***In response to the CPUC Energy Division preliminary work paper review comments for PG&E High Performance Circulator (HPC) Pumps PGECOPUM107 r0.***

Baseline Pump Size

The Review Comments dated 5/16/17 raise concern that the pump model selected for the baseline is too large. Our responses are as follows:

The second sentence in the first paragraph implies that multi-family applications are not covered. Section 1.1 of the work paper specifically does include multi-family homes in the scope as per the recommendation by the California Technical Forum[[1]](#footnote-1). The baseline pump selection is consistent with this scope.

The Review Comments suggest that transactional history may have included pumps for other applications such as heating. As explained in Section 1.1, domestic hot water heating is open-loop and must therefore use pumps with non-ferrous pump casings, such as bronze or stainless steel, to avoid oxidation from fresh water. Closed-loop applications, like solar water heating or hydronic systems, can use ferrous pumps which are cheaper. For example, the Grundfos Alpha 15-55 costs ~$345 in [stainless steel](http://www.supplyhouse.com/Grundfos-99163972-ALPHA-15-55-F-LC-Stainless-Steel-Circulator-Pump-w-Line-Cord), but the same pump in [cast iron](http://www.supplyhouse.com/Grundfos-99163906-ALPHA-15-55-F-LC-Cast-Iron-Circulator-Pump-w-Line-Cord) ~$172. The transactional history referenced was filtered for open loop applications only, effectively capturing the pumps used specifically for domestic hot water applications.

Osborne Company, a large distributor in PG&E territory, estimates that well over 80% of its sales of open-loop pumps in the size range of the baseline pump are used for domestic hot water applications.[[2]](#footnote-2)

1. As shown in the Reference Section 3 of the work paper, the residential market for circulator pumps can be segmented into two groups: small (up to 25W) and large (26-120W). Transactional history shows that larger pumps have a much greater market share. To support this data, three top manufacturers, Armstrong, Grundfos, and Xylem, were surveyed regarding their non-ferrous pump sales in these categories. Armstrong reported that in 2016 its most popular model “by far” was the Astro 320SS, which operates at 97 Watts.[[3]](#footnote-3) Grundfos, the market leader, has sold nearly 2.5 times more 15-29 models in California than its 25W model the UP 15-10.[[4]](#footnote-4) Xylem reported that in Northern California in 2016, it sold 175 units in the small segment but 464 units of the large.[[5]](#footnote-5)

All of this transactional history supports the current baseline selection.

1. Commission staff cites data from the 2012 CLASS (California Lighting and Appliance saturation Study) that the average home with a recirculating system is 2,400 square feet, which is smaller than the average found in the Alpha Field Survey, suggesting that most SFRs are likely to have smaller pumps than the baseline. However, CLASS does not differentiate between systems that use a dedicated return line and those that use the cold water line. Using the cold water line is significantly less efficient, and residences that use this configuration tend to be smaller. The work paper is specifically for systems that use dedicated return lines.
2. Commission staff observes that measure savings must be based on expected participation in the program. We agree, and expect that the most likely participation will be from replacing burnt-out pumps in the size range of the selected baseline. Most homes built starting in the 1990’s with recirculating systems have dedicated return lines[[6]](#footnote-6) and are therefore likely to be larger systems. Additionally, many homes with recirculating systems are actually quite large. In the Alpha study, the average size was ~5,400 ft2. Twelve of the thirteen pumps replaced during the study were the same size or larger than the suggested baseline pump, the UP 15-29 (see work paper Section 6.)

Outreach to distributors supported the baseline decision as appropriate[[7]](#footnote-7). One reported that the UP 15-29 pump size was typical of homes in the 2,000 ft2 range and another noted this particular size would be appropriate for recirculation loops starting at 100 feet, which are likely be in homes under the CLASS average of 2,400 ft2.

1. The Review Comments suggest that the Grundfos 29-10 would be a better baseline. However, there is no such model. A catalog of all Grundfos pumps can be found [here](http://us.grundfos.com/content/dam/GPU/Literature/ALPHA2/UP%20Series%20Data%20Book%2098532861_0217_Internet.pdf).

Title 24 Requirements – Section 150.2(b)1.G.ii.

