PUBLIC UTILITIES COMMISSION

505 VAN NESS AVENUE
SAN FRANCISCO, CA 94102-3298

November 6, 2024

Advice Letter 7115-E-A

Sidney Bob Dietz II c/o Megan Lawson
Director, Regulatory Relations
Pacific Gas and Electric Company
300 Lakeside Drive
Oakland, CA 94612

SUBJECT: Staff Disposition of Pacific Gas and Electric's Advice Letter 7115-E-A

Dear Sidney,

Pursuant to Resolution E-5073 Ordering Paragraph (OP) 2 and 11, Pacific Gas and Electric Company (PG&E) submitted Advice Letter (AL) 7115-E on December 27, 2023. On May 24, 2024, PG&E filed a supplemental AL 7115-E-A replacing AL 7115-E in its entirety. Upon further review of PG&E's AL 7115-E-A, the Public Advocates Office Protest is dismissed, and AL 7115-E-A is approved with an effective date of October 30, 2024.

Attachment A contains a detailed discussion of the AL, protest, reply to protest, supplemental and staff's determination that the AL is compliant with Resolution E-5073.

If you have any questions, please contact Sebastian Sarria at sebastian.sarria@cpuc.ca.gov.

Sincerely,

FOR

Leuwam Tesfai
Deputy Executive Director for Energy and Climate Policy/
Director, Energy Division
California Public Utilities Commission

CC:
ED Tariff Unit
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Julie Halligan
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Service Lists for A.18-03-001, A.18-02-016, and A.18-03-002.

Attachment A
Background and Disposition for
PG&E Advice Letter 7115-E-A

Background:

AB 2868 (Gatto, 2016) was signed into law on September 26, 2015, by Governor Jerry Brown, which added sections 2838.2 and 2838.3 to the Public Utilities (PU) Code. The legislation directed the Commission, in consultation with the State Air Resources Board and the Energy Commission, to direct the state's three large electrical investor-owned utilities (IOUs) to file applications for programs and investments to accelerate the widespread deployment of distributed energy storage systems to achieve ratepayer benefits, improve air quality, and reduce greenhouse gas emissions.[1]

In response, the CPUC issued D.17-04-039 on May 8, 2021, which directed the large electric IOUs to "incorporate proposals for programs and investments for up to 166.66 Megawatts (MW) of distributed energy storage (DES) systems into their 2018 energy storage procurement plans."[2]

PG&E filed their Application (A.) 18-03-001 on March 1, 2018, requesting, among other things, to move forward with a five MW procurement of behind-the-meter (BTM) thermal energy storage in compliance with AB 2868.

On June 27, 2019, the CPUC adopted D.19-06-032, implementing the AB 2868 energy storage program, including funding for PG&E's BTM thermal energy storage program. D.19-06-032 also established cost-effectiveness guidance for AB 2868 projects. PG&E's program will encourage participants to reduce or eliminate hot water heater load during peak evening hours by heating the water heater during off-peak hours. Customers would then be able to use this storage thermal energy, or hot water, during on-peak hours when there is increased congestion on the grid.

On January 15, 2021, the California Public Utilities Commission (Commission or CPUC) issued Resolution E-5073, which approved with modifications Pacific Gas and Electric Company's (PG&E) Advice Letter (AL) 5731-E and Supplemental AL 5731-E-A to implement the WatterSaver program to enable shifting of electric water heating load in compliance with Assembly Bill (AB) 2868 and Decision (D.)19-06-032.

Ordering Paragraph (OP) 11 of Resolution E-5073 directed PG&E, beginning in 2022, to file a Tier 1 Advice Letter each year no later than December 31st containing its annual WatterSaver program report.

Protest, Reply and Supplemental:

On December 27, 2023, PG&E filed AL 7115-E per Resolution E-5073. which included its annual WatterSaver program report for the year 2023, as well as Key Performance Indicators identified in Advice Letter 5731-E and cost effectiveness results calculated using the Total

[1] PU Code Section 2838.2(b).
[2] D.17-04-039, p. 20.

Resource Cost test, the Program Administrator Cost test, the Ratepayer Impact Measure test, and the Participant Cost Test.

In response to the filing, the Public Advocates Office (Cal Advocates) filed a protest on January 16, 2024, recommending that the Commission require PG&E to do the following:

- Calculate the performance metrics and cost-effectiveness tests for a hypothetical fully subscribed pilot and include the results in future advice letter filings pursuant to Resolution E-5073 to facilitate comparison of the pilot's performance with the benefits claimed by PG&E in AL 5731-E.
- Refrain from creating its own modified cost-effectiveness tests in future AL filings pursuant to Resolution E-5073.

On January 23, 2024, PG&E filed a reply to Cal Advocates' protest, which are summarized as follows:

- PG&E recommends that the Commission reject Cal Advocates' recommendation that PG&E calculate performance metrics and cost-effectiveness tests for a hypothetical fully subscribed pilot and include the results in future advice letters.
- PG&E agrees that select cost-effectiveness values presented in its Advice Letter may be confusing to stakeholders and warrant further explanation in an advice letter substitute sheet and also in future advice letters.

After PG&E filed their reply, AL 7115-E-A was filed on May 24, 2024, which replaced AL 7115-E in its entirety. The new AL reflected several updates, including:

- Removal of modified cost-effectiveness values as presented in AL 7115-E and which were the subject of Cal Advocates' protest. In doing so, PG&E stated that their original intent was to provide valuable information to demonstrate future program cost-effectiveness potential given the high expenditures and limited benefits the program has experienced.

No protests were received in response to the supplemental filing.

Disposition:

Staff agree with Cal Advocates that PG&E should not have used their own modified cost-effectiveness tests in AL 7115-E but this issue has been made moot by PG&E's AL 7115-E-A which removed the modified cost-effectiveness values.

