

APPENDIX 3.1F

Evaluation of Best Available Control Technology

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The original AFC Appendix 8.1F is now Amendment Appendix 3.1F. Significant changes have occurred with respect to proposed emissions and operational scenarios, and as such this appendix presents a summary of recent BACT data for the new facility equipment, processes, and control systems.

To evaluate BACT for the proposed turbines/HRSGs, cooling tower, and diesel fired fire pump engine, the guidelines for such devices as delineated in the District, state, and federal BACT listings were reviewed. The relevant summary of updated BACT determinations for this analysis are shown in Tables 3.1F-1 through 3.1F-4.

TABLE 3.1F-1 BACT Data for Combined Cycle Turbines w/Duct Fired HRSGs		
Pollutant	BACT Emissions Values	BACT Technology
Nitrogen oxides (NO _x)	2.0 ppmv* (1 hr)	Selective Catalytic Reduction
Sulfur dioxide (SO ₂)	4ppm S in gas	Natural Gas
Carbon monoxide (CO)	4.0 ppmv* (3 Hr)	GCP and/or Oxidation Catalyst
VOC	2.0 ppmv * (1 Hr)	Natural Gas, GCP and/or Oxidation Catalyst
PM ₁₀	<= 0.01 gr/dscf	Natural Gas
@ 15% O ₂ dry basis Recent BACT determinations from the BAAQMD and SCAQMD GCP-good combustion practices		

Table 3.1F-2 BACT Summary for Cooling Towers		
Project	PM10/2.5 BACT Level	BACT Technology
PICO-Von Raesfeld Power Plant	0.0005% drift	High efficiency drift eliminators
Inland Empire Energy Center	0.0005% drift	High efficiency drift eliminators
Tesla Energy Center	0.0005% drift	High efficiency drift eliminators
Vineyard Energy Center-Utah	0.0005% drift	High efficiency drift eliminators
Blythe Energy Center	0.0005% drift	High efficiency drift eliminators
Delta Energy Center	0.0005% drift	High efficiency drift eliminators
Rio Linda Power Plant	0.0005% drift	High efficiency drift eliminators
Las Vegas Cogen	0.0005% drift	High efficiency drift eliminators
East Altamont Energy Center	0.0005% drift	High efficiency drift eliminators

BACT for the diesel fired fire pump engine will be compliance with the state and federal tiered emissions standards for compression ignited engines as delineated in the following summary tables.

In addition, Part D of the SCAQMD BACT Guidelines generally requires that emergency diesel engines be certified to meet Tier 2 of the EPA Nonroad emission standards as Tier 2 takes effect for various engine sizes. However, fire pump engines are exempt from that requirement if no UL-listed Tier 2 fire pump engines are available, which thus far has been the case. At present, therefore, fire pump engines must only meet the Tier 1 standards.

The latest evolution of the proposed Clarke JW6H-UF40 fire pump engine will meet the Tier 2 standards and will comply with recent SCAQMD BACT limits. This engine has a control module, turbocharger, and charge air cooler. This engine meets the Environmental Protection Agency and California Air Resources Board (EPA/CARB) Tier 2 Mobile Off-Highway standard. This engine will burn commercially available California low sulfur diesel fuel. The sulfur content of the diesel fuel will not exceed 0.05% by weight. The operation of this engine is not expected to pose any health threat or risk to the surrounding community or the public at large.

The emissions associated with the latest engine model are as follows:

NO_x 4.213 g/bhp-hr
 CO 0.6 g/bhp-hr
 PM₁₀ 0.11 g/bhp-hr
 VOC 0.336 g/bhp-hr
 SO_x 0.0055 g/bhp-hr

Per subsection (c)(16) of the CARB-ATCM, fire pump engines are not subject to the emission requirements of subsection (e)(2)(B)3 of the ATCM. Even so, this 300 hp engine still meets the EPA Tier 2 requirements for HC, NO_x, NMHC+NO_x and CO. Thus, the proposed fire pump engine satisfies the current BACT requirements for this category of source.

