San Joaquin Valley
Unified Air Pollution Control District

DRAFT Best Performance Standard (BPS) x.x.xx

Date: 4/20/2010

Class and Category	Thermally Enhanced Oil Recovery (TEOR) Wells
Best Performance Standard	Minimize fugitive GHG emissions by applying leak standards and I&M requirements for components of the identified class and category
Percentage Achieved GHG Emission Reduction Relative to Baseline Emissions	- Components subject to Rule 4401: 28% - Components not subject to Rule 4401: 48%

District Project Number	C-1100392
Evaluating Engineer	Dolores Gough
Lead Engineer	Leonard Scandura
Initial Public Notice Date	April 20, 2010
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Determination Effective Date	TBD

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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 is – 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.

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 TEOR wells as a separate class and category which 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 TEOR Wells			
Phase	**Description**	**Date**	**Comments**
1	Initial Public Process	04/15/10	The District's intent notice and a list of individuals receiving notification are attached as Appendix 1.
2	BPS Development	04/15/10	See Section III of this evaluation document.
3	Public Review	04/20/10	The District's BPS determination notice and a list of individuals receiving notification are attached as Appendix 2.
4	Public Comments	05/14/10	The public comment period ended on the date given. All public comments received and the District's responses are attached as Appendix 3.

III. Class and Category

This class and category applies to thermally enhanced oil recovery wells with vapor control or closed well vents. Sources of VOC as well as GHG emissions are from the casing vents and also from the oil and gas flowing through various components that are part of the piping from the wells to the emission control system. Components include, but not limited to, any valve, fitting, threaded connection, pump, compressor, pressure relief device, flange, process drain, sealing mechanism, hatch, sight glass, meter or seal fluid system in VOC service. VOC emissions from this source is currently limited by the application of leak standards and an inspection and maintenance (I&M) program required by District rule. The application of the rule requirements are expected to also limit GHG emissions, primarily methane.

Current rule exempt certain components such as pressure relief devices, pumps, and compressors that are enclosed and whose emissions are controlled with an operating VOC collection and control system, components buried below ground, those exclusively handling gas/vapor or liquid streams with a VOC content of 10% by weight or less.

The application of the I&M requirements specified in District rules subject to the rules and those components not subject to those rules will result in a reduction of fugitive GHG emissions. Therefore, the BPS considered for this class and category will apply for all components associated with light crude oil and natural gas production/processing, refineries, liquids processing and chemical plants, even those that are not subject to a particular rule requirement.

IV. BPS Development

STEP 1. Establish Baseline Emissions Factor for Thermally Enhanced Oil Recovery (TEOR) Wells

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 in the San Joaquin Valley (SJV), expressed as annual GHG emissions per unit of activity. The Baseline Emission Factor is calculated by first defining an operation which is representative of the average population of units of this type in the SJV during the Baseline Period and then determining the specific emissions per unit throughput for the representative unit.

The following equipment is evaluated under this class and category:

Steam Enhanced Crude Oil Production Wells with Vapor Control or with Closed Well Vents

A. Representative Baseline Operation

For this equipment, the representative baseline operation is based on the number of components of wells that were regulated under the previous leak standard and Inspection & Maintenance (I&M) requirements of Rule 4401 that was in effect during 2002-2004. This rule applies to all steam-enhanced crude oil production wells and any associated vapor collection and control systems. The previous gas leak definition is a reading in excess of 10,000 ppmv, as methane above background, using portable equipment measured in accordance with EPA Method 21. Repair period for any leak was within 15 days with possible extensions. Components include valves, flanges, connectors, open-ended lines, and others.

B. Basis and Assumptions for Baseline Emissions

- *GHG emissions are stated as "CO_2 equivalent (CO_2e) which includes the global warming potential of methane and carbon dioxide emissions associated with gaseous fugitive emissions.*
- *Only direct GHG emissions [methane (CH_4) and carbon dioxide (CO_2)] are produced from the equipment/operation*
- *Fugitive CH_4 and CO_2 emissions will be reduced along with fugitive volatile organic compounds (VOCs) controls*
- *Fugitive gas is 50 % TOC (total organic compound), 31% of which is VOC (Rule 4401 Analysis Staff report assumption, 2006)*
- *Assuming TOC consists only of VOCs and GHG; then GHG is 69% of TOC*
- *The 69% GHG is broken down into approximately of 65.8% CH4 & 3.2% CO2 (projected using the ratio of CH4 (78.8%) to CO_2 (3.8%) content of production gas as listed in the API Compendium manual)*
- *Average TOC EF from EPA's Average Oil & Natural Gas Production Emission Factors (Table 6.12 API Compendium manual)*

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, using the 2002-2004 baseline period as the reference.