Staff disagree with Cal Advocates that PG&E should be required to calculate the performance metrics and cost-effectiveness tests for a hypothetical fully subscribe pilot. As noted in AL 7115-E-A, WatterSaver has had difficulty recruiting customers, which is due in part to the fact that there is only one manufacturer with the technical ability to integrate load-shifting in their heat pump water heaters. Staff believe that the program needs more time to recruit more customers to conduct the necessary performance metrics and cost-effectiveness tests for a hypothetical fully subscribed pilot. Additionally, Staff note that D.23-12-004 required PG&E customers receiving an incentive through the Self-Generation Incentive Program Heat Pump

Water Heater Program after January 1, 2025, to enroll in WatterSaver if funding is available, which is expected to lead to increased program participation.

Staff will work with PG&E and the WatterSaver implementer to ensure that performance metrics and cost-effectiveness tests for a hypothetical fully subscribed pilot are included in future iterations of the annual report when more customers have been recruited to participate in the program. Cal Advocates' protest is dismissed, and AL 7115-E-A is approved.

Pacific Gas and Electric Company®

Sidney Bob Dietz II
Director
Regulatory Relations

Pacific Gas and Electric Company
300 Lakeside Drive
Oakland, CA 94612

May 24, 2024

Advice 7115-E-A
(Pacific Gas and Electric Company ID U 39 E)

Public Utilities Commission of the State of California

Subject: **Supplemental: Pacific Gas and Electric Company's End of the Year Advice Letter Filing for the WatterSaver Reporting**

I. Purpose

Pacific Gas and Electric Company (PG&E) hereby submits this supplemental advice letter to update its End of Year Advice Letter Filing for the WatterSaver Reporting. In response to the protest letter filed by the Public Advocates Office on January 16, 2024, and subsequent discussions with California Public Utilities Commission (CPUC) staff, this supplement includes updates and clarifications to the WatterSaver reported results. These updates are described in Section III below. This supplemental advice letter replaces PG&E's original advice letter 7115-E in its entirety.

The updates to Advice 7115-E, reflected in this Supplemental Advice 7115-E-A, include the following:

- A common update to Tables 1 and 2, in which results are now based on a larger 2023 program data set than was used for Advice 7115-E. The results presented in Tables 1 and 2 of Advice 7115-E represent data through October 31, 2023, which was the duration of program data processed at the time of the advice letter development. CPUC staff asked PG&E to update the information in its supplemental advice letter to include additional 2023 program data now available. Thus, data through November 30, 2023, were used to inform results for this supplemental advice letter. Data from the month of December was not included because the control algorithm (specifically the "Load Up" duration) was modified for some devices on December 1, 2023 to improve operational performance during peak period and reduce overall daily energy use, and data from only December is insufficient to demonstrate the operational effects from this modification (especially since December is an irregular month due to holidays).[1]
- Additional changes to Table 1 include

[1] Additionally, proper analysis would require seasonal adjustments which is being considered in the current measurement and evaluation study. December's data is not included in the results presented here but will be included for the analysis reported for the 2024 End of Year Advice Letter.

  - Updated program savings calculations that examine load shifting effects over an extended, 24-hour period rather than focusing on the truncated 2 pm – 12 am period used in Advice 7115-E, to capture the entirety of load shifting effects.
  - Clarifications to the descriptions of indicators.
- Additional changes to Table 2 include
  - Removal of modified cost-effectiveness values and associated narrative that were presented in Table 2 of Advice 7115-E. As mentioned in PG&E's Response to the Public Advocates Office protest of Advice 7115-E,[2] PG&E's original intent with these modified cost-effectiveness values was "to provide in good faith an information value to demonstrate future program cost-effectiveness potential for stakeholder consideration, given the significant expenditures on program development during the program ramp-up phase relative to the limited benefits that have been realized." However, upon further consideration and discussion with the CPUC, PG&E has determined that these modified cost-effectiveness values would be most informative when more program data (both benefits and costs) is available through the end of 2025 (instead of through 2023, as was used for Advice 7115-E).[3]
  - Updates to the cost-effectiveness analysis to better capture the nuances of the heat pump water heater (HPWH) operational characteristics. These updates include use of a pro-rated EUL rather than 4-year EUL, since not all devices have been in the program since 2022. Additionally, annualized hourly bill savings rather than annualized daily bill savings were used for Participant Cost Test (PCT) and the Ratepayer Impact Measure (RIM) test.
- Table 3 was added to show:
  - Three different customer groups (considered separate cohorts) with unique operating characteristics to demonstrate the significant differences in results among these groups, at the request of CPUC staff. These three groups are: (1) Advanced Load Up (ALU) group where the temperature set point is increased to the manufacturer's ALU temperature set point, (2) Basic Load Up (BLU) group with user temperature setpoint below 140F, and (3) BLU group with user temperature setpoint at or above 140F.
  - Updates to the attribution of the results to correspond to the participation of these three different groups.

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[2] *Response to the Protest from the Public Advocates Office regarding Advice Letter 7115-E – Pacific Gas and Electric Company's End of the Year Advice Letter Filing for the WatterSaver Reporting* (January 23, 2024), p.4

[3] Because the WatterSaver program is still investing significant resources on testing HPWH connectivity and control functionalities with multiple manufacturers, and these costs should ultimately lead to more program benefits, PG&E anticipates more complete cost and benefits data to be available at the end of the pilot period in 2025. More complete data will enable PG&E to better determine which modified cost-effectiveness estimates will demonstrate the cost-effectiveness potential of a future program offering, for inclusion and discussion in a future advice letter.

- Reorganization of some of the narrative content from Advice 7115-E into table notes to clarify (a) table information given the addition of Table 3, and (b) the data analysis for three different customer groups.

II. Background

WatterSaver officially launched March 15, 2022. Pursuant to Resolution E-5073, Pacific Gas and Electric Company (PG&E) submits this letter that includes the Key Performance Indicators identified in Advice Letter 5731-E and cost effectiveness results calculated using the Total Resource Cost test, the Program Administrator Cost test, the Ratepayer Impact Measure test, and the Participant Cost Test using actual program enrollment numbers where applicable.

