San Joaquin Valley
Unified Air Pollution Control District

Best Performance Standard (BPS) x.x.xx

Date: November 1, 2011

Class and Category	Cogeneration – Topping Cycle Plants (not including Combined Cycle units) <u>Subcategories:</u> 1. Natural Gas-Fired IC Engines 2. Natural Gas-Fired Turbines (not including oilfield cogeneration units) 3. Oilfield Natural Gas-Fired Turbines
Best Performance Standard	1. *<u>Natural Gas-Fired IC Engines</u>* Emissions Performance Design Standard of 700 lb-CO_2e per MWh of Useful Energy at ISO Conditions 2. *<u>Natural Gas-Fired Turbines (not including oilfield cogeneration units)</u>* Emissions Performance Design Standard of 800 lb-CO_2e per MWh of Useful Energy at ISO Conditions 3. *<u>Oilfield Natural Gas-fired Turbines</u>* Emissions Performance Design Standard of 800 lb-CO_2e per MWh of Useful Energy at ISO Conditions
Percentage Achieved GHG Emission Reduction Relative to Baseline Emissions	1. *<u>Natural Gas-Fired IC Engines:</u>* **36.4%** 2. *<u>Natural Gas-Fired Turbines (not including oilfield cogeneration units):</u>* **27.3%** 3. *<u>Oilfield Natural Gas-Fired Turbines:</u>* **27.3%**

District Project Number	C1100393
Evaluating Engineer	James Harader
Lead Engineer	Rupi Gill
Initial Public Notice Date	April 15, 2010
Final Public Notice Date	May 10, 2010
Determination Effective Date	November 1, 2011

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I. Best Performance Standard (BPS) Determination Introduction

A. Purpose

To assist permit applicants, project proponents, and interested parties in assessing and reducing the impacts of project specific greenhouse gas emissions (GHG) on global climate change from stationary source projects, the San Joaquin Valley Air Pollution Control District (District) has adopted the polic*y: District Policy – Addressing GHG Emission Impacts for Stationary Source Projects Under CEQA When Serving as the Lead Agency.* This policy applies to projects for which the District has discretionary approval authority over the project and the District serves as the lead agency for CEQA purposes. Nonetheless, land use agencies can refer to it as guidance for projects that include stationary sources of emissions. The policy relies on the use of performance-based standards, otherwise known as Best Performance Standards (BPS) to assess significance of project specific greenhouse gas emissions on global climate change during the environmental review process, as required by CEQA. Use of BPS is a method of streamlining the CEQA process of determining significance and is not a required emission reduction measure. Projects implementing BPS would be determined to have a less than cumulatively significant impact. Otherwise, demonstration of a 29 percent reduction in GHG emissions, from business-as-usual, is required to determine that a project would have a less than cumulatively significant impact.

B. Definitions

Best Performance Standard for Stationary Source Projects for a specific Class and Category is the most effective, District approved, Achieved-in-Practice means of reducing or limiting GHG emissions from a GHG emissions source, which is also economically feasible per the definition of Achieved-in-Practice. BPS includes equipment type, equipment design, and operational and maintenance practices for the identified service, operation, or emissions unit class and category.

Business-as-Usual is the emissions for a type of equipment or operation within an identified class and category projected for the year 2020, assuming no change in GHG emissions per unit of activity as established for the baseline period, 2002-2004. To relate BAU to an emissions generating activity, the District proposes to establish emission factors per unit of activity, for each class and category, using the 2002-2004 baseline period as the reference.

Category is a District approved subdivision within a “class” as identified by unique operational or technical aspects.

Class is the broadest District approved division of stationary GHG sources based on fundamental type of equipment or industrial classification of the source operation.

C. Determining Project Significance Using BPS

Use of BPS is a method of determining significance of project specific GHG emission impacts using established specifications. BPS is not a required mitigation of project related impacts. Use of BPS would streamline the significance determination process by pre-quantifying the emission reductions that would be achieved by a specific GHG emission reduction measure and pre-approving the use of such a measure to reduce project-related GHG emissions.

GHG emissions can be directly emitted from stationary sources of air pollution requiring operating permits from the District, or they may be emitted indirectly, as a result of increased electrical power usage, for instance. For traditional stationary source projects, BPS includes equipment type, equipment design, and operational and maintenance practices for the identified service, operation, or emissions unit class and category.

II. Summary of BPS Determination Phases

The District has established Topping Cycle Cogeneration as a separate class and category that requires implementation of a Best Performance Standard (BPS) pursuant to the District's Climate Change Action Plan (CCAP). The District's determination of the BPS for this class and category has been made using the phased BPS development process established in the District's Final Staff Report, Addressing Greenhouse Gas Emissions under the California Environmental Quality Act. A summary of the specific implementation of the phased BPS development process for this specific determination is as follows:

BPS Development Process Phases for Topping Cycle Cogeneration			
Phase	Description	Date	Comments
1	Initial Public Process	2/09/10	The District's intent notice is attached as Appendix I.
2	BPS Development	4/15/10	See Section IV of this evaluation document.
3	Public Review	4/15/2010	The District's BPS determination notice and a list of individuals receiving notification are attached as Appendix II.
4	Public Comments	5/10/2010	The public comment period ended on the date given. All public comments received and the District's responses are attached as Appendix III.
5	Finalization	11/1/2011	The BPS established in this evaluation document is effective on the date of finalization.

III. Class and Category

The District has established cogeneration as a separate class and category of source that requires implementation of a Best Performance Standard (BPS) pursuant to the District's Climate Change Action Plan (CCAP). Cogeneration, also referred to as Combined Heat and Power (CHP), is the generation of electricity and useful thermal energy or mechanical work from a single fuel source.

Cogeneration units are typically categorized as either topping cycle systems or bottoming cycle systems. A topping cycle cogeneration system is a cogeneration system that uses input energy (usually fuel) to first produce electricity, with a portion or all of the reject heat then used as useful thermal energy or as useful mechanical energy. Conversely, a bottom cycle cogeneration system uses the input energy (usually fuel) to first produce useful thermal energy for a process, with the residual thermal energy used for electricity production. Most of the cogeneration units located within the San Joaquin Valley Air Pollution Control District can be categorized as topping cycle units; therefore, this BPS determination will be limited to topping cycle cogeneration units. Note, this determination w

Topping cycle cogeneration units can be further divided into subcategories based on the type of combustion unit used in the cogeneration operation. This BPS evaluation will be limited to the two most commonly permitted topping cycle cogeneration systems, natural gas-fired turbines and natural gas-fired IC engines. Finally, oilfield cogeneration facilities that are associated with enhanced oil recovery (EOR) are distinctly different than other cogeneration facilities. EOR cogeneration facilities are typically “once through” devices that generally do not include condensers or cooling towers, as well as have other features that distinguish them from other cogeneration facilities. Therefore, the turbine category will be further subdivided into non-oilfield and oilfield subcategories.

In summary, the final cogeneration subcategories that will be addressed by this analysis are:

1. Natural Gas-Fired Internal Combustion Engines
2. Natural Gas-Fired Turbines (not including oilfield cogeneration units)
3. Oilfield Natural Gas-Fired Turbines

IV. Public Notice of Intent

Prior to developing the development of BPS for this class and category, the District published a Notice of Intent. Public notification of the District’s intent to develop BPS for this class and category was sent on April 1, 2010 to individuals registered with the CCAP list server. The District’s notification is attached as Appendix I.

Comments received during the initial public outreach are presented in Appendix II. These comments have been used in the development of this BPS as presented below.

V. BPS Development

STEP 1. Establish Baseline Emissions Factor for Class and Category

The Baseline Emission Factor (BEF) is defined as the three-year average (2002-2004) of GHG emissions for a particular class and category of equipment, expressed as annual GHG emissions per unit of activity. The term CO_2e, used throughout this document, refers to carbon dioxide equivalent emissions. Carbon dioxide equivalent is a measure for describing how much global warming a given type or amount of greenhouse gas may cause, using the functionally equivalent amount or concentration of carbon dioxide (CO_2) as the reference.

A. Representative Baseline Operation

For cogeneration operations**,** the representative baseline operation for 2004/2005 has already been evaluated and established by the California Public Utilities Commission (CPUC) as part of their 2007 greenhouse gas emission standard[1]. The baseline emissions factor for cogeneration units will be based on the previous work completed by the CPUC.