This section of Title 24 mandates that manual demand recirculation controls be used for recirculation distribution systems when an alteration occurs to the water-heating system. As noted, this mandate is only required for *alterations*. After conferring with EnergyCodeAce, a support organization for Title 24 compliance (among other facets), it was concluded that only replacing the circulator pump, such as with an ROB program, is considered a “repair” and is not subject to this requirement[[8]](#footnote-8).

Operating Hours

Comparing the CLASS survey results of 2012 with those of the Alpha Field test and the DOE ASRAC accepted weights for residential applications results in the following table:

|  |  |  |  |
| --- | --- | --- | --- |
| *Installed Controls Weight* | | | |
| **Control Option** | **CLASS** | **Alpha Field Test** | **DOE Circulator ASRAC** |
| No Controls | 33% | 31% | 50% |
| Timer w/ Hours | 39% | 23% | 12.5% |
| Timer w/o Hours | 15% | 12.5% |
| Timer + Aquastat | 11% | 31% | 0% |
| Aquastat | 17% | 0% | 20% |
| On-Demand | 0% | 0% | 5% |

As noted by the reviewer, the CLASS results more closely mirror that of the Alpha field test. We can update the overall market weighted average by making a few assumptions to reflect the controls distribution found in the CLASS.

1. For pumps installed with timers, we will use the weighted operating hours found in the Alpha field test to represent the overall timer category of the CLASS results.
2. As aquastat operating hours are unknown, we will carry the ASRAC DOE accepted value of 1095 hours/year or 3 hours/day. This value would cover both the timer + aquastat and only aquastat control categories from CLASS.

Carrying these two assumptions results in the following overall market operating hours:

|  |  |  |
| --- | --- | --- |
| *Updated Operating Hours Weighting* | | |
| **Control Option** | **Weight** | **Operating Hours** |
| No Controls | 33% | 8,760 |
| Timer | 39% | 6,891\* |
| Timer + Aquastat | 11% | 1,095 |
| Aquastat | 17% | 1,095 |
| **Total w/ Alpha Field Results Timer Average:** | **100%** | **5,885** |
| \*In the Alpha field test, 5 pumps with timers were found. Two were set to operate 24/7 while three had limited schedules. | | |

We updated the work paper to change the previously carried value of 6,427 operating hours per year to 5,885 hours per year. This resulted in annual deemed savings of 338 kWh/year per unit instead of the originally carried value of 370 kWh/yr.

1. Per [meeting notes](https://static1.squarespace.com/static/53c96e16e4b003bdba4f4fee/t/58d0282bd1758e2e9224f315/1490036779843/February232017_Meeting_Notes.pdf) of the February 23rd, 2017 California Technical Forum meeting. Direct comment from Chan Paek of SoCalGas. [↑](#footnote-ref-1)
2. Per phone correspondence between Bill Schwartz, Vice President of Osborne Company, and Zyg Kunczynski, PG&E Product Manager on June 14, 2017. [↑](#footnote-ref-2)
3. Email from Andrew Januszewski, Armstrong Fluid Technology Marketing Manager, to Zyg Kunczynski, PG&E Product Manager, dated June 3, 2017. [↑](#footnote-ref-3)
4. Email from Stephen Putnam, Grundfos National Accounts Manager, to Zyg Kunczynski, PG&E Product Manager, dated May 25, 2017. [↑](#footnote-ref-4)
5. Email from Bill Kapanen, VP of Business Development/Tech at California Hydronics Corporation, the Northern California distributor for Xylem, to Zyg Kunczynski, PG&E Product Manager, dated May 31, 2017. 464 unit sales in 2016 were for 55W, 92W, and 125W models. [↑](#footnote-ref-5)
6. Per email correspondence between Bill Schwartz, Vice President of Osborne Company, and Zyg Kunczynski, PG&E Product Manager on June 13, 2017. [↑](#footnote-ref-6)
7. Phone calls to Pace Supply and Cal Steam from Bryan Boyce, Energy Solutions Engineer, dated August 30th, 2016. Documented in an e-mail the same day. [↑](#footnote-ref-7)
8. E-mail from Gina Rodda of EnergyCodeAce to David Jagger, Energy Solutions Engineer, dated February 20th, 2017. [↑](#footnote-ref-8)