III. WatterSaver Program End-of-Year Results

A. Proposed Key Performance Indicators

The following table lists the various Key Performance Indicators that were identified in AL 5731-E.

Table 1. Key Performance Indicators for WatterSaver

WatterSaver Key Performance Indicators[1]		Notes
Maximum Peak Demand Reduction (kW)	25	Maximum kW reduction for all actively controlled devices
Energy Shifted outside of Peak Period in a Single Day (kWh)	63	Average daily kWh shifted outside of peak hours (4-9pm) for actively controlled devices
Targeted Customer Segment Enrollments (Number of Customers/Segment)		
Residential Heat Pump Water Heater (HPWH)	181	Total enrolled devices, including actively controlled, baseline and non-controlled [2] but not test devices
Residential Electric Resistance Water Heater (ERWH)	11	
Commercial HPWH	1	
Program Cost-Effectiveness		
(Program $/Gross kW reduced)	$69.16	Total program costs for 2020 through 2023 [3] relative to total kW saved by currently active HPWH devices with pro-rated EUL up to 4 years [4]
(Program $/Gross kWh shifted)	$27.83	Total program costs for 2022 through 2023 relative to total kWh saved by currently active HPWH devices with pro-rated EUL up to 4 years
Number of Controlled Residential and Commercial HPWHs	159 [5,6]	Total actively controlled HPWH devices per day

WatterSaver Key Performance Indicators[1]		Notes
(Costs (control, API, TMV)/Gross kW)	$0.25	Total Equipment and API costs incurred for 159 controlled HPWH devices relative to total kW saved using a pro-rated EUL
(Costs (control, API, TMV)/Gross kWh)	$0.10	Total Equipment and API costs incurred for 159 controlled HPWH devices relative to total kWh saved using a pro-rated EUL
Number of Controlled Residential and Commercial ERWHs	11	
(Costs (control, API, TMV)/Gross kW)	n/a	Critical mass not met to evaluate the impact of load shifting control
(Costs (control, API, TMV)/Gross kWh)	n/a	
Customer Time-of-Use (TOU) Cost Savings		Updated methodology calculates load shifting effects over an extended 24-hour period rather than just 2pm-12am. [7] (Negative sign indicates an increase in customer cost.)
(Annual Gross)	-$2,929 [8]	Total estimated annual bill savings for all actively controlled devices, assuming TOU-C
(Annual Average per customer)	-$18 [8]	Average annual estimated bill savings per customer for actively controlled HPWH devices, assuming TOU-C
(Monthly Average per customer)	-$1.5 [8]	Average monthly estimated bill savings per customer for actively controlled HPWH devices, assuming TOU-C
Greenhouse Gas (GHG) Reduction		Updated methodology calculates load shifting effects over an extended 24-hour period rather than just 2pm-12am. [9] (Negative sign indicates an increase in CO2eq emissions)
(4-yr Gross)	-2.05 MT CO2eq [8]	Total estimated MT of CO2eq reduction for actively controlled HPWH devices using a pro-rated EUL
(4-yr Average per customer)	-13 kg CO2eq [8]	Estimated average kg of CO2eq reduction per customer for actively controlled HPWH devices using a pro-rated EUL
Air quality improvement	n/a	Will be quantified pending any propane to HPWH intervention
Petroleum reliance reduction (removal of propane water heaters)	n/a	Will be quantified pending any propane to HPWH intervention
Average Customer Satisfaction (1, dissatisfied - 5, satisfied)	3.9	

[1] The data used for this Advice Letter was collected between March 2022 and end of November 2023.
[2] Not all 181 Residential HPWH enrollees are being controlled by WatterSaver. Some participants prefer to be on their own more aggressive load shifting schedule.
[3] The program costs are for 193 devices currently enrolled in the program.
[4] The EUL used in these calculations is pro-rated up to 4 years depending on when the customer enrolled. Customer participation started in 2022 and continues to the end of 2025. A 4-year EUL is less than half what a normally operating HPWH might experience. Using longer EULs closer to 10-15 years will result in increased benefits.

[5] Calculations of the program impacts were performed using 159 as the total number of controlled HPWH devices currently being controlled in the program. Baseline, uncontrolled, and test devices have been excluded as they either (a) do not provide benefits to the customers/the grid or (b) they fall outside of WatterSaver's daily load shifting control.
[6] Of the 159 controlled HPWH devices, seventeen are connected via CTA-2045, and the rest are connected through Wi-Fi integration.
[7] Original cost savings calculations examined load shifting effects between 2 pm – 12 am period. Additional analysis found that the control algorithms affected how the water heaters operate outside of this period, so cost savings calculations have been updated to fully examine load shifting effects over an extended 24-hour period.
[8] A positive number represents a decrease compared to baseline. A negative number represents an increase compared to baseline.
[9] Original GHG reduction calculations examined load shifting effects between 2 pm – 12 am period. Additional analysis found that the control algorithms affected how the water heaters operate outside of this period, so GHG reduction calculations have been updated to fully examine load shifting effects over an extended 24-hour period.

B. Cost Effectiveness Calculations

Calculation Components

The results in Table 2 are presented for the program as a whole. All cost-effectiveness test values shown in Table 2 are based on the formulas that conform to the California Standard Practice Manual.[4]

Table 2. Cost Effectiveness Tests for WatterSaver

Cost-Effectiveness Test Type	Ratio	Note
Total Resource Cost (TRC) [1]	0.009	Includes benefits from controlled HPWH devices only relative to all program costs incurred during 2020-2023 including current and projected incentives[2].
Portfolio Administrative Cost (PAC)	0.009	Includes benefits from controlled HPWH devices only relative to all program costs incurred during 2020-2023 including incentives.
Participant Cost Test (PCT) [3]	1.537	Includes estimated 4-year utility bill savings and projected 4-year earned incentives for 159 actively controlled HPWH devices, relative to any utility bill increases and a conjectural participant non-energy cost estimated to be equal to 10% of earned incentives.
Ratepayer Impact Measure (RIM) [4]	0.033	Includes all programs costs incurred 2020-2023, as well as associated Ratepayer impact Benefits and Costs