GHG emissions, expressed in metric tons CO_2e per well.

D. Calculations

1) Baseline GHG Emissions of Components subject to Rule 4401

Baseline emissions, as shown in the table below, were calculated using the average EPA emission factors, the number of components per well and the estimated percentages of CH_4 and CO_2 in fugitive gas. The number of

components was taken from the Rule 4401 2006 Staff report and represents the baseline period of 2002-2004.

	# Comp/well [A]	Ave TOC EF (Mtons-TOC/hr/comp) [B]	CH_4 EF (Mton/day/well) [C]	CO_2 EF (Mton/day/well) [C]	CO_2e (Mtons/day/well) [D]
Open Vent Connected to Vapor Control					
Valves	4.7	4.50E-06	1.67E-04	2.89E-10	3.51E-03
Flanges	2.7	3.90E-07	8.31E-06	1.25E-12	1.75E-04
Connectors	24.6	2.00E-07	3.88E-05	2.98E-12	8.16E-04
Open-ended Lines	0.1	2.00E-06	1.58E-06	1.21E-12	3.32E-05
Others	0.1	8.80E-06	6.95E-06	2.35E-11	1.46E-04
Sub-Total	***32.2***				***4.68E-03***
Closed Vent					
Valves	1	4.50E-06	3.55E-05	6.14E-11	7.46E-04
Flanges	1	3.90E-07	3.08E-06	4.61E-13	6.47E-05
Connectors	2	2.00E-07	3.16E-06	2.43E-13	6.63E-05
Open-ended Lines	1	2.00E-06	1.58E-05	1.21E-11	3.32E-04
Others	0	8.80E-06	0.00E+00	0.00E+00	0.00E+00
Sub-Total	***5***				***1.21E-03***
Total					**5.89E-03**

[A] average number of components per well from Rule 4401 analysis staff report - Appendix B, 11/14/2006

[B] TOC average emission factors for oil and natural gas production (from API compendium)

[C] Estimated based on listed assumptions;
CH4 (ton/day/well) = (# comp)(Ave TOC EF)(0.5 TOC)(0.658 CH4 or 0.032 CO2) (24 hr/day)

[D] CO2e (ton/day/well) = (CH4 x 21) + CO2

2) Baseline GHG Emissions of Components not subject to Rule 4401 are taken from the 2009 American Petroleum Institute (API) as shown below

Equipment	CH_4 Mton/hr	CO_2 Mton/hr	CO_2e Mton/year	Comments	Reference
Heavy Crude Wellhead – Fugitive	6.63E-07	8.75E-08	0.123	based on 78.8% vol CH_4, 3.78% vol CO_2	2009 API GHG compendium Tables 6-3, E-4
Light Crude Wellhead - Fugitive	1.56E-05	2.06E-06	2.888	based on 78.8% vol CH_4, 3.78% vol CO_2	2009 API GHG compendium Tables 6-3, E-4
Average			**1.506**		

Equipment	CH_4 Mton/mile-hr	CO_2 Mton/mile-hr	CO_2e Mton/mile year	Comments	Reference
Oil Pump Stations	5.49E-08	7.24E-09	0.01	based on 78.8% vol CH_4, 3.78% vol CO_2	2009 API GHG Compendium Table 6-3, E-4

STEP 2. List Technologically Feasible GHG Emission Control Measures

Currently facilities are required by District Rule 4401 to perform annual Inspection and Maintenance (I&M) for controlling VOC emissions. With the performance of I&M, fugitive methane will also be controlled. Therefore, annual I&M is achieved in practice for the control of GHGs as well.

Emissions from the components not subject to Rule 4401, i.e. produced liquid lines beginning at the well head, and components serving streams with VOC content < 10% by weight can also be controlled due to instituting an I&M program (using the same inspection frequencies specified in the requirements of 4401).

