

**DISPOSITION FOR WORKPAPERS COVERING PROCESS FAN VSD**

**California Public Utilities Commission, Energy Division**

March 2, 2017, updated August 29, 2017

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## 1. Review Scope

Table 1 – Process Fan VSD Workpapers

Workpaper ID	Rev	Workpaper Title	Official Submittal Date
SCE17PR008	0	Process Fan VSD	1/1/2017
SCE17PR008	1	Process Fan VSD	5/1/2017
PGECOPRO110	2	Process Fan VSD	5/8/2015
WPSDGENRPR0004	0	Process Fan VSD	3/14/2017

This disposition reviews SCE17PR008, revision 1, which responds to the phase 1 disposition for this measure dated March 2<sup>nd</sup>, 2017. Per the message posted to the WPA on June 21<sup>st</sup>, 2017, CPUC extends the validity of SCE17PR008.1 (post-disposition updated workpaper) throughout the remainder of the year, 12/31/17.

Additionally, this disposition reviews the workpapers listed in Table 1 and documentation of a market assessment covering process fan VSDs submitted by SCE on July 6<sup>th</sup>, 2017. The PG&E workpaper adopts the revision 1 of the SCE workpaper. SDG&E's workpaper adopts an unapproved version of the SCE workpaper, revision 0, adds several building types, and does not adopt the SCE ex ante data.

**Based on the lack of evidence that this measure would be applied to process fans within both the deemed operating parameters and the proposed size range, CPUC does not approve use of these measures beyond 12/31/2017.** The disposition is applicable to all versions of this workpaper adopted by any PA. CPUC will not accept deemed claims beyond those specifically covered by workpaper SCE17PR008.1 for measures installed after December 31, 2017. SCE and others maintain the option to submit these types of claims via custom projects, meeting all requirements therein without reference to the unapproved workpaper.

## 2. Critical Review Issues

### 2.1. Submitted information does not establish a valid measure for the Process Fan VSD

The workpaper includes many assumptions regarding the applicability and operation of small process fan systems. It proposes that the energy savings and costs for a variable speed drive (VSD) retrofit to any process fan under 75 HP can be deemed using a single measure. In review of submitted information, the justification for these assumptions indicates the opposite; that is, the variability in size range, applicability, and operational parameters of process fan systems is not uniform enough to

deem savings. In particular, the market assessment submitted on July 6<sup>th</sup> does not justify the use of a single set of assumptions for the range of process fan systems illustrated in the submission.

## **2.2. Ex ante data submissions continue to have various errors inconsistent with the Ex Ante database specification and previous guidance**

Ex ante data for 3 PAs (SCE, and PG&E, and SDG&E) was reviewed for conformance with the program descriptions in the lead workpaper (SCE17PR008.1), reference to SCE's lead / statewide measure and cost definitions, and ex ante data format requirements. Several discrepancies were noted, including missing information. A copy of the corrected data is enclosed.

## **3. Detailed Review**

### **3.1. Submitted information does not establish a valid measure for the Process Fan VSD**

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 systems that the deemed fans serve. In the March 2017 disposition, CPUC directed SCE to provide justification for the workpaper assumptions.

#### 3.1.1. Summary of "Process Fan VFD Deliverables.zip"

In response to the March disposition, SCE submitted a narrative file and 4 attachments on July 6<sup>th</sup>, 2017. The response addresses the main assertion of the March disposition, "Item 1: Missing information regarding fan installations prevents evaluation of operating hours, effective useful life (EUL), and other assumptions used to calculate savings". Here is our understanding of what was submitted.

- J A narrative response is provided which is organized according to the disposition and seeks to address each of the requested elements.
- J Attachment 1: SCE submitted a list of 14 case studies with internet links. The Ex Ante team found that 4 of the submitted case studies are relevant to the workpaper in so far as they describe industrial process fan VFD retrofits within the size range proposed by the workpaper. The relevant case study numbers are 8, 12, 13, and 14. Three of the relevant case studies are for laboratory fume hood exhaust systems. The other is for wastewater treatment "blowers". The non-applicable case studies include fans which are larger than 75 HP, a VFD for a "coal dumper" which does not appear to be a fan, a wastewater treatment center that did not

include a fan VFD retrofit, and a case study for a boiler fan VFD which appears to be an HVAC applicability, not an industrial process.

- ) Attachment 2: SCE also submitted marketing information from fan manufacturers. This marketing information fails to substantiate that the workpaper's size range is common. Neither does it provide the fan parameter information we requested in the disposition. Lastly, the information does not include fan power information so no energy consumption can be gleaned from the manufacturer's literature. Beyond establishing the types of fans that the workpaper would seek to rebate, Attachment 2 is unhelpful.
- ) Attachments 3 & 4: A summary of 11 custom measures for process fan VFDs; the 11 fans were installed at 7 locations.
  - o 5 of the 11 fans are within the size range of the workpaper; these are included in Attachment 3 and are all installed at the same location (Customer #1).
  - o 7 fans are larger than 75 HP; therefore, the information provided for these fans is not relevant for this workpaper.

### 3.1.2. Analysis and Conclusions

CPUC & Ex Ante team have reviewed the Process Fan VFD Deliverables.zip. The submission is incomplete. The information provided does not justify the use of a single set of assumptions for the range of process fan systems in this workpaper.

The March disposition directs SCE to gather examples which illustrate the range of acceptable process fan applications, including details regarding fan parameters in order to justify that a single deemed measure with 1 set of fan assumptions will reasonably estimate the range of fan savings. Below we are listing the specific parameters which were requested to be justified and our findings regarding the disposition response.