[4] California Standard Practice Manual: Economic Analysis of Demand-Side Programs and Projects (October 2001). Accessible via https://www.cpuc.ca.gov/-/media/cpuc-website/files/uploadedfiles/cpuc_public_website/content/utilities_and_industries/energy_-_electricity_and_natural_gas/cpuc-standard-practice-manual.pdf

[1] Program activities began in early 2020, and a significant portion of the budget spent was – and continues to be – on program development and research activities. Additionally, enrollment only opened in March 2022. Comparing all program costs incurred to date relative to benefits from the controlled HPWH devices yields a skewed ratio that is not representative of the program's value.
[2] Incentive payments are being projected assuming the same number of participants through the end of the program, December 31, 2025.
[3] The PCT shows the program to be highly cost effective from the participant perspective because program participants do not incur financial or measure costs to participate in the program.
[4] The RIM ratio shows that larger program costs heavily influence the RIM results.

Additionally, PG&E observed results that are significantly different for three different HPWH operating profiles. Qualitative results from these three distinct groups are listed in Table 3 below:

1) Advanced Load Up group where the temperature set point is increased to the manufacturer's ALU temperature set point ("ALU group")
2) Basic Load Up group with user temperature setpoint below 140F ("BLU <140F group"), and
3) Basic Load Up group with user temperature setpoint at or above 140F ("BLU ≥ 140F group").

Table 3. Daily Impact of WatterSaver per Daily Device Profile for Load Shifting Heat Pump Water Heaters

(Note that a positive number below represents a decrease compared to baseline. A negative number represents an increase compared to baseline.)

Participant Cohort: Advanced Load Up [1] (ALU Group)		
Percentage of Actively Controlled Devices	28%	45 HPWHs
Peak Demand Reduction (kW)	0.18	Max kW reduction during peak hours (4-9pm) for one device
Energy Shifted outside of Peak (daily kWh)	0.48	Average daily kWh shifted outside of peak hours (4-9pm) for one device
Reduction in Daily Energy Usage	-8%	Average decrease in energy usage during the entire day (12am-12am) (negative sign indicates an overall increase in customer energy use)
Customer TOU Cost Savings (daily)	-$0.09	Average daily estimated bill savings for one device, assuming TOU-C (negative sign indicates an increase in customer cost)
GHG Reduction (daily kg CO2eq)	0.01	Estimated daily kg of CO2 equivalent ("CO2eq") savings for one device

Participant Cohort: Basic Load Up, User Setpoint <140F (BLU <140F Group)		
Percentage of Actively Controlled Devices	51%	81 HPWHs
Peak Demand Reduction (kW)	0.13	Max kW reduction during peak hours (4-9pm) for one device
Energy Shifted outside of Peak (daily kWh)	0.29	Average daily kWh shifted outside of peak hours (4-9pm) for one device
Reduction in Daily Energy Usage	7%	Average decrease in energy usage during the entire day (12am-12am)
Customer TOU Cost Savings (daily)	$0.10	Average daily estimated bill savings for one device, assuming TOU-C
GHG Reduction (daily kg CO2eq)	0.08	Estimated daily kg of CO2eq savings for one device
Participant Cohort: Basic Load Up, User Setpoint ≥ 140F (BLU ≥ 140F Group)		
Percentage of Actively Controlled Devices	21%	33 HPWHs
Peak Demand Reduction (kW)	0.20	Max kW reduction during peak hours (4-9pm) for one device
Energy Shifted outside of Peak (daily kWh)	0.52	Average daily kWh shifted outside of peak hours (4-9pm) for one device
Reduction in Daily Energy Usage	-23%	Average decrease in energy usage during the entire day (12am-12am) (negative sign indicates an overall increase in customer energy use)
Customer TOU Cost Savings (daily)	-$0.36	Average daily estimated bill impact for one device, assuming TOU-C (negative sign indicates an increase in customer cost)
GHG Reduction (daily kg CO2eq)	-0.27	Estimated daily kg of CO2eq savings for one device (negative sign indicates an increase in GHG emissions)

[1] The ALU group is comprised solely of customers with a Thermostatic Mixing Valve (TMV) on their hot water installation and a user setpoint less than the maximum allowed by the manufacturer (140F for the devices currently present in the program). During the load up phase, extra energy is stored for participants in this group.

The results in Table 3 suggest that the ALU group and BLU ≥ 140F group both were able to shift a significantly higher amount of HPWH usage out of the peak period compared

with the BLU <140F group.[5] However, PG&E notes that these increased load shifting benefits for the ALU and BLU ≥ 140F groups come with some trade-offs, including higher daily energy use and energy bills than the BLU <140F group.[6] In contrast, the participants in the BLU <140F group had lower peak demand reduction and energy shifting than the ALU and BLU ≥ 140F groups, but did not experience the increases in daily energy use, costs, and GHG emissions seen by the ALU and BLU ≥ 140F groups (though the BLU ≥ 140F experienced a slight decrease in GHG emissions).

While the ALU group and BLU ≥ 140F group had similar results in terms of peak demand reduced and peak energy shifted, the BLU ≥ 140F experienced significantly higher increases in energy usage (23%) throughout the day than the ALU group (8%). The increased daily energy use resulted in increased customer bills and GHG emissions at a notably higher level for the BLU ≥ 140F group ($0.36/day and 0.27 kg CO2, respectively) compared to the ALU group ($0.09/day and a decrease of 0.01 kg CO2, respectively). More research and analysis are needed to understand what is driving these results, and whether the BLU ≥ 140F group is homogeneous.

Importantly, the difference in daily energy usage between the groups is explained by the difference in user temperature setpoint outside of the load shifting period[7] and the larger than necessary load up for the ALU group. PG&E further notes that the small subset of ALU water heaters whose electric resistance elements turn on contributes to the ALU group's larger energy consumption. Results for the ALU group depend on multiple factors that have been identified as contributors to the outcomes, some of which are outside of this program's purview. More details can be found in the "Potential Program Improvements" section.

