.0%20Specification.pdf , (1)(A)(d), page 1.

In conclusion, we would like to reiterate our support to EPA's Draft 2 on Version 3.0, Water Coolers Product Specification. We thank EPA for the opportunity to be involved in this process.

Sincerely,

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Appendix A: Regression Fit Models.

Results for regression model, 1, discrete model (Comment letter page 3):

Dataset: Freestanding, air-cooled, bottle-type water dispensers in CEC MAEDbS dataset, Dec. 2020.

Dependent Variable: Standby Power in kWh/day

Independent Variables: Intercept, High Capacity Heating (T/F), High Capacity Cooling (T/F)

Regression model: R programming language, lm() function[17]

Residuals:

Min	1Q	Median	3Q	Max
-0.69720	0.00280	0.00480	0.05063	0.45063

Coefficients:

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	0.749367	0.004178	179.35	<2e-16 ***
es_hotcapYes	0.345828	0.006974	49.59	<2e-16 ***
es_coldcap.Yes	0.147837	0.007071	20.91	<2e-16 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.08673 on 888 degrees of freedom
Multiple R-squared: 0.7363, Adjusted R-squared: 0.7357
F-statistic: 1239 on 2 and 888 DF, p-value: < 2.2e-16

[17] https://www.rdocumentation.org/packages/stats/versions/3.6.2/topics/lm

Results for regression model, 2, continuous model (Comment letter page 4):

Dataset: Freestanding, air-cooled, bottle-type water dispensers in CEC MAEDBS dataset, Dec. 2020.

Dependent Variable: Standby Power in kWh/day

Independent Variables: Intercept, Heating Capacity in 6-oz cups per hour, Cooling Capacity in gph.

Regression model: R programming language, lm() function

Residuals:

Min	1Q	Median	3Q	Max
-0.41665	0.00337	0.01106	0.04598	0.44598

Coefficients:

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	0.3062879	0.0143605	21.33	<2e-16 ***
heat_cap6oz_hr	0.0148960	0.0003075	48.45	<2e-16 ***
cool_cap_gph	0.2400437	0.0137323	17.48	<2e-16 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.08755 on 885 degrees of freedom
Multiple R-squared: 0.7266, Adjusted R-squared: 0. 726
F-statistic: 1176 on 2 and 885 DF, p-value: < 2.2e-16