#### 3.1.2.1. Type of process: submission incomplete.

Attachment 1 lists 14 types of processes that utilize fans; however, no correlation is provided between these types of fans and the fan size deemed by the workpaper (less than 75 HP). For each type of process, typical fan power information is needed to establish relevancy. The submitted data does not establish that the workpaper is relevant for all 14 type of processes; instead, Ex Ante team finds that SCE documented 3 types of processes served by fans less than 75 HP:

1. Customer #1 industrial processes (established by Attachment 3, file name "Customer #1 Process Fan VFD.xlsx"). The submitted spreadsheet lists the 5 fans as "North transfer fan", "South Comco Press & Slitter", "Floor Sweep", "South Transfer Fan", and "South Balancing Fan". An Internet search of the term "Comco Press & Slitter" suggests that Customer #1's business includes a printing press. SCE did not correlate Attachment 3

with Attachment 1 so it is unclear which of the other 14 process types from Attachment 1 are illustrated here.

2. Wastewater treatment “blowers” (established by Attachment 1 case study #8)
3. Laboratory fume hood exhaust fans (established by Attachment 1, case studies 12, 13, & 14)

3.1.2.2. Type of process fan and drive: submission incomplete.

The response document notes that the process fans within Attachment 2 are of type “blower” or “exhaust” which is generally a centrifugal fan. Additionally, the response document states that the Attachment 3 examples are all centrifugal single width fans.

However, in looking at the relevant data provided in Attachment 1, it appears that the other 2 applicability are wastewater treatment “blowers” and laboratory fume hood exhaust systems. The photographs of the wastewater blowers do not appear to be single width, single inlet airfoil fans (see photo from case study #8, below)



Figure 1: Hoffmann Blowers at Pana WWTP

Similarly, laboratory fume hood exhaust fans should not be characterized by the assumptions within the workpaper. While individual lab exhaust fans may be centrifugal, the common practice of manifolding multiple fans together mean that the assumptions associated with the single width centrifugal fans in the online tool are not relevant. SCE submitted an excellent description with the market assessment: Case Study 13, “Best Practice Guide: Manifolding Laboratory Exhaust Systems”.

3.1.2.3. Static Pressure: submission incomplete

The general statement within the response document that 5" w.g seems "reasonable and conservative" needs justification and data. Attachment 3 includes static pressures for 5 applicable fans. These pressures range from 4.5" to 9" w.g. Attachments 1 and 4 do not provide static pressure information associated with fan power. Attachment 2 data does not provide any fan power information so the pressures listed cannot be correlated with fans which are less than 75 HP.

3.1.2.4. Type of control: submission incomplete

There are 2 sets of relevant information provided. On one hand, the response document describes a manufacturing situation where the plant is shut down using a manual ON/OFF control. The narrative does not provide actual examples. On the other hand, Attachment 1 illustrates that 3 of the 4 relevant case studies are for laboratory fume hood exhaust systems. These case studies make it clear that energy savings is derived from the variation of the fan speed based on a sensor within the distribution system that reacts to closing the fume hood sashes. This workpaper does not include a requirement to install such controls. Together, the submitted materials do not justify the type of control as "manual".

3.1.2.5. Operating Hours: submission incomplete

It is unclear how the operating hours assumption is derived. Based on a prima facie review of the submittal, it appears that the PG&E operating hours are used; however, the PG&E fans are too large for the workpaper. The SCE fans (Attachment 3) all operate more than 8,400 hours per year; however, they appear to represent only 2 customers and 1 of the customers has a fan that is too large for this workpaper.

3.1.2.6. Minimum VFD speed: submission incomplete

Similar to the section above, Operating Hours, the response document confirms that the PG&E data was used to determine the minimum speed. These custom projects are not relevant to this workpaper since they range in size from 125 to 300 HP. The Attachment 3 fans appear to have a minimum speed ranging from 82% to 95%; however, this is only 1 customer. Similarly, case study 8 notes that the new fan speed is 80% of the pre-existing condition.

Regarding laboratory fume hood systems, the minimum speed will be dictated by the ducting arrangement of the fans (manifolding) and the required discharge velocities. Information regarding these systems is missing from the submission and does not seem relevant to the workpaper's calculation approach (on-line tool).

3.1.2.7. EUL: submission complete

Together, the attachments document the range of fan systems which are likely to be rebated under this workpaper. However, since CPUC is not approving this workpaper, the Ex Ante team did not determine a deemed EUL for this measure technology.

#### 3.1.2.8. Inlet Temperature: submission incomplete

The three applicabilities seem like they have different temperatures. Here are our findings:

- ) Attachment 3, industrial customer: the inlet temperature is unclear.
- ) Wastewater blowers: the inlet temperature is unclear.
- ) Laboratory fume hoods: 85F may be okay. For operation when the sashes are open, the inlet temperature would be close to occupied thermal comfort conditions; however, when air is entrained from the roof to create the minimum discharge velocity, higher temperature are likely.

#### 3.1.2.9. Drive Type: submission complete

### 3.2. Ex ante data submissions continue to have various errors inconsistent with the Ex Ante database specification and previous guidance

The revised ex ante data from SCE and PG&E correctly limited the measures to the scope per the March disposition. Contrary, the SDG&E submission adds 5 building types without providing market assessment or other justification required by the March disposition.

Ex ante data revised by the Ex Ante team is enclosed for reference and future information. An earlier version of this file that only includes SCE data is available on the Workpaper Project Archive (<https://deeresources.info/wpa/projects/14586>). The copy enclosed with this disposition is updated to include the ex ante data submitted by SDG&E on March 14<sup>th</sup> and PG&E on July 11th. All differences are highlighted and annotated.

## 4. Attachments

### 1. ExAnteData-EARteamCorrections.xlsx



ProcessFanVSD-ExA  
nteData-EARteamCo