PG&E notes that an important assumption impacting the calculation of the customer TOU cost savings shown in both Table 1 and Table 3 is the rate structure peak/off-peak differential. For this advice letter KPI calculation, PG&E applied assumptions based on the PG&E TOU-C rate, which has a 6% peak/off-peak differential in winter and 15% differential in summer. If PG&E instead used a 40% peak/off-peak differential (based on SCE's default TOU rate, with a 40% differential in winter and 42% in summer), the results would show bill neutrality for the ALU group, higher bill savings for the BLU <140F group, and lower bill increase for the BLU ≥ 140F group than what is currently presented.

[5] For the ALU group and the BLU≥140F group, the *maximum peak demand reduction* is 46% and 61% higher and the average daily energy *shifted out of peak period* is 64% and 76% higher, respectively, compared to the BLU <140F group.

[6] The ALU group uses 27% more energy on a daily basis compared to the BLU<140F group, and the BLU≥140F group uses 71% more energy than the BLU with user setpoint <140F group.

[7] The average user temperature setpoint is 119F for the BLU <140F group, 123F for the ALU group, and 140F for the BLU >=140F group.

C. Program Incentive Structure

As the program explores how to enroll multifamily buildings into WatterSaver, it must address multiple unique scenarios with different conditions:

1) Property owner-paid utility bill, ERWH
2) Property owner-paid utility bill, HPWH
3) Tenant-paid utility bill, ERWH
4) Tenant-paid utility bill, HPWH

WatterSaver is currently focusing on incentive structures for scenarios 3 and 4 where the tenant pays for their own utility bill.

D. Potential Program Improvements

Analysis of the data used for this Advice Letter resulted in findings that will be used to improve the program.

- *Pursue enablement of 'efficiency mode' setting for participating HPWHs.* Across all groups, the program found that about 10% of the controlled devices used their resistive elements during the load up and/or post-shed recovery period, resulting in a significant increase in energy usage. Whether or not a resistive element is allowed to turn on depends on the "mode" that the customer has selected. To reduce resistive element usage as a result of load shifting, a command to set the efficiency mode would need to be sent to the devices. This corresponds to the SetEfficiency command of the CTA-2045-B standard. Unfortunately, the functionality to send this command is optional and not currently implemented by any of the OEMs that have engaged with WatterSaver. The WatterSaver team has started conversations with OEMs and stakeholders involved in the CTA standard development to enable that command.
- *Consider recommendations for adjustments to ALU group's participant-controlled HPWH temperature setpoints.* Outside of the controlled period, customers in the ALU group have their temperature setpoints on average 4F higher than customers in the BLU group. This results in an overall increased energy usage.
- *Consider manufacturer-controlled adjustments to how HPWH responds to ALU command.* Currently, all devices in the ALU group are from one manufacturer and connected through Wi-Fi. In response to the ALU command, devices heat up to the maximum allowed temperature setpoint, sometimes resulting in an increased energy storage beyond what is really needed to respond to a particular customer's hot water demand during the shed period. A better alternative to explore would be to either set the amount of extra energy to store or to increase the temperature setpoint by a certain number of degrees rather than driving it all the way up to the maximum allowed temperature set point. This alternative approach is used by other OEMs and the CTA standard.
- *Consider reviewing a baseline period for program participants prior to cohort assignment.* For customers whose hot water usage happens mostly outside of the peak period, ALU results in an increased energy usage compared to non-controlled days. The program would benefit from an initial baselining period to learn individual customers' usage patterns before assigning them to a specific cohort.

- *Consider reviewing participant usage profiles prior to determining program intervention.* Usage profiles for customers with setpoints at 140F and above should be analyzed in order to determine the optimal course of action. One possibility would be to exclude them from the daily load shifting schedule and only do event-based load shifting during critical days.

IV. Protests

PG&E requests that the Commission, pursuant to General Order 96-B, General Rule 7.5.1, maintain the original protest and comment period designated in advice letter 7115-E.

V. Effective Date

Pursuant to General Order (GO) 96-B, Rule 5.1, this advice letter is submitted with a Tier 1 designation. PG&E requests that this Tier 1 advice submittal become effective upon date of submittal, which is May 24, 2024.

VI. Notice

In accordance with General Order 96-B, Section IV, a copy of this advice letter is being sent electronically to parties shown on the attached list and the parties on the service lists for A.18-03-001, A.18-02-016, and A.18-03-002. Address changes to the General Order 96-B service list should be directed to PG&E at email address PGETariffs@pge.com. For changes to any other service list, please contact the Commission's Process Office at (415) 703-2021 or at Process_Office@cpuc.ca.gov. Send all electronic approvals to PGETariffs@pge.com. Advice letter submittals can also be accessed electronically at: http://www.pge.com/tariffs/.

/S/
Sidney Bob Dietz II
Director, Regulatory Relations
CPUC Communications

Attachment

cc: Paul Worhach, Public Advocates Office
Julie Halligan, Public Advocates Office
Service Lists A.18-03-001, A.18-02-016, and A.18-03-002

California Public Utilities Commission

ADVICE LETTER SUMMARY

ENERGY UTILITY

MUST BE COMPLETED BY UTILITY (Attach additional pages as needed)

Company name/CPUC Utility No.: Pacific Gas and Electric Company (ID U39 E)

Utility type:
☑ ELC ☐ GAS ☐ WATER
☐ PLC ☐ HEAT

Contact Person: Kimberly Loo
Phone #: (279)789-6209
E-mail: PGETariffs@pge.com
E-mail Disposition Notice to: KELM@pge.com

EXPLANATION OF UTILITY TYPE
ELC = Electric GAS = Gas WATER = Water
PLC = Pipeline HEAT = Heat

(Date Submitted / Received Stamp by CPUC)

Advice Letter (AL) #: 7115-E-A

Tier Designation: 1

Subject of AL: Supplemental: Pacific Gas and Electric Company's End of the Year Advice Letter Filing for the WatterSaver Reporting

