San Joaquin Valley
Unified Air Pollution Control District

Best Performance Standard (BPS) x.x.xx

Date: January 24, 2012

Class	Driers
Category	Direct Fired Lumber Kilns
Best Performance Standard	Heat Input (Fuel use) of no more than 2,500 Btu per pound of moisture removed – for pine or spruce dried from green to 19% moisture (KD-19)
Percentage Achieved GHG Emission Reduction Relative to Baseline Emissions	17%

District Project Number	N-1113701
Evaluating Engineer	Mark Schonhoff
Lead Engineer	Arnaud Marjollet
Public Notice: Start Date	December 23, 2011
Public Notice: End Date	January 20, 2012
Determination Effective Date	January 24, 2012

TABLE OF CONTENTS

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 policy: *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, 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 Process

The District has established direct fired lumber kilns 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 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:

Table 1
BPS Development Process Phases for Direct Fired Lumber Kilns

Phase	Description	Date	Description
1	Public Notice of Intent	12/1/2011	The District's intent notice is attached as Appendix 1
2	BPS Development	12/14/2011	See evaluation document
3	Public Participation Notice	12/23/2011	A Draft BPS evaluation was provided for public comment. The District's notification is attached as Appendix 3
4	Public Participation: End Date	1/20/2012	No comments were received
5	Finalization	1/24/2012	The BPS established in this evaluation document is effective on the date of finalization.

III. Class and Category

Lumber kilns are heated enclosures that are utilized to remove moisture from wood prior to its use and to kill pests. Kilns are most typically heated utilizing indirect heat from boilers but are also heated utilizing direct fired burners or electricity. Since the District BPS Clearinghouse currently includes determinations for boilers, this BPS will apply only to direct fired lumber kilns.

The District is currently preparing a BPS for Process Heaters. A Process Heater is normally considered to be a unit that meets the definition of Process Heater in Rules 4305, 4306 and 4320 (Boilers, Steam Generators and Process Heater Rules). That definition specifically excludes kilns, therefore, that BPS will not apply.

IV. Public Notice of Intent

Prior to developing the 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 December 1, 2011 to individuals registered with the CCAP list server. The District's notification is attached as Appendix 1.

No comments were received during the initial public outreach.

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 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.

A. Representative Baseline Operation

For direct fired lumber kilns, the representative baseline operation has been determined to be a heat requirement of 3,000 Btu's per pound of moisture removed. This determination is based on a survey of kiln manufacturers and is based on pine or spruce 2 x 4 boards dried from green to KD-19 **(kiln dried from green to 19% moisture)**[1].

[1] Telephone conversation with representatives of Kiln Direct Kilns and Better Built Dry Kilns

B. Basis and Assumptions

- All direct GHG emissions are produced by the combustion of natural gas in this unit.

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.

The resulting emissions factor is the combination of
GHG emission reductions achieved through technology, and
GHG emission reductions achieved through changes in activity efficiencies.

GHG emissions are directly proportional to the amount of fuel burned, therefore, reporting the potential GHG emissions per unit of activity is equivalent to reporting it in the terms of Btu per unit of activity

Based on industry standard, the unit of activity commonly used to measure and compare kiln efficiency is the lb of moisture removed.

As a result, for the purpose of comparing efficiency level in term of GHG emissions from kilns, the unit of activity is: ***Btu/lb of moisture removed***.

D. Calculations

The amount of energy required to achieve the desired core temperature and moisture removal depends on the type of wood being dried, the dimensions of the wood being dried, the starting moisture content and the final moisture content. Therefore, because of the number variables involved, accurately establishing a baseline period emission factor in the terms of Btu/lb of moisture removed for all types and dimensions of wood would not be possible. However, from the research conducted, it is known that kilns produced during the baseline period of 2002 through 2004 are capable of achieving a moisture removal rate of about 3,000 Btu/lb [1]. This is based on pine or spruce 2 x 4 boards dried from green to KD-19.

Most end users of dried wood products purchase green wood from a vender, have it transported to a drying facility where it is dried and then have it trucked to their site. An on-site kiln allows a facility to eliminate heavy duty truck miles, which would result in reduced formation of GHG and other pollutants such as NOx.

