DISPOSITION FOR WORKPAPERS COVERING PROCESS FAN VSD

California Public Utilities Commission, Energy Division

March 2, 2017

[1. Review Scope 2](#_Toc476153520)

[2. Critical Review Issues 2](#_Toc476153521)

[2.1. Missing information regarding fan installations prevents evaluation of operating hours, effective useful life (EUL), and other assumptions used to calculate savings 2](#_Toc476153522)

[2.2. Measure definition incorrectly assumes a linear relationship between savings and size 2](#_Toc476153523)

[2.3. Ex ante data submissions have various errors and is inconsistent with the workpaper 2](#_Toc476153524)

[3. Detailed Review 3](#_Toc476153525)

[3.1. Missing information regarding fan installations prevents evaluation of operating hours, effective useful life (EUL), and other assumptions used to calculate savings 3](#_Toc476153526)

[3.2. Measure definition incorrectly assumes a linear relationship between savings and size 4](#_Toc476153527)

[3.3. Ex ante data submissions have various errors and is inconsistent with the workpaper 6](#_Toc476153528)

# Review Scope

Table – Process Fan VSD Workpapers

|  |  |  |  |
| --- | --- | --- | --- |
| **Workpaper ID** | **Rev** | **Workpaper Title** | **Official Submittal Date** |
| SCE17PR008 | 0 | Process Fan VSD | 1/1/2017 |
| PGECOPRO110 | 0 | Process Fan VSD | 5/8/2015 |

The PG&E workpaper above adopts the 2014 version of the SCE workpaper. In addition, in January 2017, SDG&E stated that they plan to adopt SCE’s latest version. This disposition reviews SCE17PR008r0 and is applicable to all versions of this workpaper adopted by any PA.

# Critical Review Issues

## Missing information regarding fan installations prevents evaluation of operating hours, effective useful life (EUL), and other assumptions used to calculate savings

The workpaper includes many assumptions regarding the applicability (process fan systems) and operation of process fans; however, the justification for these assumptions is missing from the workpaper. PAs are directed to provide additional justification to support the assumptions made to generate deemed savings. The current approach is approved through June 30th, 2017. SCE has 90 days to gather this information and submit it to the Commission for evaluation.

## Measure definition incorrectly assumes a linear relationship between savings and size

This workpaper averages demand savings over a large range of process fans: 5 to 75 horsepower (HP). This average assumes that there is a linear relationship between savings and size which is not correct. There are at least 2 groups of savings: 3 to 5 HP, >5 to 75 HP. Grouping the technologies into these two categories increases savings on small systems by 11% and decreases savings for all other systems by 1.1%.

## Ex ante data submissions have various errors and is inconsistent with the workpaper

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

# Detailed Review

## Missing information regarding fan installations prevents evaluation of operating hours, effective useful life (EUL), and other assumptions used to calculate savings

This workpaper uses SCE’s custom online calculation tool to generate energy savings values for deeming variable speed drive (VSD) retrofits on process fans. The online tool provided 12 types of centrifugal fans and 4 types of axial fans as well as dozens of other inputs in order to calculate customized energy savings for modifications to fan systems including addition of a variable speed drive (VSD).

Submission of this workpaper appears to indicate that the PAs have identified a large group of process fans which are similar enough that savings can be deemed rather than going through the custom review process. To generate savings, the workpaper makes several assumptions regarding the system that the fans serves. The assumptions include airflow temperature (85F), static pressure (5” w.g.), 70% average flow requirement, and operating hours equal to the lighting within light industrial manufacturing facilities[[1]](#footnote-1). As well, the workpaper assumes specific information about the fans which are being retrofit. Using Greenheck as an example manufacturer, the workpaper assumes that the process fan is a belt-driven, backward incline single width (DISW) centrifugal fan. Workpaper statements regarding assumptions include the following:

* “An average static pressure of 5“ Wg was assumed because process fans vary from exhaust fans that can have less than 1“ Wg static pressure to large dust collection fans that can have around 10“ Wg static pressure” (page 9)
* “…the specific fan type being modeled was chosen because it is the typical type used for process fan.” (page 9)
* “The tool was then run at an assumed 70% average flow. 70% loading was chosen as the midpoint of a range between which savings would be minimal at the high end and the motor would be considered oversized at the low end.” (page 9-10)

The statements above are general and do not include enough information for Commission Staff to determine whether these assumptions are reasonable to use for a deemed measure. No examples of process fans are provided. Additionally, as discussed in Section 3.4, below, the ex ante data is inconsistent with statements in the workpaper which raises concerns that these measures are being claimed for non applicable installations such as commercial building types or HVAC.

Further, it is unclear why a double width fan (DIDW) was modeled in the calculation tool but a single width fan (BISW) was used to determine fan data (per attachments 3 and 5 of the workpaper).

**Direction:** Within 90 days, revise the workpaper as follows:

### Provide justification for the workpaper assumptions

SCE shall gather examples which illustrate the range of acceptable process fan applications that are intended to be deemed via this workpaper. Provide examples of process fans to justify the workpaper assumptions listed in the discussion above including at least the following: type of process (what is the fan serving), type of process fan (centrifugal or axial), operating hours and type of control (manual or automatic), and all other parameters input into the custom calculation tool.

Additionally, justify the use of a single operating point (70%) in the deemed fan operation. While it appears that this was done for simplicity, it is not obvious whether this point is reasonable. For example, it seems unusual that a variable speed drive would be desired for a system that operates at a constant speed. Often, it is more energy efficient to re-sheave a constant flow system providing too much airflow and/or pressure than to install a VSD. In other words, this simplification seems too simple.