Keywords (choose from CPUC listing): Compliance

AL Type: ☐ Monthly ☐ Quarterly ☑ Annual ☐ One-Time ☐ Other:

If AL submitted in compliance with a Commission order, indicate relevant Decision/Resolution #: E-5073

Does AL replace a withdrawn or rejected AL? If so, identify the prior AL: No

Summarize differences between the AL and the prior withdrawn or rejected AL:

Confidential treatment requested? ☐ Yes ☑ No

If yes, specification of confidential information:
Confidential information will be made available to appropriate parties who execute a nondisclosure agreement. Name and contact information to request nondisclosure agreement/ access to confidential information:

Resolution required? ☐ Yes ☑ No

Requested effective date: 5/24/24

No. of tariff sheets: N/A

Estimated system annual revenue effect (%): N/A

Estimated system average rate effect (%): N/A

When rates are affected by AL, include attachment in AL showing average rate effects on customer classes (residential, small commercial, large C/I, agricultural, lighting).

Tariff schedules affected:

Service affected and changes proposed[1]: N/A

Pending advice letters that revise the same tariff sheets: N/A

[1]Discuss in AL if more space is needed.

Clear Form

Protests and correspondence regarding this AL are to be sent via email and are due no later than 20 days after the date of this submittal, unless otherwise authorized by the Commission, and shall be sent to:

California Public Utilities Commission
Energy Division Tariff Unit Email:
EDTariffUnit@cpuc.ca.gov

Contact Name: Sidney Bob Dietz II, c/o Megan Lawson
Title: Director, Regulatory Relations
Utility/Entity Name: Pacific Gas and Electric Company

Telephone (xxx) xxx-xxxx:
Facsimile (xxx) xxx-xxxx:
Email: PGETariffs@pge.com

Contact Name:
Title:
Utility/Entity Name:

Telephone (xxx) xxx-xxxx:
Facsimile (xxx) xxx-xxxx:
Email:

CPUC
Energy Division Tariff Unit
505 Van Ness Avenue
San Francisco, CA 94102

Clear Form

Appendix A

WatterSaver 2023 Annual Report

Appendix A

WatterSaver 2023 Annual Report

This appendix gives a high-level report on the various WatterSaver activities of 2023.

Electric Resistance Water Heaters

1) The WatterSaver team started enrolling ERWHs into the program in early 2023.
2) Initially, with only a limited number of ERWHs being controlled, it was discovered that the control strategy used by the control device manufacturer was hard curtailment during peak hours which turned off ERWHs, resulting in cold water events. (Note that this is the prevailing approach in France and potentially other countries where TOU rates have been in place for decades. Additional research is needed to estimate the acceptability of utility and/or regulatory driven hard curtailment.)
3) Load shifting of ERWHs was paused until enough ERWHs were eventually enrolled in the program and a modified approach of soft curtailment could be implemented. With the current approach, when multiple devices want to recover at the same time during the shed period, only the one with the highest need can turn on. The system reviews the need of all the ERWHs every five minutes and adjusts which ERWH turns on as needed.
4) The WatterSaver team will continue to work with the control device manufacturer to refine ERWH control strategy.
5) ERWHs are estimated to represent 13% of water heaters in California. Unlike HPWH, there is no program incentivizing the installation of ERWH. Additionally, analyzing meter-level data to identify usage patterns associated with ERWH has not been successful. As a result, it has not been possible to conduct targeted outreach to ERWH owners which has been the most successful recruitment strategy for HPWHs.

Multifamily

1) Because the owner/billpayer scenario is more complicated and varied for multifamily than for single family customers, working with the legal team has been necessary to develop Project Participation Agreement language for MF property owners and tenants.
2) A separate MF enrollment website was created and connected to the DERMS provider on the backend to be able to enroll multiple tenants quickly.
3) The MF enrollment strategy focus is on ERWH and HPWH units with tenant-paid bills as opposed to property owner-paid bills. This strategy may be expanded based on initial MF enrollments and the outcomes of their participation.
4) Regardless, the property owner must be engaged because of water heater ownership, possible common non-tenant space with hot water, and what happens at turnover to sustain program participation for that device.

5) Based on involved discussions with one building with ERWHs, the property owner's highest concerns regarding WatterSaver were hot water availability and not wanting to increase tenant bills.
6) Outreach to owners of buildings with unitary HPWHs began in Q1 2024.

Program Enhancements

1) A digital welcome packet was developed to serve as a resource of basic information regarding WS participation such as what the water heater's load-up/shed schedule is, how the incentives are paid out, how to log into the WatterSaver account, how to opt out, and what baselining means.
2) Baselining was implemented for the bulk of the year to be able to capture data and measure program effects.
3) Starting Fall 2023, a cohort with a new schedule was introduced to optimize E-ELEC and EV-2A rates. In other words, different schedules were implemented for rates with part-peak and longer off-peak periods. No negative feedback has been received even with a 9-hour shed. Due to its success, now customers on an E-ELEC/EV-2A rate are defaulted into this cohort with a more aggressive schedule. Further learnings from this group will come next year since there are now sufficient participants to implement a baseline for that cohort as of Q2 2024. The next step is to understand what characteristics could be used to further tailor schedules such as tank size, high/low hot water usage, morning usage, etc.
4) A searchable qualified products list (QPL) was added to the website.
5) The option for paper enrollments was introduced for customers without strong enough Wi-Fi for enrollment.
6) Work with an EM&V consultant who will report mid-program findings in 2024 began.
7) A list of specific operational requirements for products to be eligible for the WatterSaver program was completed in Q1 2024.

Marketing

1) A survey of TECH participants who chose not to participate in WatterSaver was conducted to better understand why not. Fifty responses were received:
    a. Some customers did not feel comfortable with an external party controlling their water heater. They did not like the idea of "big brother" controlling an appliance.
    b. Despite potential bill savings, the incentive amount was not high enough.
2) An email campaign to ESA and Home Intel ERWH customers was conducted. However, this resulted in no immediate ERWH customers.
3) WatterSaver recruitment messages were included in outreach related to Home Intel, local government partnerships, CBOs, PG&E's Energy Savings Assistance program, and the E-ELEC rate.
4) The response from the outreach suggested clearer language about gas water heater ineligibility was needed.

