

DOCKETED

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HBGS-CEC-146

June 28, 2017

Mary Dyas
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Siting, Transmission and Environmental Protection Division
California Energy Commission
1516 Ninth Street
Sacramento, CA 95814

**RE: Pacific Gas & Electric Company Humboldt Bay Generating Station
Petition to Amend TN 211728, Docket No. 06-AFC-7C, Data Request Response**

Ms. Dyas:

On June 6, 2016, Pacific Gas and Electric Company (PG&E) submitted a Petition to Amend (PTA) to the California Energy Commission (CEC) for Humboldt Bay Generating Station (HBGS) to conform the Air Quality Conditions of Certification to recent amendments to the Title V Operating Permit (PTO) issued by North Coast Air Quality Management District (NCAQMD). The CEC responded to PG&E's PTA with a list of data requests, dated September 19, 2016.

PG&E has reviewed the CEC's data request and is hereby submitting a formal response to each of the 14 items requested by the CEC. Please find enclosed PG&E's responses, with the original data request text listed in *italic*, and PG&E's response in **bold**.

In preparation of our CEC responses, we would like to advise staff that this submittal serves to amend the most recent PTO to remove the annual pilot fuel use increase of 948,562 gallons, and maintain the previously permitted level of 376,735 gallons. Based on this revision, there will be no annual increase in fuel use or its associated emissions of either criteria pollutants or hazardous air pollutants (HAPs). PG&E will cap the facility emissions at the existing potential to emit levels and with the pilot fuel use limits re-established at 376,735 gallons/year. However, we propose to maintain the short-term increases in the pilot fuel use (hourly and daily) as denoted in the recently updated PTO. As discussed below, we do not expect any increases in the hourly or daily emission limits above our currently permitted potential to emit (PTE) limits. As such, the project will continue to comply with all applicable laws, ordinances, and limits.

Background

The diesel pilots are only used during natural gas firing mode, they are not used during diesel firing mode. Each engine has a separate pilot for each cylinder, i.e., there are 18 pilots on each engine and the cumulative total btu/hr heat input is currently set at 0.8 mmbtu/hr for all 18 pilots per engine.

Prior to the February 2016 modification to the permit to operate (PTO), the diesel pilot data from permit NCU 059-12 contained the following limits:

Increasing the pilot fuel heat rate to 2.0 mmbtu/hr (3-hour average) and using the same EPA fuel factor as noted above results in an hourly fuel use rate of 14.61 gals/hr/engine. Table 2 presents the Table 1 annual total data converted to the new pilot heat rate, i.e., a ratio of 2.5 and conservatively assumes that every hour of engine operation in natural gas mode would utilize the pilot at 2.0 MMBtu/hr. While this assumption is extremely conservative, it demonstrates that utilizing short term increases up to 2.0 MMBtu/hr on a 3-hour average basis on the engine pilots would not result in any exceedance of the annual diesel pilot fuel limit, based on the actual fuel use over the last six years.

Table 2: Total Predicted Annual Diesel Usage (gallons/year) for Pilot Fuel during Operation in Natural Gas Mode

Unit	2011	2012	2013	2014	2015	2016
Total per year	317,928	266,723	237,250	249,895	281,065	221,643
Permit Limit	376,734	376,734	376,734	376,734	376,734	376,734

Table 2 indicates that with the pilot operating at the new hourly heat rate of 2.0 MMBtu/hr, the current fuel limit of 376,734 gal/yr would not have been exceeded in any of the past operating years.

Table 3 presents the actual annual emissions over the two most recent years and includes all emissions with both natural gas and diesel mode operations, including the diesel pilot. Emission data were obtained from annual emission reports previously submitted to the NCUAQMD and the CEC.

**Table 3
HUMBOLDT BAY GENERATING STATION
Wärtsilä Reciprocating Engines
Combined Emissions (Tons) S-1 through S-11**

	NOx	CO	ROC	PM10	DPM	SO2
2015 Totals (tpy)	30.16	29.31	45.70	48.94	0.21	1.03
2016 Totals (tpy)	32.21	30.66	42.24	43.79	0.09	0.86
Annual Limit (tpy)	179.10	172.70	190.80	119.80	na	4.30

As Table 3 demonstrates, the actual emissions for the last two years at HBGS have been far less than the annual permitted emission limits. This data also shows that, when compared to the previous years of operation, there is was a substantial decrease in the operation of the engines in diesel mode. As such, the facility operated a large majority of the time in 2015 and 2016 in natural gas mode. As discussed below, the ability to avoid having the engines switch into diesel mode would allow the facility to utilize unused emissions capacity to cover the small increase in the pilot heat rate.

Thus, increasing the pilot heat rate to 2.0 MMBtu/hr for short periods of natural gas mode operation would not require that the annual pilot fuel limit be modified and the previous facility limit of 376,375 gallons per year of diesel fuel could be maintained with an adequate margin of safety.