B. Basis and Assumptions

- The 2004/2005 baseline emissions reported by the California Public Utilities Commission is representative of the 2002 and 2003 baseline years.
- GHG emissions are stated as "CO_2 equivalents" (CO_2e) which includes the global warming potential of methane and nitrous oxide emissions associated with gaseous fuel combustion.

C. Unit of Activity

To relate Business-as-Usual to an emissions generating activity, it is necessary to establish an emission factor per unit of activity, for the established class and category. Cogeneration operations can generate useful electricity, useful thermal energy, and/or useful mechanical energy. Therefore, the chosen unit of activity should account for all three possible types of energy output.

California Assembly Bill 1613 and Assembly Bill 2791 directed the California Energy Commission, Public Utilities Commission (CPUC), and the Air Resources Board (ARB) to implement the Waste Heat and Carbon Emissions Reduction Act. As required by the Assembly Bills, the California Energy Commission published "Guidelines for Certification of Combined Heat and

[1] See http://docs.cpuc.ca.gov/PUBLISHED/FINAL_DECISION/64072.htm

Power Systems Pursuant to the Waste Heat and Carbon Emissions Reduction ACT, Public Utilities Code, Section 2840 ET SEQ.", modified in January 2010. In their guidelines, the California Energy Commission utilized MWh useful energy output as the unit of activity for cogeneration units. To be consistent with the CEC guideline, the emissions factor per unit of activity chosen for cogeneration operations will be expressed as lb-CO_2e/useful energy output (MWh).

The unit of activity, represented in equation form, is shown below:

$$\text{Unit of Activity} = \frac{\text{lb} - \text{CO}_2\text{e}}{\text{Useful Energy Output(MWh)}}$$

The useful energy output is the sum of the useful electrical energy, useful thermal energy, and useful mechanical energy generated by a cogeneration plant, each expressed in units of MWh. Useful thermal energy and useful mechanical energy are typically not measured in units of MWh. The following conversion factors are used to convert useful thermal energy and useful mechanical energy into MWh.

Useful Thermal Energy Conversion Factor: 1 MWh / 3.412 MMBtu
Useful Mechanical Energy Conversion Factor: 1 MWh / 1,341 hp-hr

D. Baseline Emission Factor Determination

Pursuant to SB 1368, in 2007 the California Public Utilities Commission adopted an interim greenhouse gas Emissions Performance Standard (EPS)[2] of 1,100 pounds of carbon dioxide equivalent (CO_2e) per megawatt hour of useful energy. Pursuant to the rulemaking document,

> *"Based on the record in this proceeding, we find that this level reflects the intent of the Legislator to base the EPS on representative combined cycle gas turbine emission rates. As discussed in this decision, a 1,100 lbs/MWh standard reasonable accounts for potential CCGT plant "outliers" from the average data on CCGT emission rates to accommodate those units that utilize dry cooling technologies, are smaller-sized facilities, or are located in the desert or at high altitudes. At the same time, our adopted level avoids establishing a performance standard that is representative of the most inefficient, older CCGT power plants currently in operation…"*

In other words, CPUC determined that the 1,100 lbs/MWh standard was representative of the baseline emissions level for the time period they evaluated. Further investigation of the CPUC's rulemaking shows that the

[2] See http://docs.cpuc.ca.gov/PUBLISHED/FINAL_DECISION/64072.htm

1,100 lb-CO_2e/MWh emission standard adopted by the California Public Utilities Commission was based on 2004/2005 baseline data and is applicable to cogeneration plants. Since the population of cogeneration plants does not change significantly from year to year, it is assumed that the 2004/2005 baseline data would closely resemble the 2002 – 2004 baseline data, and the 1,100 lbs-CO_2e/MWh value is an appropriate baseline emissions factor. It should be noted that other GHG emissions from cogeneration systems, such as N_2O and CH_4, were determined by PUC to be insignificant compared to the greenhouse gas contribution of CO_2 emissions.

Additionally, the California Energy Commission (CEC) has developed certification guidelines for combined heat and power (CHP) systems. Pursuant to their draft modified "Guidelines for Certification of Combined Heat and Power Systems Pursuant to the Waste Heat and Carbon Emissions Reduction Act, Public Utilities Code, Section 2840 ET SEQ." (January 2010)[3], the greenhouse emissions standard for certification of a CHP system is 1,100 lb-CO_2e/MWh.

Based on the CPUC and CEC determinations, the baseline emissions factor for this cogeneration BPS is determined to be 1,100 lb-CO_2e/MWh of useful energy. Note, this baseline emissions factor will be applied to all of the topping cycle cogeneration subcategories covered by this BPS (natural gas-fired IC engines, natural gas-fired turbines, and oilfield natural gas-fired turbines).

STEP 2. List Technologically Feasible GHG Emission Control Measures

The following findings or considerations are applicable to topping cycle cogeneration systems:

Two methods of determining the applicable GHG emissions Best Performance Standard for cogeneration units were examined. The first method considered is to perform a detailed analysis to determine the possible GHG control measures for each possible cogeneration system component. While this method could result in the most efficient cogeneration system possible, pinning down specific performance parameters would be very difficult since cogeneration systems often include custom components that are specifically tailored to meet the unique heat and power generation demands of each installation.

The second method considered is to evaluate each entire cogeneration system and determine the lb-CO_2e/MWh rating for each whole system. This approach would result in the development of a single BPS emissions standard for a cogeneration system, rather than specifying efficiency requirements for individual cogeneration system components. This second method has been chosen for development of the cogeneration BPS for the following reasons:

[3] http://energy.ca.gov/2009publications/CEC-200-2009-016/CEC-200-2009-016-CMF-REV1.PDF

1. This method is consistent with the approach used by the California Public Utilities Commission to adopt their interim GHG emissions performance standard.
2. This approach is consistent with that used to develop the certification requirements for combined heat and power systems that have been adopted by the California Energy Commission.
3. CPUC and CEC have already developed a framework for determining and enforcing an overall GHG emissions performance standard.
4. This approach allows for flexibility in the design of custom cogeneration components.

The following GHG Control Measures, or in this case potential emission standards, have been identified for each subcategory of the topping-cycle cogeneration system class of emission unit.

Natural Gas-Fired IC Engines

Based on a review of available technology and with consideration of data supplied from industry, manufacturers, and other members of the public, the following is determined to be the technologically feasible GHG emission reduction measures for the topping cycle cogeneration class and category, Natural Gas-Fired IC Engines subcategory:

Technologically Feasible GHG Control Measures for a *Topping-Cycle Cogeneration Plant – Natural Gas-Fired IC Engine*	
Control Measure	**Qualifications**
Emissions Performance Design Standard of 1,100 lb-CO_2e per MWh of Useful Energy at ISO Conditions	This proposed emissions level is identical to the emissions performance standard adopted by the CPUC for cogeneration units and identical to the emissions performance standard for certification of a combined heat and power system with the CEC.
Emissions Performance Design Standard of 700 lb-CO_2e per MWh of Useful Energy at ISO Conditions	This proposed emissions level is based on the results of the District's survey of existing natural gas-fired IC engine cogeneration plants located within the SJVAPCD, allowing for some variation of GHG emissions between cogeneration plant designs and utilization. For a copy of the survey results, please refer to Appendix V.

None of the identified GHG emission standards listed above is expected to result in an increase in emissions of criteria pollutants.

Natural Gas-Fired Turbines

Based on a review of available technology and with consideration of data supplied from industry, manufacturers, and other members of the public, the following is determined to be the technologically feasible GHG emission reduction measures for the topping cycle cogeneration class and category, Natural Gas-Fired Turbines category, not including oilfield cogeneration turbines:

Technologically Feasible GHG Control Measures for a *Topping-Cycle Cogeneration Plant – Natural Gas-Fired Turbine (not including oilfield cogeneration turbines)*	
Control Measure	**Qualifications**
Emissions Performance Design Standard of 1,100 lb-CO_2e per MWh of Useful Energy at ISO Conditions	This proposed emissions level is identical to the emissions performance standard adopted by the CPUC for cogeneration units and identical to the emissions performance standard for certification of a combined heat and power system with the CEC.
Emissions Performance Design Standard of 800 lb-CO_2e per MWh of Useful Energy at ISO Conditions	This proposed emissions level is based on the results of the District's survey of existing turbine cogeneration plants (not including oilfield cogeneration) located within the SJVAPCD, allowing for some variation of GHG emissions between cogeneration plants. For a copy of the survey results, see Appendix VI.

None of the identified GHG emission standards listed above is expected to result in an increase in emissions of criteria pollutants.

