FOR WORKPAPERS COVERING RESIDENTIAL VARIABLE SPEED POOL PUMPS

California Public Utilities Commission, Energy Division

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# Review Scope

Table 1 – Residential Variable Speed Pool Pump Workpapers

|  |  |  |  |
| --- | --- | --- | --- |
| **Workpaper ID** | **Rev** | **Workpaper Title** | **Official Submittal Date** |
| **SCE** |  |  |  |
| WPSDGEREWP0002 | 6 | Residential Variable Speed Swimming Pool Pump | 1/1/2017 |
| SCE17WP009 | 0 | Residential Variable Speed Spa and Wading Pool Pump | 1/1/2017 |
| SCE17WP001 | 3 | Residential Variable Speed Swimming Pool Pump | 4/4/2016 |
| PGECOPUM102 | 4 | Residential Variable Speed Swimming Pool Pump | 7/12/2012 |
| PGECOPUM102 | 7 | Costs only with no description of cost savings | 1/25/2017 |

# Critical Review Issues

## Assumption regarding market saturation of 2-speed pumps is out of date

Some workpaper measures assume that most swimming pool pumps are single-speed. For pumps over 1 HP, this assumption is out of date. The code has required 2-speed pump & motor combinations over 1 HP since January 1st 2008[[1]](#footnote-1). Except for direct install delivery types, CPUC staff requires that pre-existing technology be assumed to match Title 20 requirements: 2-speed pumps, motors, and controls which default to low speed operation.

## PAs have varying energy savings approaches for identical measures

CPUC staff prescribes statewide savings based on SCE’s single family swimming pool pump calculation approach for both single family and multi-family installations. This will replace four of the calculations approaches currently used by PAs across the state.

## Ex ante data submissions have various errors

Ex ante data was reviewed for conformance with program descriptions and calculated values described in the existing workpapers. Several discrepancies were noted, including missing information. PAs are directed to update and resubmit their ex ante data.

## Technology costs vary across the state

Limited work has been done to determine the material and labor costs to install Title 20 code compliant pumps and measure case variable speed pumps. Within the proposed workpapers, baseline technology costs vary by 200% and measure costs vary 23%.

# Detailed Review

## Assumption regarding market saturation of 2-speed pumps over 1 HP is out of date

SCE and SDG&E are implementing a measure named, “Commissioned Variable Speed Drive on Pool Pump Controls replacing **Two Speed** Pool Pump”. Despite this name, the measure assumes that 95% of the pre-existing pumps are single-speed and 5% are two-speed[[2]](#footnote-2). This assumption appears to be a hold-over from the 2010 version of this workpaper; however, in that version of the workpaper, this measure was called, “Programmed Variable-Speed Pump Replacing Existing **Single and Two-Speed** Pumps.”[[3]](#footnote-3)

2-speed pool pumps have been required for 9 years and the effective useful life of this technology is deemed to be 10 years. Additionally, since there is another measure called, “Commissioned Variable Speed Drive on Pool Pump Controls replacing **Single Speed** Pool Pump”, it seems likely that direct install contractors are claiming the Two Speed measure when they replace two-speed pumps.

**Direction:** Revise workpaper as follows:

### Remove single speed pump savings from the two-speed pump early retirement (retrofit) measure:

Table 2 is excerpted from pages 30 and 37 of SCE17WP001r3. The Base Case technology assumptions are updated as well as the annual first period, early retirement electrical energy savings and peak demand reduction. The red highlighting in the table shows changes to the PA workpaper values.

Table 2. Energy Savings and Demand Reduction for Programmed Variable Speed Pool Pumps, Direct Install Delivery Type only

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Measure Code (Implement ID)** | | **Base Case (1st Period pre-existing technology)** | **Measure Case** | **1st Period Early Retirement (retrofit)** | | |
| **SCE** | **SDG&E** | **Energy Savings, kWh/yr** | | **kW Reduction** |
| Measure A (PM-78394) | Measure 1 (463003) | 0% single-speed  100% two-speed | Programmed variable-speed pumps | Climate zone 15 | ~~1,704~~  695 | ~~0.530~~  0.196 |
| All Other Climate Zones | ~~1,686~~  677 |
| Measure C (PM-69234) | None | 100% single-speed | Programmed variable-speed pumps | Climate zone 15 | 1,757 | 0.548 |
| All Other Climate Zones | 1,742 |