5) The WatterSaver team is currently exploring how to leverage some best practice opportunities that have been developed from smart thermostat marketing and customer recruitment experience.

HPWH Technology Research Actions and Findings

The WatterSaver Program continues to play a critical role in advancing the market's technology by working with various HPWH manufacturers, particularly on the communication and control functionalities of new HPWHs so that a third party can control them. Most manufacturers already have or will soon have water heaters where a customer can enter a schedule that will optimize the water heater's operation based on a customer's electric rate schedule, making them JA-13 compliant. However, a number of manufacturers are still refining their technology so that the water heater can receive signals from a third party such as a utility's DERMS provider. WatterSaver is the first utility program asking HPWHs for that level of connectivity and control from multiple manufacturers. Eventually, the findings will inform utilities and future programs that will send out commands based on price signals, grid needs, or specific customer hot water usage patterns. Research activities, challenges, and results from collaboration with the different manufacturers are listed below, but specific names have been omitted.

General

1) Most manufacturers are focusing on CTA-2045 as their solution for connection to third party DR programs. The WatterSaver team continues to learn about the different variations of that standard to understand what load shifting strategies are available with this type of connection as well as which data will be available for all devices versus specific to a connection type.
2) Notably absent from the data transmitted by CTA of the first generation (CTA-2045-A) are the set point and actual tank temperature.
3) Among the data received from CTA-2045 devices are the Total Take Capacity (defined as the total amount of energy that can be stored in the device) and the Present Take Capacity (defined as the remaining energy the tank needs to reach its Total Take Capacity). Investigations are still underway to understand how these can be used, in addition to the mode reporting, to verify that a device is responding to load shifting events.
4) The WatterSaver team is finding that multiple manufacturers are transmitting hard coded power values, rather than the actual power usage of devices. It is possible that this information is not monitored at the device level. Combined with the lack of conformance (response to DR commands varies by OEM), this complexifies program impact reporting. The WatterSaver team has started conversations with OEMs and stakeholders involved in the CTA standard development to improve power reporting.

Manufacturer A

1) During 2022, several customers who owned Manufacturer A HPWHs wanted to enroll in WatterSaver but could not because their HPWHs did not have a way to receive signals and send data to the WatterSaver team. By the end of 2022, Manufacturer A released a new add-on device that would enable the necessary communication and control via Wi-Fi. In Jan 2023, the WatterSaver team sent these new add-on devices to retrofit those Manufacturer A units.
2) In order for the customer to be able to install the new add-on device, the WatterSaver team developed easy-to-understand instructions for the customers.
3) Half of the first batch of customers were able to connect smoothly - plug and play. However, the remaining half had difficulty connecting, requiring additional support from the manufacturer and the WatterSaver team.
4) When the HPWHs were connected, customers had difficulty seeing data on their homeowner app and needed additional support.
5) By spring, Manufacturer A realized that the add-on Wi-Fi modules were not working as intended. They worked on a next version and sent out updated add-on modules. Most customers were able to connect but not all.
6) The WatterSaver team began to see non-reporting events, meaning there were days-long gaps in data. Some of these non-reporting events were simultaneous across all of Manufacturer A units, others were sporadic where not all the HPWHs experienced the same loss of communication and resolved within a few days. The non-reporting event durations vary from days to months and continue to occur.
7) Manufacturer A's units have a high percentage of non-participation in load up and shed events.
8) Manufacturer A reported their devices' mode reporting is not always accurate.
9) Manufacturer A does not provide actual or set point tank temperature, but they do provide power and capacity. However, Manufacturer A has shared that the power values are not actual power values. Power is being reported as only a few static numbers, always one of three values. With the high number of non-reporting events, the low participation to load shifting events, and the static values, the power data sometimes resembles noise with no load shape.
10) Additional customers with Manufacturer A units have enrolled and connected to WatterSaver either via the most recent model's native built-in Wi-Fi or via CTA-2045. Unexplained non-reporting events for both scenarios along with erroneous power and capacity readings have been observed.
11) Manufacturer A's CTA-2045 option requires an AC form factor.
12) The WatterSaver team is pausing on recruitment outreach to customers with Manufacturer A HPWHs due to the uncertainty of resolution timeline and has removed them from WatterSaver's QPL. Current customers have been informed that resolution timeline is unclear. Significant progress has been made over the first quarter of 2024 in reliably connecting to and field testing two devices from Manufacturer A via CTA.

Status – WatterSaver is still gathering data on how Manufacturer A HPWHs are responding to commands being sent via Wi-Fi with their add-on device, via the HPWH's native Wi-Fi, or via CTA-2045. It is currently not possible to calculate kWh shifted or kW reduced during peak periods with the available information.

Manufacturer B

1) The first CTA-2045 units plugged into the EcoPort of Manufacturer B's units were enrolled in the program and successfully controlled. Manufacturer B's CTA-2045 option requires an AC form factor.
2) The WatterSaver team was not able to initiate ALU through the CTA-2045 module. It was discovered that Manufacturer B's HPWH units on the market at the beginning of 2023 were not CTA-2045B level 2-ready which is the standard that includes ALU. After some discussions with Manufacturer B, they moved forward with their original plan of upgrading their existing control board, conducted some in-house testing, and sent one of their new boards to the WatterSaver team for field testing. The DERMS provider is updating the necessary software to be able to deliver the additional information that CTA-2045B level 2 requires. The team is also working with the CTA-2045 module provider to send signals directly to evaluate the one updated control board.
3) It was discovered that connectivity was interrupted when Manufacturer B performed over-the-air maintenance. Some customers were unable to receive the cancel shed command for some time. Problems stemmed from 1) API set inconsistency issues between the DERMS provider and Manufacturer B or 2) coincident timing of "over the air" maintenance and a control event. These issues have been resolved.