Table 3.1F-3

PM Emissions Factors by Horsepower and Year (g/bhp-hr)								
Year	Horsepower Groups							
	25-49	50-74	75-99	100-174	175-299	300-599	600-750	750+
1900	0.950	1.200	1.200	1.100	1.100	0.950	0.950	0.950
1969	0.950	1.200	1.200	1.100	1.100	0.950	0.950	0.950
1970	0.950	1.200	1.200	0.940	0.940	0.810	0.810	0.810
1972	0.950	1.200	1.200	0.780	0.780	0.680	0.680	0.680
1988	0.950	0.980	0.980	0.540	0.540	0.490	0.490	0.490
1989	0.950	0.980	0.980	0.540	0.540	0.490	0.490	0.490
1996	0.950	0.980	0.980	0.540	0.40	0.40	0.40	0.500
1997	0.950	0.980	0.980	0.600	0.40	0.40	0.40	0.500
1998	0.950	1.090	1.090	0.600	0.40	0.40	0.40	0.500
1999	0.60	1.090	1.090	0.600	0.40	0.40	0.40	0.500
2000	0.60	1.090	1.090	0.600	0.40	0.40	0.40	0.40
2001	0.60	1.090	1.090	0.600	0.40	0.15	0.40	0.40
2002	0.60	1.090	1.090	0.600	0.40	0.15	0.15	0.40
2003	0.60	1.090	1.090	0.22	0.15	0.15	0.15	0.40
2004	0.45	0.30	0.30	0.22	0.15	0.15	0.15	0.40

2005	0.45	0.30	0.30	0.22	0.15	0.15	0.15	0.40
2006	0.45	0.30	0.30	0.22	0.15	0.15	0.15	0.15
2007	0.45	0.30	0.30	0.22	0.15	0.15	0.15	0.15
2008	0.22	0.22	0.30	0.22	0.15	0.15	0.15	0.15
2009	0.22	0.22	0.30	0.22	0.15	0.15	0.15	0.15
2010	0.22	0.22	0.30	0.22	0.15	0.15	0.15	0.15
2011	0.22	0.22	0.30	0.22	0.015	0.015	0.015	0.07
2012	0.22	0.22	0.015	0.015	0.015	0.015	0.015	0.07
2013	0.02	0.02	0.015	0.015	0.015	0.015	0.015	0.07
2014	0.02	0.02	0.015	0.015	0.015	0.015	0.015	0.07
2015	0.02	0.02	0.015	0.015	0.015	0.015	0.015	0.03
2016	0.02	0.02	0.015	0.015	0.015	0.015	0.015	0.03
2017	0.02	0.02	0.015	0.015	0.015	0.015	0.015	0.03
2018	0.02	0.02	0.015	0.015	0.015	0.015	0.015	0.03
2019	0.02	0.02	0.015	0.015	0.015	0.015	0.015	0.03
2020	0.02	0.02	0.015	0.015	0.015	0.015	0.015	0.03

Tier 0 Engine	
Tier 1 Engine	
Tier 2 Engine	

Tier 3 Engine	
Interim Tier 4	
Tier 4 Engine	

Summary of CARB/EPA Tier 0-4 Emissions Factors
(CARB website, 10/06)

Table 3.1F-4 CARB and USEPA Off-Road Compression-Ignition (Diesel) Engine Standards (NMHC+NOx/CO/PM in g/bhp-hr). When CARB and USEPA standards differ, the standards shown here represent the more stringent of the two.

Maximum horsepower	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015+
<11	See Table 2 footnote (a)																				
11≤hp<25	7.8 / 6.0 / 0.75																				
25≤hp<50	7.1 / 4.9 / 0.60																				
50≤hp<75	7.1 / 4.1 / 0.60																				
75≤hp<100	- / 6.9 / - / - ^b																				
100≤hp<175	4.9 / 3.7 / 0.22																				
175≤hp<300	4.9 / 2.6 / 0.15																				
300≤hp<600	1.0 / 6.9 / 8.5 / 0.40 ^b																				
600≤hp<750	4.8 / 2.6 / 0.15																				
Mobile Machines > 750hp	1.0 / 6.9 / 8.5 / 0.40 ^b																				
750hp<GEN ≤1200hp	1.0 / 6.9 / 8.5 / 0.40 ^b																				
GEN>1200 hp	1.0 / 6.9 / 8.5 / 0.40 ^b																				

a) The PM standard for hand-start, air cooled, direct injection engines below 11 hp may be delayed until 2010 and be set at 0.45 g/bhp-hr.

b) Standards given are NMHC/NOx/CO/PM in g/bhp-hr.

c) Engine families in this power category may alternately meet Tier 3 PM standards (0.30 g/bhp-hr) from 2008-2011 in exchange for introducing final PM standards in 2012.

d) The implementation schedule shown is the three-year alternate NOx approach. Other schedules are available.

e) Certain manufacturers have agreed to comply with these standards by 2005.