## PAs have varying energy savings approaches for identical measures

Residential variable speed pool pump measures are offered throughout the state; however, PAs use different calculation approaches and values for their territories. For example, SCE and SDG&E have 3 different calculation approaches for (1) single-family swimming pools, (2) multi-family swimming pools and (3) wading pools & spas. PG&E’s workpaper offers a (4) calculation approach which is based on single-family installations; however, their submitted data is applicable to both single- family and multi-family building types. Most recently, SDG&E submitted a “short form” workpaper which changes the measure case energy use for SCE’s downstream single-family measure from a calculated approach using InDEE to adoption of 2016 EM&V results. This 5th calculation approach introduces and “apples-to-oranges” comparison between a calculated baseline energy use and field data for the measure energy use. This level of variation sends confusing signals to the consumer market, is difficult to track from an ex-post savings perspective, and is counter to CPUC direction that the PAs collaborate to adopt statewide measures.

Based on review of PA workpapers, there are 3 variations in the offered measures: delivery type, pool health code regulations, and Title 20 base case pump requirements (for pumps <1 HP).

* SCE’s workpaper describes a contractor direct install program in which the installer is trained to program the pool pump controls to avoid peak period operation (noon to 6pm). All other measures are prescriptive downstream rebates.
* Health code for public pools requires pools in multi-family buildings to have the following water turnover rates:
  + Swimming pools: 6 hours (4 “turnovers” per day)
  + Wading pools: 1 hour (24 per day)
  + Spas: 0.5 hours (48 per day)

Compared with these rates, the workpapers assume that they typical single family swimming pool has only 1 turnover per day.

* Pumps less than 1 HP are not governed by Title 20 requirements regarding 2-speed controls. However, the 2006-2008 SCE pool database show that less than 2% of single family pool pumps used for filtering are less than 1 HP and meet the workpaper assumptions for 1.0 daily water “turnover”[[4]](#footnote-4).

**Direction:** Create a single statewide workpaper. Designate a Lead PA and then revise the workpaper as follows:

### Direct Install programs may continue to claim early retirement savings:

“Commissioned” measures may claim first period early retirement savings noted in Table 2 as well as the 2nd period savings shown in SCE17WP001r3, measures A and C. These direct install programs shall continue to perform the training described in SCE17WP001r3, Section 1.3 Installation Types and Delivery Mechanism. Additionally, to claim early retirement, the statewide workpaper shall include at least the following documentation requirements as preponderance of evidence:

* Pump manufacturer, model number, and rated horsepower
* Confirmation that the replaced pump is a main filter pump. Booster pumps which are solely used for added spa jet circulation or secondary pumps used for cleaning purposes (a “sweep” pump) may not claim savings using these measures.
* Documentation to justify the claim of early retirement including certification that the pump is able to continue operating and will provide adequate service for the RUL period being claimed (a minimum of 3.3 years). For example, a cell phone video of the pre-existing operating pump would establish that the pump operates without bearing or other noise indicating a problem and also showing the pump providing adequate flow.
* Documentation confirming that the pump will be destroyed rather than refurbished and sold.

No other delivery types may claim early retirement.

### All non-direct install delivery types for single family swimming pool pumps will adopt SCE’s Measure B values:

SCE’s calculation provide consumption and demand savings on a per pump basis. They use multiple database sources to establish an average pool volume (20,341 gallons), daily water turn-over (0.98), and pump size and efficiency for single-family residential installations. CPUC staff extends the SCE energy impact results for measure PM-98422 to all climate zones and PAs.

For downstream rebates, all pre-existing pool pumps shall be assumed to be 2-speed. If the PAs believe they have statistically valid data that shows the saturation of filter pumps smaller than 1HP in single family building types is greater than 10%, then this data and analysis shall be presented to CPUC staff for review and approval prior to use in the updates directed by this disposition. Once such data and analysis is reviewed and approved by CPUC staff the resultant values may be used to weight the code/standard energy impacts.

### Pools in multi-family buildings will update energy impacts following SCE’s calculation approach:

PAs shall recalculate savings for all pool types (swimming, wading, and spa) in multi-family buildings using equation 1 of WP13SCE001.3. Either use the following assumptions or provide new information that is more recent or more thorough than the multi-family data in Attachment 4 of SCE13WP001.3.