Status – The WatterSaver team is testing the updated CTA-2045B level 2 control board. The WatterSaver team stays closely coordinated with Manufacturer B to monitor and troubleshoot any issues arising from over-the-air maintenance events.

Manufacturer C

1) Manufacturer C has opted to not offer a native Wi-Fi solution and is focusing on the cellular CTA-2045 path. Models already on the market will need an additional adapter to connect a CTA-2045.
2) Manufacturer C's CTA-2045 option requires a DC form factor which is different than Manufacturers A and B.
3) For upcoming models, the additional CTA-2045 adapter will come with the HPWH and should be installed at the same time.
4) The WatterSaver team and Manufacturer C began testing their CTA-2045 solution mid-2023 and continue to resolve issues. Communication and control functionality are not ready "right out of the box" yet.

Status – The WatterSaver team and Manufacturer C are still evaluating the CTA-2045 module set up. Manufacturer C needs to make a firmware update. They are currently

looking for field testers to participate in the qualification of their units. It is uncertain if ALU can happen via Manufacturer C's add-on or built-in CTA-2045 modules.

Manufacturer D

1) Manufacturer D integrated a CTA-2045B level 2-compliant module into their HPWH. The WatterSaver team has successfully connected to two field units and is conducting tests now.
2) Initial power data is reporting only a few static numbers which is similar to what is observed with Manufacturer A.

Status –In addition to the current field tests, the WatterSaver team is working with Manufacturer D to understand the power issue and what other information they may be able to provide.

Savings

- On average, BLU for users with their setpoint < 140F reduces customer's energy usage and results in bill savings and GHG reduction.
- As discussed in the "Cost Effectiveness" section of this advice letter, for the ALU group and the BLU≥140F group, the *maximum peak demand reduction* is 46% and 61% higher and the average daily energy *shifted out of peak period* is 64% and 76% higher, respectively, compared to the BLU <140F group. However, it is important to note that:
  a) The ALU group uses 27% more energy on a daily basis compared to the BLU with user setpoint <140F group,
  b) The BLU with user setpoint >=140F group uses 71% more energy than the BLU with user setpoint <140F group.
  The difference in energy usage between the groups can be explained by the difference in set point/tank temperature outside of the load shifting period (average user setpoints are 119F for the BLU <140F group, 123F for the ALU group and 140F for the BLU >=140F group) and the larger than necessary load up for the ALU group. Also, the small subset of ALU water heaters whose electric resistance elements turn on contributes to the ALU group's larger energy consumption.
- When comparing devices with the same set point outside of controlled events, the ALU strategy has the best results with a setpoint increase of 10F during the load up phase.
- For some devices in the ALU group with a set point at or below 120F outside of event periods, the load up period is the only time the water heater consumes power. This is mostly observed during summer months when incoming water is warmer and standby losses are lower.

Future Work

1) The WatterSaver team is exploring the possibility of collaboration with manufacturers to leverage their connectivity with customers via their app to educate customers about and enroll them in WatterSaver.
2) Additional collaboration is necessary to enable the ability for multiple third parties (DERMS and manufacturers) to control a single device with a control hierarchy programmed into the HPWH.
3) As mentioned above, the WatterSaver team would like to add new control strategies based on characteristics that would result in even more savings such as tank size, usage pattern, location/climate, etc.

PG&E Gas and Electric
Advice Submittal List
General Order 96-B, Section IV

AT&T

Albion Power Company
Alta Power Group, LLC

Anderson & Poole

Atlas ReFuel BART

BART
Buchalter
Barkovich & Yap, Inc.
Braun Blaising Smith Wynne, P.C.

California Community Choice Association
California Cotton Ginners & Growers Association
California Energy Commission
California Hub for Energy Efficiency
California Alternative Energy and Advanced Transportation Financing Authority
California Public Utilities Commission
Calpine
Cameron-Daniel, P.C.
Casner, Steve
Center for Biological Diversity
Chevron Pipeline and Power
City of Palo Alto
City of San Jose
Clean Power Research
Coast Economic Consulting
Commercial Energy
Crossborder Energy
Crown Road Energy, LLC
Communities Association (WMA)

Davis Wright Tremaine LLP

Day Carter Murphy
Dept of General Services
Douglass & Liddell
Downey Brand LLP
Dish Wireless L.L.C.

East Bay Community Energy

Ellison Schneider & Harris LLP
Electrical Power Systems, Inc. Fresno
Engineers and Scientists of California

GenOn Energy, Inc.

Green Power Institute

Hanna & Morton LLP

ICF consulting
iCommLaw

International Power Technology

Intertie
Intestate Gas Services, Inc.

Kelly Group

Ken Bohn Consulting
Keyes & Fox LLP

Leviton Manufacturing Co., Inc.
Los Angeles County Integrated

Waste Management Task Force

MRW & Associates
Manatt Phelps Phillips
Marin Energy Authority
McClintock IP
McKenzie & Associates
Modesto Irrigation District

NOSSAMAN LLP
NRG Solar

OnGrid Solar

Pacific Gas and Electric Company
Peninsula Clean Energy
Pioneer Community Energy

Public Advocates Office

Redwood Coast Energy Authority
Regulatory & Cogeneration Service, Inc.
Resource Innovations
Rockpoint Gas Storage
SCD Energy Solutions
San Diego Gas & Electric Company
SPURR
San Francisco Water Power and Sewer
Sempra Utilities

Sierra Telephone Company, Inc.
Southern California Edison Company
Southern California Gas Company

Spark Energy

Sun Light & Power
Sunshine Design
Stoel Rives LLP

Tecogen, Inc.
TerraVerde Renewable Partners
Tiger Natural Gas, Inc.
TransCanada

Utility Cost Management
Utility Power Solutions

Water and Energy Consulting
Wellhead Electric Company
Western Manufactured Housing Communities Association (WMA)

Yep Energy