Technical Basis for the Proposed Short Term Increase in the Diesel Pilot Heat Rate

As noted in our permit to amend and as discussed in our response to comments, an increase in the pilot heat limit from 0.8 MMBtu/hour to 2.0 MMBtu/hour would allow the units to run more dependably, with fewer trips into diesel mode. While units S-1 through S-10 came online in late 2010, by mid-2015,

PG&E operational staff, via routine observation and recordkeeping, identified that the engines were tripping from natural gas to diesel mode more frequently than in previous years. Between January 2015 and February 2017, the engines have tripped on an average of 57 times per unit, with each event lasting an average of 3.3 minutes. When PG&E first noticed the increase in trips to diesel mode, PG&E contacted the engine manufacturer Wartsila to evaluate the reason the engines were tripping to diesel mode. Wartsila's analyses indicated that the most common instance of increased trips to diesel was when low exhaust gas temperatures were detected in the cylinders of the engines (herein referred to as temperature deviation). The engines, due to their age, were unable to sustain continued operation in natural gas mode in instances when the temperature deviated beyond a certain point such that additional heat was required from the diesel pilot in order to maintain the natural gas mode of operation. As the diesel pilot was restricted to a 0.8 MMBtu/hr permit limit, PG&E could not adjust the pilot heat rate upwards to prevent the engine from switching from natural gas mode to diesel mode. PG&E has since continued to engage Wartsila in discussions to determine other causes of dependability problems, including but not limited to, low pilot fuel input.

Wartsila conducted extensive analyses on the engines (including the fuel delivery system, engine and emissions controls) to determine the reason for the trips to diesel mode. Ultimately, Wartsila concluded that the problems could be attributed to temperature deviations within the engine which lead to diesel trips and as such, recommended that a higher pilot heat threshold be set to avoid unplanned trips into diesel mode.

Based on the Warstila's recommendations, the 2.0 MMBtu/hr pilot fuel limit established as the maximum short term limit as a three hour average. This limit includes an appropriate level of safety margin. This heat input value would provide an adequate level of pilot heat to avoid unplanned trips into diesel mode. If the diesel pilot heat input reaches the 2.0 MMBtu/hr trigger level, the unit would be shut down and PG&E would evaluate what was causing the anomaly. Note that this set-point does not require that the pilot continuously operate at the higher limit. Rather, the pilot most likely would remain at 0.8 MMBtu/hr for most hours of operation. It is during the low exhaust temperature excursion events that would require a short period of increase fuel use in the diesel pilot in order to stabilize the natural gas operation. Thus, it is expected that most hours of operation would still utilize the 0.8 MMBtu/hr heat input.

To account for the proposed short-term increase in the diesel pilot heat rate, Table 4 presents the proposed increase in the short-term pilot heat rate.

Table 4 - Heat Input Limitations Per Engine

	Heat Input, MMBtu (HHV)	
	Hourly (3 hr Rolling Average)	Daily (Calendar Day)
Natural Gas Mode*: Natural Gas + Diesel Pilot	144.7	3,473
Diesel Mode	148.9	3,574

*Combined heat rate limit for the engine (natural gas heat input plus the diesel pilot heat input)

While the short-term increase in the pilot heat rate may result in an increase of criteria pollutants for short-term periods (24-hours and less), the potential emissions from the facility will remain at the currently permitted levels. Table 5 summarizes the source test results for HBGS from 2012-2016 and compares them to the PTE emission limits from the Permit to Operate.

Table 5 Summary of HBGS Source Test Data by Year for NOx, CO, VOC, and SOx					
		Natural Gas Firing Mode*			
(all values are on a per engine basis)		lbs/mmbtu			
	PTO Emissions Limits	NOx	CO	VOC	SOx
		0.022	0.029	0.035	0.0028
		lbs/mmbtu			
Year	Reference	NOx	CO	VOC	SOx
2012	2010/2011 Test Data	0.0084	0.0039	0.0044	0.00017
2013	2013 Test Data	0.0118	0.0113	0.00332	0.000045
2014	2013/2014 Test Data	0.0207	0.015	0.00359	0.000082
2015	2015 Test Data	0.0136	0.016	0.00359	0.000736
2016	2015/2016 Test Data	0.0155	0.0181	0.009995	0.000736

* This includes the contribution from the diesel pilot. Average lbs/MMBtu based on test data from all engines tested, all loads, etc.

Table 5 demonstrates that the actual facility emissions are well below the current facility permitted emission limits based on source test results. The increase in the diesel pilot from 0.8 up to 2 MMBtu/hr will not cause the existing limits to be exceeded and the current source test data indicates an adequate level of safety between the actual emissions and the potential. Therefore, based on the PTO emission limits, which reflect the facility potential to emit, the source test results demonstrate that any potential short-term increase in the diesel pilot up to 2.0 MMBtu/hr will not cause any increase in the facility potential to emit.

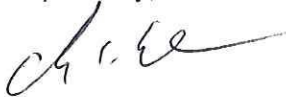
Revised Modification

In summary, we will revise the recently amended PTO to remove the annual pilot fuel use increase of 948,562 gallons back to the previously permitted level of 376,735 gallons. Based on this revision, there will be no annual increase in fuel use or its associated emissions of either criteria pollutants or hazardous air pollutants (HAPs) over the existing permitted levels. PG&E will cap the facility emissions at existing potential to emit levels and with the pilot fuel use limits re-established at 376,735 gallons/year. Thus, based on no changes to the annual emissions, a revision to the health risk assessment will not be needed.

However, we proposed to maintain the short-term increases in pilot fuel use (hourly and daily) up to 2 MMBtu/hr as denoted in the recently updated PTO. As previously discussed and based on source test data over the last five years, we do not expect any increases in the hourly or daily emission limits above our currently permitted potential to emit (PTE) limits as the actual emissions remain well below these levels. As such, the project will continue to comply with all applicable laws, ordinances, and limits.

PG&E greatly appreciates the CEC's review of the enclosed data. If you have any questions, or need further information, please do not hesitate to contact me at (707) 441-2667.

Respectfully,



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