Oilfield Natural Gas-Fired Turbines

Based on a review of available technology and with consideration of data supplied from industry, manufacturers, and other members of the public, the following is determined to be the technologically feasible GHG emission reduction measures for the topping cycle cogeneration class and category, Natural Gas-Fired Turbines (oilfield cogeneration units) category:

Technologically Feasible GHG Control Measures for a ***Topping-Cycle Cogeneration Plant – Oilfield Natural Gas-Fired Turbine***	
Control Measure	**Qualifications**
Emissions Performance Design Standard of 1,100 lb-CO_2e per MWh of Useful Energy at ISO Conditions	This proposed emissions level is identical to the emissions performance standard adopted by the CPUC for cogeneration units and identical to the emissions performance standard for certification of a combined heat and power system with the CEC.
Emissions Performance Design Standard of 800 lb-CO_2e per MWh of Useful Energy at ISO Conditions	This proposed emissions level is based on the results of the District's survey of existing oilfield turbine cogeneration plants located within the SJVAPCD, allowing for some variation of GHG emissions between cogeneration plants. For a copy of the survey results, see Appendix VII.[4]

None of the identified GHG emission standards listed above is expected to result in an increase in emissions of criteria pollutants.

[4] Note, while some oilfields have emission levels lower than 600 lb-$CO_{2,equivalent}$/MWh, there was noticeable variation in the GHG emissions of cogeneration plants from one oilfield to the next, and even between identical units located in the same oilfield. This variation is believed to be caused by differences in the type and temperature of incoming feedwater available at each site, the size of the cogeneration unit that may be utilized at each site, and the varying utilization rates of each specific cogeneration unit. The 800 lb-$CO_{2,equivalent}$ value was chosen as it allows for variation in these parameters, which individual facilities may not be able to control (I.E. feedwater availability or size of the cogeneration unit).

STEP 3. Identify all Achieved-in-Practice GHG Emission Control Measures

For all technologically feasible GHG emission reduction measures, all GHG reduction measures determined to be Achieved-in-Practice are identified. Achieved-in-Practice is defined as any equipment, technology, practice or operation available in the United States that has been installed and operated or used at a commercial or stationary source site for a reasonable period of time sufficient to demonstrate that the equipment, the technology, the practice or the operation is reliable when operated in a manner that is typical for the process. In determining whether equipment, technology, practice or operation is Achieved-in-Practice, the District will consider the extent to which grants, incentives or other financial subsidies influence the economic feasibility of its use.

<u>Natural Gas-Fired IC Engines</u>

Based on a review of available technology and with consideration of input from industry, manufacturers and other members of the public, the following is determined to be the Achieved-in-Practice GHG emission reduction measures for this class and category:

Achieved-in-Practice GHG Control Measures for a *Topping-Cycle Cogeneration Plant – Natural Gas-Fired IC Engine*

Control Measure	Achieved-in-Practice Qualifications
Emissions Performance Design Standard of 1,100 lb-CO_2e per MWh of Useful Energy at ISO Conditions	This proposed emissions level is identical to the emissions performance standard adopted by the CPUC for cogeneration units and identical to the emissions performance standard for certification of a combined heat and power system with the CEC. Therefore, this emissions level is considered Achieved in Practice.
Emissions Performance Design Standard of 700 lb-CO_2e per MWh of Useful Energy at ISO Conditions	Several existing engines identified in the District's survey (Appendix IV) of natural gas-fired IC engine cogeneration systems are currently operating at levels below this emissions level. Therefore, this emissions level is considered Achieved in Practice.

Natural Gas-Fired Turbines (not including oilfield cogeneration units)

Based on a review of available technology and with consideration of input from industry, manufacturers and other members of the public, the following is determined to be the Achieved-in-Practice GHG emission reduction measures for this class and category:

Achieved-in-Practice GHG Control Measures for a *Topping-Cycle Cogeneration Plant – Natural Gas-Fired Turbine (not including oilfield cogeneration turbines)*	
Control Measure	**Achieved-in-Practice Qualifications**
Emissions Performance Design Standard of 1,100 lb-CO_2e per MWh of Useful Energy at ISO Conditions	This proposed emissions level is identical to the emissions performance standard adopted by the CPUC for cogeneration units and identical to the emissions performance standard for certification of a combined heat and power system with the CEC. Therefore, this emissions level is considered Achieved in Practice.
Emissions Performance Design Standard of 800 lb-CO_2e per MWh of Useful Energy at ISO Conditions	Several existing turbines identified in the District's survey (Appendix V) of natural gas-fired turbine cogeneration plants are currently operating at levels below this emissions level. Therefore, this emissions level is considered Achieved in Practice.

Oilfield Natural Gas-Fired Turbines

Based on a review of available technology and with consideration of input from industry, manufacturers and other members of the public, the following is determined to be the Achieved-in-Practice GHG emission reduction measures for this class and category:

Achieved-in-Practice GHG Control Measures for a ***Topping-Cycle Cogeneration Plant – Oilfield Natural Gas-Fired Turbine***	
Control Measure	**Achieved-in-Practice Qualifications**
Emissions Performance Design Standard of 1,100 lb-CO_2e per MWh of Useful Energy at ISO Conditions	This proposed emissions level is identical to the emissions performance standard adopted by the CPUC for cogeneration units and identical to the emissions performance standard for certification of a combined heat and power system with the CEC. Therefore, this emissions level is considered Achieved in Practice.
Emissions Performance Design Standard of 800 lb-CO_2e per MWh of Useful Energy at ISO Conditions	Several existing turbines identified in the District's survey (Appendix VI) of oilfield natural gas-fired turbine cogeneration plants are currently operating at levels below this emissions level. Therefore, this emissions level is considered Achieved in Practice.

STEP 4. Quantify the Potential GHG Emission and Percent Reduction for Each Identified Achieved-in-Practice GHG Emission Control Measure

A. Basis and Assumptions:

No assumptions are necessary as the candidate emission performance standards are already in units of GHG emissions per unit of activity.

B. Calculation of Potential GHG Emissions per Unit of Activity (G_a):

The candidate emission performance standards are already in units of GHG emissions per unit of activity.

C. Calculation of Potential GHG Emission Reduction as a Percentage of the Baseline Emission Factor (G_p):

Natural Gas-Fired IC Engines

The following table shows the GHG Emission Reduction Percentage Calculations for each Achieved-in-Practice GHG emission control measure.

GHG Emission Reduction Percentage for Control Measures for a *Topping-Cycle Cogeneration Plant – Natural Gas-Fired IC Engine*	
Control Measure	**Percent GHG Reduction from Baseline**
Emissions Performance Design Standard of 1,100 lb-CO_2e per MWh of Useful Energy at ISO Conditions	$\%\text{Reduction} = \dfrac{1{,}100\,\dfrac{\text{lb}-\text{CO}_2\text{e}}{\text{MWh}} - 1{,}100\,\dfrac{\text{lb}-\text{CO}_{2\text{e}}}{\text{MWh}}}{1{,}100\,\dfrac{\text{lb}-\text{CO}_{2\text{e}}}{\text{MWh}}} \text{x}100\%$ Emission Reduction = 0%
Emissions Performance Design Standard of 700 lb-CO_2e per MWh of Useful Energy at ISO Conditions	$\%\text{Reduction} = \dfrac{1{,}100\,\dfrac{\text{lb}-\text{CO}_2\text{e}}{\text{MWh}} - 700\,\dfrac{\text{lb}-\text{CO}_{2\text{e}}}{\text{MWh}}}{1{,}100\,\dfrac{\text{lb}-\text{CO}_{2\text{e}}}{\text{MWh}}} \text{x}100\%$ Emission Reduction = 36.4%

Natural Gas-Fired Turbines (not including oilfield cogeneration units)

The following table shows the GHG Emission Reduction Percentage Calculations for each Achieved-in-Practice GHG emission control measure.