For the specific equipment or operation being proposed, all technologically feasible GHG emissions reduction measures are listed, including equipment selection, design elements and best management practices, that do not result in an increase in criteria pollutant emissions compared to the proposed equipment or operation. The following findings or considerations are applicable to this class and category:

a) *Technologically Feasible - Increased Inspection & Maintenance Frequency for Components Subject to Rule 4401 Requirements*

Current requirement is annual inspection and maintenance. Increasing I&M frequency should decrease direct GHG emissions but has not been achieved in practice. This control measure would not result in an increase in emissions of criteria pollutants.

b) *Technologically Feasible - Applying Leak Standards and I&M Requirements to Components Not Subject to Rule 4401 Requirements*

Applying leak standards and I&M requirements to components not subject to Rule 4401 requirements is expected to decrease GHG emissions. This control measure would not result in an increase in emissions of criteria pollutants.

Table 1
Technologically Feasible GHG Control Measures for *TEOR Wells*

Control Measure	Qualifications
Increased I&M frequency for components subject to Rule 4401 requirements	*Increasing I&M frequency for components subject to Rule 4401 requirements will reduce fugitive VOCs and GHG emissions*
Applying leak standards and I&M requirements to components not subject to Rule 4401 requirements	*Applying leak standards and I&M requirements to components not subject to Rule 4401 requirements will reduce fugitive VOCs and GHG emissions from those components*

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.

The following findings or considerations are applicable to this class and category:

- *Rule 4401 that included the provisions of the leak standards effective after 1/1/2009 was amended on December 14, 2006. Operators are required to perform all component inspections, with some exceptions, at least once a year. All affected units are expected to comply with the current rule requirements.*

- *Compliance with Rule 4401 will control fugitive VOCs as well as fugitive GHG emissions*

- *Application of the I&M to all components subject to Rule 4401, and to those components that are not subject to I&M requirements will limit VOCs as well as GHG emission*

- *Increasing the inspection and monitoring to semi-annual has not been implemented at this time. Therefore this option can not be considered to be Achieved-in-Practice.*

Based on a review of available technology, the following is determined to be the Achieved-in-Practice GHG emission reduction measures for this class and category:

Table 2
Achieved-in-Practice GHG Control Measures for *TEOR Wells*

Control Measure	Achieved-Quantifications
Minimize fugitive GHG emissions by applying leak standards and I&M requirements to components subject to Rule 4401 requirements	*Current rule specifies a leak definition of 400 ppmv to 2,000 ppmv for the various components. Repair periods are also specified depending on the severity of the leak.*
Minimize fugitive GHG emissions by applying leak standards and I&M requirements to components not subject to Rule 4401 requirements	*Current rule exempt certain components associated with TEOR wells but leak standards and I&M program are also applicable to these components to reduce GHG emissions*

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

A. Basis and Assumptions:

- *Fugitive gas and direct GHG emissions will be reduced similar to VOC emissions due to change in repair period and leak definition*
- *VOC emissions reduction for each type of component subject to Rule 4401 based on current leak standard is 19 to 56% (Rule 4401 analysis staff report)*
- *TOC average emission factor is adjusted based on the above VOC emissions reduction*
- *A control efficiency of 48% is assumed on TEOR well components not subject to Rule 4401 due to imposition of an I&M program*

B. Current GHG Emissions

1) Current GHG Emissions from Components Subject to Rule 4401

	# Comp/well [A]	Adjusted TOC EF (Mtons-TOC/hr/comp) [B]	CH4 EF (Mton/day/well)[C]	CO2 EF (Mton/day/well [C]	CO2e (Mtons/day/well[D]
Open Vent Connected to Vapor Control					
Valves	4.7	3.23E-06	1.20E-04	1.49E-10	2.52E-03
Flanges	2.7	2.62E-07	5.58E-06	5.62E-13	1.17E-04
Connectors	24.6	1.63E-07	3.16E-05	1.98E-12	6.64E-04
Open-ended Lines	0.1	1.34E-06	1.06E-06	5.44E-13	2.22E-05
Others	0.1	3.91E-06	3.09E-06	4.63E-12	6.48E-05
Sub-Total	***32.2***				***3.39E-03***
Closed Vent					
Valves	1	3.23E-06	2.55E-05	3.17E-11	5.36E-04
Flanges	1	2.62E-07	2.07E-06	2.08E-13	4.34E-05
Connectors	2	1.63E-07	2.57E-06	1.61E-13	5.40E-05
Open-ended Lines	1	1.34E-06	1.06E-05	5.44E-12	2.22E-04
Others	0	3.91E-06	0.00E+00	0.00E+00	0.00E+00
Sub-Total	***5***				***8.55E-04***
Total					**4.24E-03**