Examples should illustrate the range of fan systems that are eligible for this program and justify why the assumptions in the workpaper are the appropriate values to deem. Custom projects may be used as examples but the selection of projects must be supported as representative of the typical project expected to be submitted for a deemed savings claim. Make sure that every example clarifies how it is typical of a deemed savings claim.

### Adjust the fan modeled in the calculation tool to be consistent with the manufacturer’s fan data

Either update the energy savings results to be “single width” instead of “double width” or provide updated fan performance data to be “single width” and also update the energy savings results to reflect the manufacturer’s single width information. Commission staff expects that several parameters will differ when this inconsistency is corrected; however, we are unsure what the impact will be.

## Measure definition incorrectly assumes a linear relationship between savings and size

It appears that the SCE analysis for the workpaper averaged the energy savings together in order to simplify the incentive payment and claims process; however, Figure 1 shows that the energy savings are not linear with motor horsepower (HP).

Figure – Process Fan VSD kW savings per horsepower for each size of fan system

**Direction:** Revise the workpaper as follows (retroactive to January 1, 2017):

### Develop separate measure definitions to provide systems 3 to 5 HP with different savings

Ex ante team developed the following table for PA’s use until the updated assumptions and evaluation can be conducted as described in Section 3.1, above. These values using the same equations as Attachment 2 of the workpaper.

Table 2 – Allowed savings for process fan VSD. Separate measures are required for <5 HP and >5 to 75 HP

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Workpaper Values** | | **Disposed Values** | | **Difference from Workpaper Claimed Average** | | | |
| **HP** | **kW, Adj Hours** | **kWh, Adj Hours** | **kW, Adj Hours** | **kWh, Adj Hours** | **kW, %** | **kW, diff** | **kWh, %** | **kWh, diff** |
| 5 | 0.387948 | 672.9163 | 0.38795 | 672.90 | 111% | 0.04 | 111% | 68.26 |
| 7.5 | 0.362546 | 624.111 |  |  |  | 0.01 |  | 19.46 |
| 10 | 0.347248 | 599.2668 |  |  |  | 0.00 |  | -5.39 |
| 15 | 0.360237 | 623.2278 |  |  |  | 0.01 |  | 18.57 |
| 20 | 0.342052 | 592.889 |  |  |  | -0.01 |  | -11.77 |
| 25 | 0.348807 | 604.6825 |  |  |  | 0.00 |  | 0.03 |
| 30 | 0.342052 | 594.6195 |  |  |  | -0.01 |  | -10.04 |
| 40 | 0.337073 | 584.4092 |  |  |  | -0.01 |  | -20.25 |
| 50 | 0.343091 | 596.5529 |  |  |  | -0.01 |  | -8.10 |
| 60 | 0.329784 | 573.6057 | For >5 HP to 75 HP | |  | -0.02 |  | -31.05 |
| 75 | 0.334951 | 584.9237 | 0.34478 | 597.83 | 98.9% | -0.01 | 98.9% | -19.73 |
| Claimed Average | 0.34871 | 604.65 |  |  |  |  |  |  |

## Ex ante data submissions have various errors and is inconsistent with the workpaper

The workpaper program descriptions states the following:

* Must not be a HVAC or refrigeration fan.
* May be used for exhaust, ventilation, pressurization, or other process applications
* This measure is applicable only to the following building types: Manufacturing - Bio/Tech and Manufacturing - Light Industrial.

The ex ante data is not limited to this scope. In fact, it provides very broad applicability across industrial, agricultural, and commercial building types. Given the lack of information about the type of process fans included in the program, Commission Staff is concerned that these measures are being claimed for fans that are supposed to be excluded from the program.

**Direction:** Revise the workpaper as follows (retroactive to January 1, 2017):

### SCE to revise and resubmit ex ante data

The workpaper data submitted in January 2017 includes downstream rebates for commercial, agricultural, and industrial sectors (Implementation table). While this may be appropriate, it must be matched with narrow building types definitions (BldgType) within the EnergyImpact and Cost tables; otherwise, the data indicates that claims may be made for a wide variety of installations. The submitted data is valid for any commercial, industrial, or agricultural building.

Correct the data to limit the data to the 2 building types listed within the workpaper: Manufacturing - Bio/Tech and Manufacturing - Light Industrial. Also, make changes to the descriptions to

* clarify that systems under 3 HP do not qualify and
* reflect the required measure definition ranges in section 3.2, above.

### PG&E to revise and resubmit ex ante data

The 2014 PG&E ex ante data appears to limit the building types appropriately. The Implementation table uses the Industrial sector and “Any” Building Type in EnergyImpact and Cost tables which will limit the claims to “Any” industrial building. However, in order to adopt SCE’s measures (which is what the submitted workpaper states), PG&E’s data must refer directly to the SCE’s measure definitions. Please submit only an Implementation table describing the program that PG&E is using to implement the adopted measures.

### SDG&E to submit a workpaper

Submit a “short form” workpaper to adopt the SCE’s workpaper. The ex ante data should refer to the SCE’s measure definitions. SDG&E is required to submit an Implementation table which lists their own workpaper ID (Source Description) and describes the program that SDG&E is using to implement the adopted measures.

1. DEER2017 requires 3,372 operating hours for lighting used within Light Industrial Manufacturing facilities (DEER building type is MLI). The workpaper assumes that the process fans operate the same number of hours as the lighting. (page 10) [↑](#footnote-ref-1)