GHG Emission Reduction Percentage for Control Measures for a *Topping-Cycle Cogeneration Plant – Natural Gas-Fired Turbine (not including oilfield cogeneration turbines)*	
Control Measure	**Percent GHG Reduction from Baseline**
Emissions Performance Design Standard of 1,100 lb-CO_2e per MWh of Useful Energy at ISO Conditions	$\%\text{Reduction} = \dfrac{1{,}100\,\dfrac{\text{lb}-\text{CO}_2\text{e}}{\text{MWh}} - 1{,}100\,\dfrac{\text{lb}-\text{CO}_{2\text{e}}}{\text{MWh}}}{1{,}100\,\dfrac{\text{lb}-\text{CO}_{2\text{e}}}{\text{MWh}}}\ \text{x}100\%$ Emission Reduction = 0%
Emissions Performance Standard of 800 lb-CO_2e per MWh of Useful Energy	$\%\text{Reduction} = \dfrac{1{,}100\,\dfrac{\text{lb}-\text{CO}_2\text{e}}{\text{MWh}} - 800\,\dfrac{\text{lb}-\text{CO}_{2\text{e}}}{\text{MWh}}}{1{,}100\,\dfrac{\text{lb}-\text{CO}_{2\text{e}}}{\text{MWh}}}\ \text{x}100\%$ Emission Reduction = 27.3%

Oilfield Natural Gas-Fired Turbines

The following table shows the GHG Emission Reduction Percentage Calculations for each Achieved-in-Practice GHG emission control measure.

GHG Emission Reduction Percentage for Control Measures for a *Topping-Cycle Cogeneration Plant – Oilfield Natural Gas-Fired Turbine*	
Control Measure	**Percent GHG Reduction from Baseline**
Emissions Performance Design Standard of 1,100 lb-CO_2e per MWh of Useful Energy at ISO Conditions	$\%\text{Reduction} = \frac{1{,}100\frac{\text{lb}-\text{CO}_2\text{e}}{\text{MWh}} - 1{,}100\frac{\text{lb}-\text{CO}_{2\text{e}}}{\text{MWh}}}{1{,}100\frac{\text{lb}-\text{CO}_{2\text{e}}}{\text{MWh}}} \text{x}100\%$ Emission Reduction = 0%
Emissions Performance Design Standard of 800 lb-CO_2e per MWh of Useful Energy at ISO Conditions	$\%\text{Reduction} = \frac{1{,}100\frac{\text{lb}-\text{CO}_2\text{e}}{\text{MWh}} - 800\frac{\text{lb}-\text{CO}_{2\text{e}}}{\text{MWh}}}{1{,}100\frac{\text{lb}-\text{CO}_{2\text{e}}}{\text{MWh}}} \text{x}100\%$ Emission Reduction = 27.3%

STEP 5. Rank all Achieved-in-Practice GHG emission reduction measures by order of % GHG emissions reduction

Natural Gas-Fired IC Engines

Based on the calculations presented in Section II.4 above, the Achieved-in Practice GHG emission reduction measures are ranked in the table below:

Ranking of Achieved-in-Practice GHG Emission Control Measures for a *Topping-Cycle Cogeneration Plant – Natural Gas-Fired IC Engine*			
Rank	Control Measure	Potential GHG Emission per Unit of Activity (G_a) (lb-CO_2e/ton)	Potential GHG Emission Reduction as a Percentage of the Baseline Emission Factor (G_p)
1	Emissions Performance Design Standard of 700 lb-CO_2e per MWh of Useful Energy at ISO Conditions	700	36.4%
2	Emissions Performance Design Standard of 1,100 lb-CO_2e per MWh of Useful Energy at ISO Conditions	1,100	0%

Natural Gas-Fired Turbines (not including oilfield cogeneration units)

Based on the calculations presented in Section II.4 above, the Achieved-in Practice GHG emission reduction measures are ranked in the table below:

Ranking of Achieved-in-Practice GHG Emission Control Measures for a *Topping-Cycle Cogeneration Plant – Natural Gas-Fired Turbine (not including oilfield cogeneration turbines)*			
Rank	Control Measure	Potential GHG Emission per Unit of Activity (G_a) (lb-CO_2e/ton)	Potential GHG Emission Reduction as a Percentage of the Baseline Emission Factor (G_p)
1	Emissions Performance Design Standard of 800 lb-CO_2e per MWh of Useful Energy at ISO Conditions	800	27.3%
2	Emissions Performance Design Standard of 1,100 lb-CO_2e per MWh of Useful Energy at ISO Conditions	1,100	0%

Oilfield Natural Gas-Fired Turbines

Based on the calculations presented in Section II.4 above, the Achieved-in Practice GHG emission reduction measures are ranked in the table below:

Ranking of Achieved-in-Practice GHG Emission Control Measures for a *Topping-Cycle Cogeneration Plant – Oilfield Natural Gas-Fired Turbines*			
Rank	Control Measure	Potential GHG Emission per Unit of Activity (G_a) (lb-CO_2e/ton)	Potential GHG Emission Reduction as a Percentage of the Baseline Emission Factor (G_p)
1	Emissions Performance Design Standard of 800 lb-CO_2e per MWh of Useful Energy at ISO Conditions	800	27.3%
2	Emissions Performance Design Standard of 1,100 lb-CO_2e per MWh of Useful Energy at ISO Conditions	1,100	0%

STEP 6. Establish the Best Performance Standard (BPS) for this Class and Category

For Stationary Source Projects for which the District must issue permits, Best Performance Standard is – "For a specific Class and Category, the most effective, District approved, Achieved-In-Practice means of reducing or limiting GHG emissions from a GHG emissions source, that is also economically feasible per the definition of achieved-in-practice. BPS includes equipment type, equipment design, and operational and maintenance practices for the identified service, operation, or emissions unit class and category".

Based on the definition above and the ranking given in Table 3 from Section II.5, Best Performance Standard (BPS) for this class and category is determined as:

Best Performance Standards for Topping Cycle Cogeneration Systems

Draft Best Performance Standards for *Topping-Cycle Cogeneration Plants*	
Subcategory	**Control Measure**
Natural Gas-Fired IC Engine	Emissions Performance Design Standard of 700 lb-CO_2e per MWh of Useful Energy at ISO Conditions
Natural Gas-Fired Turbine (not including oilfield cogeneration units)	Emissions Performance Design Standard of 800 lb-CO_2e per MWh of Useful Energy at ISO Conditions
Oilfield Natural Gas-Fired Turbine	Emissions Performance Design Standard of 800 lb-CO_2e per MWh of Useful Energy at ISO Conditions

STEP 7. Eliminate All Other Achieved-in-Practice Options from Consideration as Best Performance Standard

The following Achieved-in-Practice GHG control measure, identified in Section II.4 and ranked in Section II.5 has been eliminated from consideration as Best Performance Standard for each subcategory since the GHG control efficiency that are less than that of the selected Best Performance Standard for each subcategory stated in Section II.6:

- Emissions Performance Design Standard of 1,100 lb-CO_2e per MWh of Useful Energy at ISO Conditions

VI. Public Participation

A draft BPS evaluation was provided for public comment. Public notification was sent on May 10, 2010 to individuals registered with the CCAP list server. The District's notification is attached in Appendix III.

Comments received during the public notice period are presented in Appendix IV. These comments have been used in the development of this BPS.

VII. Appendices

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Appendix I
Public Notice of Intent: Notice

Appendix II
Comments Received During the Public Notice of Intent and Responses to Comments

Comments Received During the Public Notice of Intent and Responses to Comments

1) **Envirotech Consultants** (From Joe Selgrath. Received February 22, 2010 via email.)

Comment:

There are multiply types of equipment, facility design, and operational characteristics that make establishment of "BPS" difficult. We recommend that the District structure BPS following the existing categories and organization of the District's BACT guidelines.

District Response:

The District agrees that the type of equipment, facility design, and the operational characteristics must be considered when establishing BPS for cogeneration systems. Accordingly, the cogeneration class and category of source has been split into subcategories. This specific BPS determination is limited to the most commonly permitted cogeneration systems, which are topping-cycle cogeneration units that utilize natural gas fuel and a turbine or internal combustion engine. Additional cogeneration subcategories, such as cogeneration units fired on waste gas, will be addressed in future BPS determinations.

Comment:

BPS is already in effect for new sources through the District's BACT guidelines. BACT standards achieve reductions in priority pollutants from operation of specified equipment and processes. BACT standards, by their nature, improve the energy efficiency of affected equipment i.e. through combustion controls, increased maintenance, and periodic combustion monitoring. For these reasons (and others) BPS should be equivalent to BACT for this category and type of source.

District Response:

While the District's current BACT requirements for cogeneration equipment may indirectly impact the fuel efficiency for a cogeneration unit, the District BACT requirements have no impact on other factors that can influence GHG emission rates, such as heat recovery steam generator thermal efficiencies. Therefore, the BACT requirements for criteria pollutants are not suitable for use as a BPS standard.

Comment:

BPS needs to provide exemptions for small sources of GHG emissions. EPA is proposing a threshold of 25,000 MT CO2e, and a similar threshold should be part of any BPS determination.