[A] average number of components per well from Rule 4401 analysis staff report - Appendix B, 11/14/2006

[B] Adjusted TOC average emission factors for oil and natural gas production (from API compendium) based on VOC reduction reported in Rule 4401 analysis staff report

[C] Estimated based on listed assumptions; CH4 (ton/day/well) = (# comp)(Ave TOC EF)(0.5 TOC)(0.658 CH4 or 0.032 CO2) (24 hr/day)

[D] CO_2e (ton/day/well) = (CH4 x 21) + CO_2

2) Current GHG Emissions from Components Not Subject to Rule 4401

Equipment	CO_2e Mton/year	Comments	Reference
Heavy Crude Wellhead – Fugitive	0.064	based on 78.8% vol CH_4, 3.78% vol CO_2	2009 API GHG compendium Tables 6-3, E-4, and 48% reduction due to I&M
Light Crude Wellhead - Fugitive	1.502	based on 78.8% vol CH_4, 3.78% vol CO_2	2009 API GHG compendium Tables 6-3, E-4, and 48% reduction due to I&M
Average	0.783		

Equipment	CO_2e Mton/mile year	Comments	Reference
Oil Pump Stations	0.005	based on 78.8% vol CH_4, 3.78% vol CO_2	2009 API GHG compendium Tables 6-3, E-4, and 48% reduction due to I&M

C. Calculation of Potential GHG Emission Reduction as a Percentage of the Baseline Emission Factor

1) Components Subject to Rule 4401

% Total Reduction = GHG (baseline) - GHG (current) / GHG (baseline) * 100%
= (5.89E-03) - (4.24E-03) / (5.89E-03) * 100%
= 28 %

2) Components Not Subject to Rule 4401 Requirements

A review of available references did not reveal a control efficiency due to instituting an annual (as specific in Rule 4401) I&M program.

The control efficiency for instituting an I&M program for such components is estimated to be twice the “increase” in control efficiency specified in the staff report for the 11/14/06 amendments to Rule 4401

for strengthening the I&M requirements in Rule 4401. The staff report estimated about 24% VOC emission reduction due to the rule amendments. Therefore, the corresponding reduction in GHG emissions is 48%.

This is a reasonable assumption as the components not subject to Rule 4401 are not currently subject to any I&M requirement. Imposing an I&M requirement for such components for the first time will likely result in a high level of control for such components.

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

Based on the calculations presented in Section II.4 above, the Achieved-in Practice GHG emission reduction measures are ranked in Table 3 below:

Table 3
Ranking of Achieved-in-Practice GHG Emission Control Measures

Rank	Control Measure	Potential GHG Emission per Unit of Activity	Potential GHG Emission Reduction as a Percentage of the Baseline Emission Factor (G_p)
1	*Minimize fugitive GHG emissions by applying leak standards and I&M requirements for components subject to Rule 4401 requirements*	0.0042 Mton-CO_2e per well-day	28%
	Minimize fugitive GHG emissions by applying leak standards and I&M requirements to components not subject to Rule 4401 requirements	0.783 Mton-CO_2e/yr 0.005 Mton-CO_2e/mile/yr	48%

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 Standard for TEOR Wells

Minimize fugitive GHG emissions by applying leak standards and I&M requirements to all components at Thermally Enhanced Oil Recovery Wells (TEOR).

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

The following Achieved-in-Practice GHG control measures, identified in Section II.4 and ranked in Table 3 of Section II.5 are specifically eliminated from consideration as Best Performance Standard since they have GHG control efficiencies which are less than that of the selected Best Performance Standard as stated in Section II.6:

No other Achieved-in-Practice options were identified.