* Pool Volume per pump: 31,000 gallons (swimming pools), 720 (wading pools), 1,400 (spa) [[5]](#footnote-5)
* Daily water turnover: 4 (swimming pools), 24 (wading pools), 48 (spas)
* Pump size & efficiency: develop new EFF values for pumps that are less than 1 HP. For larger pumps, the pump size and efficiency from SCE Measure B may be used.
* For downstream rebates, all pre-existing multi-family pool pumps shall be assumed to be 2-speed. If the PAs believe they have statistically valid data that shows the saturation of pumps smaller than 1HP in multi-family building types is greater than 10% this data and analysis shall be presented to CPUC staff for review and approval prior to use in the updated directed by this disposition. Once such data and analysis is reviewed and approved by CPUC staff the resultant values may be used to weight the code/standard energy impacts.

If PAs wish to claim an early retirement direct install measure for multi-family buildings, a measure may be developed which assumes a single-speed pump as a pre-existing technology. In this case, please also provide a 2nd direct install measure for early retirement of two-speed pumps. These measures should generally follow the structure of Measures A & C in SCE13WP001.3. Also, they must demonstrate preponderance of evidence as listed in 3.2.1, above.

## Ex ante data submissions have various errors

Ex ante data was reviewed for conformance with program descriptions and calculated values described in the existing workpapers. Several discrepancies were noted, including missing information.

**Direction:** Revise workpapers as follow:

### SCE to submit complete ex ante data

The workpaper data submitted in April 2016 does not appear to include an implementation table; therefore, the CPUC staff is unable to review how the proposed program parameters are being implemented by SCE. Please submit complete ex ante data.

### PG&E to submit a workpaper

As mentioned above, PG&E’s ex ante data uses the Res sector and Res Building Type. The Res Building Type includes multi-family buildings. Revise and resubmit ex ante data to separate energy savings values for single family installations from multi-family installations.

### SDG&E to update ex ante data

Submitted data shows energy impacts do not match the adopted workpaper (SCE13WP001.3). In general, the retrofit (early retirement) values have been shown in SDG&E data even though their program delivery type is limited to natural replacement (replace on burnout) measures. The result is that SDG&E is incorrectly claiming savings compared with the pre-existing technology. Revise and resubmit ex ante data to follow this disposition.

## Technology costs vary across the state

Limited work has been done to determine the material and labor costs to install code compliant (Title 20) pumps and measure case variable speed pumps. Across the submitted workpapers, code compliant pump costs vary by 200% and measure pump costs vary 23%.

**Direction:** Revise workpapers as follow:

### Establish a statewide costs for the cost compliant pumps (2-speed) and the measure pumps e (variable speed)

Provide a material cost and a labor cost within the statewide workpaper for installation of a Title 20 compliant 2-speed pump and a variable speed pump. If desired, location cost adjustment factors may be used to reflect different costs for materials and labor throughout the state. Direct install programmed (“commissioned”) pumps may have a separate deemed cost reflecting the additional cost associated with programming the pump. Also, pumps installed in multi-family buildings may have separate costs, if PAs provide information to justify a difference due to the building type, pool system complexity, etc.

1. Title 20- CEC Appliance Efficiency Regulations Section 1605.3(g) (5). In addition to pump and motor combinations, 2-speed pump controller requirements started in January 2008 and 2-speed pool pump motors have been required since January 1, 2010. [↑](#footnote-ref-1)
2. Regarding the 95% / 5% split, the workpaper states, “these percentages are conservative estimates from SCE based upon likely market penetration of two-speed pumps after roughly one and one half years" (page 3). [↑](#footnote-ref-2)
3. WPSCREWP0001 Revision 4, dated December 7, 2010. [↑](#footnote-ref-3)
4. SCE13WP001.3, Attachment 2, EC&C database.xls. Tab: Analysis, column B “HP”, column K “Pool Size”, and column L “Turnover”. Out of 674 pools, 8.3% were served by filter pumps less than 1 HP (56 pools). 78% of these pools (44) did not meet program assumptions regarding 1 turnover per day. Therefore, only 12 of 674 pools (less than 2%) were operating with a filter pump less than 1 HP at the turnover rate assumed in the workpaper. [↑](#footnote-ref-4)
5. The swimming pool volumes are an average of the per-pump pool volumes in SCE’s data combined with the 2 pools referenced in the SDG&E M&V report. Wading and spa volumes are the average of the SCE multi-family data provided in SCE17WP009.0 which had baseline pumps of 1 HP or larger. [↑](#footnote-ref-5)