District Response:

A significance threshold, such as the 25,000 MT CO2e threshold you mention, was explored by the District; however a numerical threshold could not be established. As detailed further in the Districts Final CEQA GHG Staff Report, the District concluded that it is not feasible to scientifically establish a numerical threshold that supports a determination that GHG emissions from a specific project, of any size, would or would not have a significant impact on global climate change.

Comment:

Cogeneration facilities are already inherently energy efficient. The combined energy and electrical production efficiency is variable and depends on facilities electrical demand and thermal demand.

District Response:

The District agrees that cogeneration facilities can be energy efficient and that the combined energy and electrical production efficiency is variable. The District considered these factors in determining the BPS standards for cogeneration units.

2) Berry Petroleum (From John Ludwick, Regulatory Compliance Specialist. Received February 23, 2010 via email.)

Comment:

In my opinion, the District cannot receive adequate information to form BPS without first meeting with industry and their representatives to discuss what the baseline period equipment is. A blanket request for information will only create confusion and the submittal of information that can only be applied to a single company. Once the District understands the difference not only between industry types, but the differences within the same industry, can the District begin receiving adequate information to form an achievable and economical BPS.

District Response:

The District has received adequate information to form BPS for the cogeneration subcategories addressed in this BPS determination, and the BPS standards are achievable.

3) **City of Fresno Department of Public Utilities** (from Stephen A. Hogg, Assistant Director of Public Utilities, Wastewater. Received March 8, 2010 via mail.)

Comment:

We disagree with the District's approach to consider CO emissions as being equivalent to CO2 for greenhouse gas purposes; and, the District's reasoning that, while CO is not a greenhouse gas, it is converted to CO2 in the atmosphere.

District Response:

The District's final CEQA GHG staff report did not identify CO as a greenhouse gas (GHG) and CO emissions were not considered as GHG's in the development of this BPS.

4) **LA County Sanitation Districts (Gregory M. Adams, Assistant Departmental Engineer. Received March 4, 2010 via email.)**

Comment:

AB 32 has interwoven a highly complex array of energy regulations with potentially conflicting elements such as a scoping plan goal of 4000 MW of CH&P distributed north and south, existing renewable portfolio standard (RPS) legislative mandates, proposed renewable efficiency standards (RES) per the Governor's recent Executive Order and the low carbon fuel standard (LCFS), all within a declining balance, cap and trade program, most of whose regulatory entities (those with surrender obligations) are entities also targeted for additional, individual command and control regulations. At this point, we are of the opinion (and "we" are simply a local government potential digester gas/landfill gas producer) that if you suggest more than "Do the best job you can energy-efficiency-wise on your cogeneration project" that San Joaquin will also have added to the morass of mandates that have/will befall the electrical generation industry, both large and small players.

It seems Catch-22ish to us to require CHP schemes to comply with overall Scoping Plan goals and then, in turn, to go and regulate those same CHP facilities from a best performance standards viewpoint to achieve another, somewhat different goal. It seems to us that you need a very deep appreciation of the interplay that is happening in Sacramento at the CPUC, the CEC and CARB levels on the energy regulation front before you go wading into those deep waters with anything but the simplest requirements.

District Response:

Please note, the District took the complex CPUC, CEC, and CARB energy regulations into consideration while developing the BPS for cogeneration units. The District's BPS is based upon achieved-in-practice GHG emission levels for existing cogeneration units, which is roughly equivalent to "do the best you can energy-efficiency-wise on your cogeneration project". Additionally, it should be noted the BPS is a streamlined process to determine significance for CEQA. An applicant also has the options to demonstrate a 29% reduction in project specific GHG emissions or to deem the project significant for GHG emissions under CEQA, neither of which requires a project to meet BPS.

Comment:

CARB staff stated many times during the Scoping Plan process that criteria pollutant emissions reductions would always trump GHG reductions. We are concerned that given SJAPCD strict NOx standards, truly very little technology exists that makes a small cogenerator viable. After the latest round of rulemaking on R1110.2 and BACT determinations at the South Coast as an example, essentially only fuel cells, a Mitsui 1.5 catalyst line combustion turbine (that cannot be used with waste gas fuels) and microturbines are the only viable distributed generation prime movers. Fuel cells, for instance, in addition to their prohibitive costs, require an appropriate heat sink, like a nearby building, for the best power/heat match. These criteria pollutant-driven considerations are clearly understood by project developers whose projects won't benefit much from another regulatory GHG constraint.

District Response:

During the determination of BPS for cogeneration units, the District also considered criteria pollutant emission reductions to always trump GHG emission reductions. The proposed BPS for the cogeneration subcategories in this BPS determination are based on achieved in practice GHG emission levels, while units are meeting the current NOx regulations. Therefore, the District believes that the cogeneration BPS will not be a significant constraint for the class and category of cogeneration operations addressed by this determination. Please note, this determination was limited in scope to natural gas-fired turbines and IC engines. Cogeneration units, such as fuel cells and microturbines, will be addressed in future BPS determinations.

Comment:

Be aware, that for all practical purposes, the offset creation and use provisions set forth in the cap and trade preliminary draft rule (PDR) are so onerous and top-heavy with requirements, we seriously doubt if anyone in the waste industry (with its tremendous renewable energy potential) would undertake the risk to create the offset and then sell/use it in the marketplace. Among the many hurdles to creating an offset (a reputed safety valve on the C&T program to prevent runaway costs), per Page 63 of the PDR, potential projects must address public health, social, economic, and energy effects and address activity-shifting and market-shifting leakage, among many other things. These are complex analyses for a small cogenerator to undertake and coupled with rigorous protocols that must be followed (recently withdrawn, by the way, because they were not of sufficient regulatory quality), we truly wonder what the future of cogeneration is in California. As a final thought, we seriously hope that any BPS developed by the SJVAPCD will not thwart any “additionality” determination for an offset credit.

District Response:

The District believes that the BPS will not thwart any “additionality” determination for an offset credit.

Appendix III
Public Participation: Notice

Appendix IV
Comments Received During the Public Participation Process and Responses to Comments

1) **California Wastewater Climate Change Group** (From Jackie Kepke, Program Manager. Received May 10, 2010 via email.)

Comment:

Biogas Combustion in Lieu of Fossil Fuel Combustion should be considered as Alternative Strategy in the BPS

The SJVAPCD Final Staff Report, Addressing Greenhouse Gas Emissions Impacts under the California Environmental Quality Act, recognizes that renewable fuels reduce GHG emissions when they displace fossil-fuels. Furthermore, in the California Low Carbon Fuel Standard life-cycle analysis of alternative fuels, landfill gas has the lowest carbon intensity pathway of nearly every other fuel. Accordingly, we respectively request the SJVAPCD consider the use of renewable fuels as a potential alternative BPS for co-generation units.

The Final Staff Report (page 92) mentions that biogas combustion in lieu of fossil fuels could be considered as an alternative technology. However, it also mentions that this option has not been achieved-in-practice. Contrary to that report, there is a long history of biogas combustion in many co-generation units such as engines, turbines, etc., pioneered at landfills and wastewater treatment plants throughout California. We encourage the District to investigate these existing facilities and further encourage and reward the productive use of biogas fuels.

District Response:

This determination was limited to natural gas-fired units, which are the most commonly permitted cogeneration units within the SJVUAPCD. Future BPS determinations will address biogas-fired cogeneration units for landfills and wastewater treatment facilities, as necessary.

Comment:

The Proposed BPS is an Additional Burden to Distributed Energy Projects

AB-32 has interwoven a highly complex array of energy regulations with potentially conflicting elements such as a Scoping Plan goal of 4000 MW of combined heat and power (CHP); existing renewable portfolio standard (RPS), legislative mandates, proposed renewable electricity standards (RES) per the Governor's recent Executive Order and the Low Carbon Fuel Standard (LCFS) Most regulated entities with surrender obligations within a declining balance, cap and trade program are entities also targeted for additional, individual command and control regulations.

It seems like a Catch-22 situation to require CHP schemes to comply with overall Scoping Plan goals and then, in turn, to regulate those same CHP facilities from a best performance standards viewpoint to achieve another, somewhat different goal. We respectfully request that the District weight carefully the interplay unfolding in Sacramento among the California Public Utilities Commission, California Energy Commission, and CARB on the energy regulatory front before wading into these deep waters with anything but the simplest achievable requirements.

District Response:

Please note, the District took the complex CPUC, CEC, and CARB energy regulations into consideration while developing the BPS for cogeneration units. The District's use of performance based standards is not a requirement but a method of determining significance of project specific GHG emissions using established specifications or project design elements: Best Performance Standards (BPS). The District's BPS is based upon achieved-in-practice GHG emission levels for existing cogeneration units.

Additionally, it should be noted the BPS is a streamlined process to determine significance for CEQA. An applicant also has the options to demonstrate a 29% reduction in project specific GHG emissions (Please note that it is not the applicant decision to deem the project "significant") or to provide GHG emissions reduction credits. Neither of the options require a project to meet the BPS standard.

Comment:

Small Co-generation Units will be Discouraged by the Proposed BPS

In light of the District's increasingly strict NOx standards, truly very little technology exists that makes a small co-generator viable. After the latest round of rulemaking on Rule 1110.2 and BACT determinations at the South Coast Air Quality Management District as an example, essentially only fuel cells and microturbines remain the only viable distributed generation prime movers. In addition to their prohibitive costs, fuel cells require an appropriate heat sink, like a nearby building, for the best power/heat match for small installations. Although small cogeneration projects may achieve the energy efficiency metric, they may fail in complying with other aggressive air quality goals. We ask that the District investigate whether these small projects are indeed, achievable in practice given these myriad constraints.

District Response:

While fuel cells dissipate heat, the amount of heat available for recovery is minimal when compared to the heat available for recovery from turbine or engine cogeneration installations. Therefore, fuel cells are not considered to be viable cogeneration units and have not been included in this class and category of source.

Microturbines were included in the District analysis of turbines. Therefore, the proposed energy efficiency metric for turbine cogeneration systems is applicable to microturbine cogeneration systems.

During the determination of any BPS standard, the District always prioritizes the minimization of criteria pollutants over GHG emission reductions. The proposed BPS standards for the cogeneration subcategories in this BPS determination are based on achieved-in-practice GHG emission levels for units that are meeting current District requirements and current State of California distributed generation requirements. Therefore, the District believes the proposed BPS will not affect the viability of small co-generator projects.

Comment:

Offset Generation Could be Frustrated by this Proposal

Practically speaking, the offset creation and use provisions set forth in the cap and trade preliminary draft rule (PDR) are so onerous and top-heavy with requirements, we seriously doubt if anyone in the waste industry (with its tremendous renewable energy potential) would undertake the risk to create the offset and then sell/use it in the marketplace.

Among the many hurdles to creating an offset (a reputed safety valve on the cap and trade program to prevent runaway costs), per page 63 of the PDR, potential projects must address: public health, welfare, social, economic, and energy effects; and address activity-shifting and market-shifting leakage, among many other things. These are complex analyses for small co-generators to undertake and coupled with the rigorous protocols that must be followed, we truly question the viability of future cogeneration projects in California when new, even stricter protocols are finally adopted. As a final thought, we seriously hope that any BPS developed by SJVAPCD will not thwart any “additionality” determination for offset credits.

District Response:

The District believes that the BPS will not thwart any “additionality” determination for an offset credit.

2) Solar Turbines (From Leslie Witherspoon, Environmental Programs Manager. Received October 21, 2010 via email)

Comment:

The type and operation of cogeneration application is dependent upon the energy needs at a particular facility. In most cogeneration applications, the cogeneration system design is based upon thermal loads. This, by default, maximizes design efficiency. The emissions of GHGs depend on the overall energy efficiency of the total system, which can vary by time of day and season-to-season. It is unclear whether the BPS level is a design standard, continuous standard, or annual average standard. The basis of the level is a critical point as the lb-CO_2e/MWh level for a given prime mover can vary significantly throughout a day, month, season, year based on the electrical and thermal needs of the application. Solar is concerned with the potential negative compliance implications if the standards are not properly represented in the BPS should the BPS levels errantly make their way into an air permitting program.

District Response:

The BPS document has been revised to clarify that the proposed BPS for cogeneration are design standards, referenced to standard ISO conditions. The proposed BPS levels for cogeneration are not continuous or annual average standards.

Comment:

Since it can be shown that there is a net environmental benefit by using cogeneration, the application of cogeneration, regardless of the efficiency, should satisfy regulators. Cogeneration operators will always maximize efficiency for a given application as it directly impacts the bottom line.

District Response:

According to the approved District Policy, "Addressing GHG Emission Impacts for Stationary Source Projects Under CEQA When Serving as the Lead Agency", in determining the BPS standard for a class and category of source the District must "quantify the potential GHG emission reduction, as compared to the baseline GHG emissions factor per unit of activity". This requirement to quantify the potential GHG emission reductions cannot be accomplished without including an efficiency or lb-CO_2e/MWh standard as part of the proposed BPS. Therefore, an efficiency standard, or lb-CO_2e/MWh, is required.

Comment:

The BPS is for topping cycle cogeneration. A variation of topping cycle cogeneration not specifically mentioned in the BPS is "combined cycle" While combined cycle systems are uncommon on gas turbines in our size range, the BPS should not, by default, force the technology into additional review to assess significance per CEQA. In a combined cycle, the input energy first produces electricity and the waste heat is then used to create additional electricity. We are unable to determine from the documentation if the draft BPS considered any "combined cycle" cogeneration cycles when arriving at the 800 lb-CO_2e/MWh so as not to place unnecessary review and project delay upon combined cycle applications.

District Response:

Language has been added to the BPS document to clarify that this BPS does not apply to combined cycle plants. Combined cycle plants will be addressed in a future BPS determination.

Comment:

Solar is concerned with the use of the 1100 lb-CO_2/MWh as "business as usual". The 1100 lb-CO_2e/MWh value is based on a combined cycle power plant. Thus, only the electrical component is represented in the "business as usual" case as currently proposed. In order for a fair comparison to "business as usual", a thermal component's, e.g. onsite boiler, GHG footprint needs to be added to the 1100 lb-CO_2e/MWh electrical component. Alternatively, the "business as usual" case could assume a lb lb-CO_2e/MWh impact of a simple cycle turbine/reciprocating engine with a separate boiler (or other thermal system).

District Response:

Both the California Public Utilities Commission's 1100 lb-CO_2e/MWh standard and the California Energy Commission's 1100 lb-CO_2e/MWh certification standard for combined heat and power systems are applicable to cogeneration units. Therefore, the District believes the 1100 lb-CO_2e/MWh "business as usual" standard is appropriate.

Comment:

The BPS states on page 6… "other GHG emissions from cogeneration systems, such as N_2O and CH_4 were determined by the PUC to be insignificant compared to the greenhouse gas contribution of CO_2 emissions." "Insignificant" is a relative term. CARB's AB32 and EPA's GHG reporting rule essentially use the same N_2O and CH_4 emission factors. The factors are taken from the Intergovernmental Panel on Climate Change, 2006 IPCC Guidelines for National Greenhouse Gas Inventories (2006). These emission factors are used by inventory programs around the world to generically represent N_2O and CH_4 emissions from natural gas combustion.

It is worth noting that the CH_4 emission factor in the reporting programs is **not** representative of CH_4 emissions from combustion turbines or reciprocating engines. While the IPCC factors are used for generic reporting programs, their use should be carefully reconsidered prior to being used in a BPS or other regulatory scheme where any testing and/or compliance is probable.

For example, AP-42 methane estimates for reciprocating engines and combustion turbines are orders of magnitude higher than the IPCC values. Estimates from engine and turbine manufacturers would provide another set of values. While the contribution of CH_4 to the CO_2e total may still be deemed "insignificant", it is not as negligible as the IPCC emission factors infer.

District Response:

The District did not consider the CH_4 and N_2O emission factors to be insignificant. The IPCC CO_2, CH_4, and N_2O emission factors were used to determine the CO_2e emissions from the units surveyed, and in development of the BPS standard. Specific CO_2e emission factors for all of the turbines included in the survey is not available. Therefore, use of an AP-42 or IPCC emission factors is necessary.

While the CH_4 and N_2O AP-42 emission factors for turbines are greater than their IPCC counterparts, the IPCC CO_2 emission factor is greater than the AP-42 CO_2 emission factor. Due to the higher CO_2 emission factor, the CO_2e emission factor when using only IPCC data is greater than the CO_2e emission factor when using only AP-42 data. Therefore, the IPCC emission factors were determined to be the most conservative and are appropriate for establishing the BPS standard.

Comment:

Size of system. Larger facilities generally have higher efficiencies. It's unclear from the draft BPS as to the size of the cogeneration facilities included in the Survey.

District Response:

The size of the cogeneration units, in MMBtu/hr for turbines and HP for IC engines, has been added to the survey tables.

Comment:

The survey volume is inadequate for the non-oilfield combustion turbines. Solar does not agree that a sample size of four captures the wide variety of cogeneration applications. Two of the four non-oilfield combustion turbines exceed the proposed BPS. With this in mind, how was the proposed BPS determined appropriate for this class/category?

District Response:

The District's CEQA policy, defines Achieved-in-Practice as "Any equipment, technology, practice or operation available in the United States that has been installed and operated or used at a stationary source site for a reasonable period of time sufficient to demonstrate that the equipment, technology, practice or operation is reliable when operated in a manner that is typical for the process…". All four of the cogeneration units were determined to be Achieved-in-Practice.
Additionally, the Best Performance Standard is defined as follows: "For a specific Class and Category, the most effective, District Approved, Achieved-In-Practice means of reducing or limiting GHG emissions from a GHG emissions source, that is also economically feasible per the definition of Achieved-in-Practice…".

Pursuant to the above definition of Best Performance Standard, the Best Performance Standard must be set to equal the most effective Achieved-in-Practice means of reducing or limiting GHG emissions. Based on the two cogeneration sites you mention, a GHG emissions rate of 800 lb-CO_2e/MWh was determined to be Achieved-in-Practice; therefore, the proposed BPS of 800 lb-CO_2e/MWh is appropriate despite the small size of the survey.

Comment:

The survey for the oilfield combustion turbines included 36 turbines. Five of the turbines exceed the proposed BPS. Seven of the turbines are just under the proposed BPS. These twelve turbines account for 1/3 of the survey. Essentially, on any given day 1/3 of oilfield turbines would not meet the proposed BPS, again signaling that the proposed BPS is not at the appropriate level for the technology. Here too, Solar is concerned with the potential negative compliance implications if the standards are not properly represented in the BPS should the BPS levels errantly make their way into an air permitting program.

District Response:

The proposed BPS standard is a design standard, not a continuous or annual average standard. Therefore, the turbines in the survey that are just under the proposed BPS meet the BPS standard. Furthermore, the proposed 800 lb-CO_2e/MWh BPS standard was determined to be Achieved-in-Practice; therefore, the proposed BPS standard is appropriate.

Comment:

There are many cogeneration applications that may not be able to meet the draft BPS of 800 lb-CO_2e/MWh. This does not mean that such applications are not efficient or that cogeneration at a proposed facility provides no reduction in GHG or fuel savings. It means, simply, that the proposed facility was designed to achieve the maximum efficiency for the specific application. Solar asks that the final BPS take into consideration the wide variety of cogeneration applications. As such, Solar recommends that the final BPS be set at 1100 lb-CO_2e/MWh.

While many cogeneration applications will far out perform the 1100 lb-CO_2e /MWh standard, the 1100 lb-CO_2e/MWh will allow for a wide variety of cogeneration applications to remain viable in the District. Such a strategy will ultimately reduce criteria and GHG emissions by discouraging separate production of electricity and steam.

District Response:

Pursuant to District policy, the BPS standard must be set at the most effective, District-approved level that has been considered to be Achieved-in Practice. For the two turbine categories, the District has determined that an 800 lb-CO_2e/MWh standard is Achieved-in-Practice.

Keep in mind, proposing to meet a BPS standard is only one of the three options for addressing GHG emissions for CEQA. Another option to demonstrate that a project is not significant for GHG emissions is to demonstrate that project specific emissions would be reduced and/or mitigated by at least 29%, compared to "business as usual". Several methods to mitigate GHG emissions are available, including shutting down other emission units that are currently in use, reducing the GHG emissions from other emission units that are currently in use, providing GHG emission reduction credits, or entering into a Voluntary Emission Reduction Agreement with the District. A third option is to consider the project to be significant for GHG emissions and perform an Environmental Impact Report.

Neither of the alternative options for addressing CEQA require an operator to meet the proposed BPS standard. In other words, the adoption of a 800 lb-CO_2e/MWh standard does not prevent an applicant from proposing a cogeneration system that does not meet the BPS standard. An applicant proposing a 1,100 lb-CO_2/MWh cogeneration system has the options of demonstrating that the project will result in a 29% reduction/mitigation in GHG emissions, or performing an Environmental Impact Report.

3) Engine Manufacturers Association (From Joseph L. Suchecki, Director, Public Affairs. Received October 18, 2010)

EMA has reviewed the proposed Best Performance Standard (BPS) for co-generation facilities, and we appreciated the opportunity to provide comments and recommendations regarding the proposed standards. We believe that adopting a BPS that will serve as a benchmark when co-generation facilities are undergoing a permit review is a suitable way to incorporate greenhouse gas (GHG) emissions considerations into the permitting process. In that regard, we do not believe that the District should establish a traditional GHG emission standard or require a fixed GHG emission reduction requirement for each facility. GHG emissions are fundamentally different than criteria pollutants because there is no specific “emissions control equipment” designed to reduce greenhouse gases. Also, mandating specific levels of GHG reductions may have the unintended consequence of reducing the number of engines that otherwise would have operated with CHP systems, thereby increasing the amount of GHG emissions as a result of those last CHP opportunities. Consequently, it is both necessary and appropriate to apply an alternative approach to seek to achieve any needed GHG reductions.

Although EMA supports cost-effective and feasible GHG emission reductions, EMA has concerns with the proposed BPS for engine-based co-generation facilities. Specifically, we believe that the 700 lbs/MWh standard for natural gas-fired IC engines is too restrictive and may eliminate CHP opportunities for many stationary engines. As a result, the proposed BPS level needs to be raised to 800 lbs/MWh. The reasons supporting this necessary change are as follows:

Comment:

The database used to justify the proposed BPS is very limited, being comprised of only 6 facilities. In that regard, co-generation facilities are developed for many specific purposes and applications, and we do not believe that a sample size of 6 adequately captures the potential range and variety of all applications. The proposed BPS needs to consider a larger sample size of co-generation facilities.

District Response:

The District's CEQA policy, defines Achieved-in-Practice as "Any equipment, technology, practice or operation available in the United States that has been installed and operated or used at a stationary source site for a reasonable period of time sufficient to demonstrate that the equipment, technology, practice or operation is reliable when operated in a manner that is typical for the process…". All the cogeneration options for engines were determined to be Achieved-in-Practice.

Best Performance Standard is defined as follows: "For a specific Class and Category, the most effective, District Approved, Achieved-In-Practice means of reducing or limiting GHG emissions from a GHG emissions source, that is also economically feasible per the definition of Achieved-in-Practice…".

Pursuant to the above definition of Best Performance Standard, the Best Performance Standard must be set to equal the most effective Achieved-in-Practice means of reducing or limiting GHG emissions. Based on the data available to the District, a GHG emissions rate of 700 lb-CO_2e/MWh is Achieved-in-Practice; therefore, the District believes a Best Performance Standard of 700 lb-CO_2e/MWh is appropriate despite the small size of the survey.

Comment:

The emissions of GHGs on a per MWh basis depend on the overall energy efficiency of the total system. For IC engine-based facilities, co-generation typically includes use of the thermal energy created by the engine as well as the electrical output of the generator. Both the opportunity to use the thermal energy and electrical energy generated by the engine are specific to the design and power needs of the facility. In other words, the type of co-generation system installed at a facility is inherently dependent on the energy needs at that particular facility. Those site-specific and case-specific needs will determine how much thermal energy can be used and how much electrical energy can be used. Those energy needs, in turn, will determine the potential maximum efficiency of the cogeneration system. Thus, co-generation facilities are not well-suited to a "one size fits all" approach. Quite to the contrary.

District Response:

The purpose of the BPS standard is to streamline the GHG significance determination as much as possible. A one-size fits all approach was chosen, since this approach results in the most streamlined approach possible for this class and category of source.

While the proposed BPS standard may be a one-size fits all approach, another option to demonstrate that a project is not significant for GHG emissions is to demonstrate that project specific emissions would be reduced and/or mitigated by at least 29%, compared to “business as usual”. This alternative option allows for site-specific and case-specific analyses of cogeneration systems. Therefore, adoption of a one-size fits all BPS standard doesn’t prevent the use of site-specific and case specific approaches to addressing GHG emissions in a project.

Comment:

The foregoing facts are important to consider when establishing a BPS for GHG emissions because not all co-generation facilities can be designed to achieve the same emission limit. One co-generation facility may be able to achieve an extremely high energy efficiency level, and therefore a low greenhouse gas efficiency level on a per unit work basis, because the facility includes a process that can use low-temperature steam or even hot water (e.g., a commercial laundry facility). As a result it can utilize more of the thermal energy generated by the IC engine. Another facility, however, one that can utilize only high temperature steam, simply cannot extract the same amount of thermal energy for use. Thus, while the EMA agrees that some co-generation facilities simply are not capable of meeting that performance standard because they do not have the functional capability to utilize the same energy generated in the same way. The energy efficiency of a co-generation facility is application and site-specific, and this needs to be factored into setting the BPS.

District Response:

As stated in the response to the previous comment, there are multiple approaches to determining the significance of GHG emissions for CEQA. Complying with the BPS is just one option. A one-size fits all approach was chosen for the BPS standard to streamline the BPS option as much as possible. For cases where site specific and case-specific analyses would be necessary, the alternative option of demonstrating that project specific emissions would be reduced and/or mitigated by at least 29%, compared to “business as usual” is available. That option allows for site-specific and case-specific analyses to be factored in.

Comment:

The efficiency of a co-generation facility is also size dependent, with larger facilities generally having a higher efficiency. Smaller facilities may not be capable of achieving the proposed BPS, and it is unclear what size range of facilities the District considered in its database of 6 sites.

District Response:

The size of the cogeneration units, in MMBtu/hr for turbines and HP for IC engines, has been added to the survey tables.

Comment:

In sum, although there are some co-generation facilities that could be able to meet the proposed BPS of 700 lbs/MWh, other facilities will not be able to meet that standard. That does not mean that those facilities are not efficient or that co-generation at those facilities is not of value in reducing fuel consumption and greenhouse gases. It simply means that the co-generation facility was designed to meet the maximum efficiency for its specific application, and that its application is inherently more limited in the amount of thermal energy that can be utilized. As a result, the final BPS for IC engine cogeneration facilities needs to take into consideration a wide variety of applications and energy-saving opportunities in the District.

To address the wide variety of applications and facilities that have the potential to install cogeneration facilities, EMA recommends that the final BPS be set at 800 lbs/MWh. We believe that level will allow a wide variety of applications for CHP and co-generation to remain viable in the District, which will help to promote GHG reductions in a cost-effective and reasonable manner. A BPS of 800 lbs/MWh will allow co-generation in facilities that are not capable of utilizing the highest levels of thermal and electrical energy possible, but can nevertheless achieve significant energy and fuel savings through the installation of CHP units. Further, a BPS of 800 lbs/MWh still represents a substantial 27% GHG reduction compared to the 1100 lbs/MWh established by the PUS, and is comparable to the proposed BPS for gas turbines.

District Response:

Pursuant to District policy, the BPS standard must be set at the most effective, District-approved level that has been considered to be Achieved-in Practice. For the IC engine cogeneration category, the District has determined that a 700 lb-CO_2e/MWh standard is Achieved-in-Practice.

Keep in mind, proposing to meet a BPS standard is only one option for addressing GHG emissions for CEQA. Another option to demonstrate that a project is not significant for GHG emissions is to demonstrate that project specific emissions would be reduced and/or mitigated by at least 29%, compared to “business as usual”. Several methods to mitigate GHG emissions are available, including shutting down other emission units that are currently in use, reducing the GHG emissions from other emission units that are currently in use, providing GHG emission reduction credits, or entering into a Voluntary Emission Reduction Agreement with the District.

Neither of the alternative options for addressing CEQA requires an operator to meet the proposed BPS standard. In other words, the adoption of a 800 lb-CO_2e/MWh standard does not prevent an applicant from proposing a cogeneration system that does not meet the BPS standard. An applicant proposing a 1,100 lb-CO_2e/MWh cogeneration system has the options of demonstrating that the project will result in a 29% reduction/mitigation in GHG emissions.

Appendix V

Survey Results for Natural Gas-Fired IC Engine Cogeneration Systems

Survey Results for Natural Gas-Fired IC Engine Cogeneration Systems

The District conducted a survey of the permitted natural gas-fired IC engine cogeneration systems that are currently located in the District. This survey included the collection of fuel usages, useful electricity production, useful thermal energy production, and useful mechanical energy production. Using the provided information and the conversion factors presented in the main body of this document, the District calculated the CO_2 equivalent emissions per unit of activity for each of the permitted cogeneration units for the facilities that responded to the survey. The District identified ten natural gas-fired IC engine cogeneration operations and obtained information from six of the operations using the survey. Several of these operations include more than one engine. The facilities have asked that the raw data and the identity of the facilities be kept confidential; therefore, only the results of the District's analysis are shown below:

Survey Results for Natural Gas IC Engines (based on current configuration)		
Unit	**lb-CO_2e/MWh**	**Engine Horsepower Rating (HP)**
Confidential Unit #1	816.5	Eight 1,585 HP Engines
Confidential Unit #2	555.3	Four 280 HP Engines
Confidential Unit #3	629.0	One 1,468 HP Engine
Confidential Unit #4	475.0	One 1,375 HP Engine
Confidential Unit #5	687.2	One 1,049 HP Engine
Confidential Unit #6	490.2	Two 108 HP Engines

Appendix VI
Survey Results for Natural Gas-Fired Turbine Cogeneration Systems
(non-oilfield)

Survey Results for Natural Gas-Fired Turbine Cogeneration Systems (non-oilfield)

The District conducted a survey of the permitted natural gas-fired non-oilfield turbine cogeneration systems that are currently located in the District. This survey included the collection of fuel usages, useful electricity production, useful thermal energy production, and useful mechanical energy production. Using the provided information and the conversion factors presented in the main body of this document, the District calculated the CO_2 equivalent emissions per unit of activity for each of the permitted cogeneration units for the facilities that responded to the survey. The District obtained information from four non-oilfield units using the survey. The facilities have asked that the raw data and the identity of the facilities be kept confidential; therefore, only the results of the District's analysis are shown below:

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Survey Results for Natural Gas-Fired Turbines (non-oilfield) (based on current configuration)		
Unit	**lb-CO_2e/MWh**	**Heat Input Rating (MMBtu/Hr)**
Confidential Unit #1	683	173.5
Confidential Unit #2	825	270.0
Confidential Unit #3	809	43.4
Confidential Unit #4	746	458.3

Appendix VII

Survey Results for Oilfield Natural Gas-Fired Turbine Cogeneration Systems

Survey Results for Oilfield Natural Gas-Fired Turbine Cogeneration Systems

The District conducted a survey of the permitted natural gas-fired oilfield turbine cogeneration systems that are currently located in the District. This survey included the collection of fuel usages, useful electricity production, useful thermal energy production, and useful mechanical energy production. Using the provided information and the conversion factors presented in the main body of this document, the District calculated the CO_2 equivalent emissions per unit of activity for each of the permitted cogeneration units for the facilities that responded to the survey. The District obtained information from 36 oilfield cogeneration units using the survey. The facilities have asked that the raw data and the identity of the facilities be kept confidential; therefore, only the results of the District's analysis are shown below:

Survey Results for Oilfield Natural Gas-Fired Turbines (based on current configuration)		
Unit	**lb-CO_2e/MWh**	**Heat Input Rating (MMBtu/Hr)**
Confidential Unit #1	951	453.50
Confidential Unit #2	794	250.30
Confidential Unit #3	794	250.30
Confidential Unit #4	794	250.30
Confidential Unit #5	794	250.30
Confidential Unit #6	794	250.30
Confidential Unit #7	794	250.30
Confidential Unit #8	794	250.30
Confidential Unit #9	571	96.7
Confidential Unit #10	628	96.7
Confidential Unit #11	664	603.4
Confidential Unit #12	960	457.8
Confidential Unit #13	960	457.8
Confidential Unit #14	960	457.8
Confidential Unit #15	952	454.13
Confidential Unit #16	529	235.4
Confidential Unit #17	483	235.4

Confidential Unit #18	533	235.4
Confidential Unit #19	614	48.7
Confidential Unit #20	643	48.7
Confidential Unit #21	593	48.7
Confidential Unit #22	655	72.0
Confidential Unit #23	655	72.0
Confidential Unit #24	639	81.0
Confidential Unit #25	553	920.0
Confidential Unit #26	553	920.0
Confidential Unit #27	553	920.0
Confidential Unit #28	553	920.0
Confidential Unit #29	553	920.0
Confidential Unit #30	553	920.0
Confidential Unit #31	553	920.0
Confidential Unit #32	553	920.0
Confidential Unit #33	518	457.5
Confidential Unit #34	509	467.2
Confidential Unit #35	454	52.7
Confidential Unit #36	492	52.7