STEP 2. List Technologically Feasible GHG Emission Control Measures

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:

Facilities that dry wood typically do so for two reasons; the first is to reduce the moisture content such that it does not mold and does not change dimensions once it is placed into service and the second is to heat-treat it sufficiently to kill pests. Heat-treating is a non-fumigation method of complying with the International Standards for Phytosanitary Measures – 15 **(ISPM-15)** standard, which requires the core of the wood to be maintained at 133 degrees F or greater for a period of at least 30 minutes. Two possible technologies were identified. The first is direct-fired heat-and-vent kiln technology and the second is dehumidification type kiln technology. A description of each technology is below:

Direct Fired Heat-and-Vent:

These types of units are equipped with fuel fired burners, vent louvers and heat recovery heat exchangers. During operation, the burners heat the interior of the kiln and cause evaporation of the moisture contained in the wood. During drying, the burners cycle on and off as necessary to maintain the necessary temperature. Once the inside atmosphere reaches a predetermined humidity level, the louvers are opened and the humid air is evacuated through a heat exchanger. Fresh combustion air is then brought in through the heat exchanger where it is preheated prior to being introduced into the burner. This cycle continues until the wood is heated and/or dried to the correct specification. These driers are capable of reaching the temperatures in excess of 160 degrees F and can dry/heat-treat a charge of wood in 16 to 24 hours. With advances in insulation and heat recovery technology since the baseline period, the fuel rates associated with these types of units are typically in the range of 2,000 to 2,500 Btu/lb of moisture removed [1]. This is based on pine or spruce 2 x 4 boards dried from green to KD-19.

Dehumidification Kilns:

These units normally utilize electric heaters in combination with a heat-pump that is located inside of the kiln. The wood is placed inside of the kiln and the interior of the unit heated with the electric heater. As moisture removal from the wood begins, the air becomes humid. At this time, moisture is removed by routing the air through the evaporator portion of the heat pump, reducing the need to vent hot air. The refrigerant is then piped to the compressor for

recycling through the evaporator. The heat generated by the compressor is released inside of the kiln. These types of units are capable of reaching approximately 100 degrees F [2] and can dry a charge of wood in approximately 36 to 48 hours. The drying rates associated with this type of kiln are approximately 800 to 1,000 Btu of electric heat per pound of moisture removed. This is based on pine or spruce 2 x 4 boards dried from green to KD-19.

Conclusion:

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 technologically feasible GHG emission reduction measures for this class and category:

Table 2
Technologically Feasible GHG Control Measures for Direct Fired Lumber Kilns

GHG Control Measures	Qualifications
Direct Fired Heat-and-Vent Kilns	Heat recovery and insulation reduces direct GHG emissions by reducing the amount of fuel required to achieve heating
Dehumidification Kilns	Dehumidification reduces the amount of heated air that must be purged to control the chamber humidity

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.

[2] Representative of Better Built Dry Kilns
Fundamental Aspects of Kiln Drying Lumber, Salim Hiziroglu

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

- Based on an industry survey[1], direct-fired heat-and-vent type kilns that include the heat recovery and insulation required to meet a fuel standard of 2,500 Btu's per pound of moisture removed are currently available. This is based on pine or spruce 2 x 4 boards dried from green to KD-19. Therefore, a fuel standard of 2,500 Btu per pound of moisture removed is Achieved-in-Practice for this category of source.
- Compliance with the ISPM-15 standard is often required for the elimination of pests from the wood. ISPM-15 requires that the core temperature of the wood be maintained at 133 degrees F for a continuous period of at least 30 minutes. Dehumidification type kilns are capable of only about 100 degrees F [2] and are therefore not able provide the heat required to comply with the standard. Therefore, this technology is not considered to be Achieved-in-Practice at this time.

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 measure for this class and category:

Table 3
Achieved-in-Practice GHG Control Measures for Direct Fired Lumber Kilns

GHG Control Measures	Qualifications
Direct Fired Heat-and-Vent Kilns	Kiln capable of meeting a fuel use standard of 2,500 Btu per pound of moisture removed (based on pine or spruce 2 x 4 boards dried from green to KD-19)

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

For each Achieved-in-Practice GHG emission reduction measure identified:
a. Quantify the potential GHG emissions per unit of activity (G_a)
b. Express the potential GHG emission reduction as a percent (G_p) of Baseline GHG emissions factor per unit of activity (BEF)

- Direct Fired Heat-and-Vent Kilns.

A. Basis and Assumptions:

The amount of energy required to achieve the desired core temperature and moisture removal depends on the type of wood being dried, the dimensions of the wood being dried, the starting moisture content and the final moisture content. Therefore, because of the number variables involved, establishing a fuel usage per unit of activity that would apply to all types and dimensions of wood would not be possible. Therefore, this BPS will establish a fuel usage per unit of activity based on pine or spruce 2 x 4 boards dried from green to KD-19. It will be assumed that if a kiln can meet the standard established for this type and dimension of board, then it meets BPS for all types of wood even if it cannot, for example, meet the pine or spruce 2 x 4 standard when drying 12" x 12" pieces.

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

GHG Emissions per Unit of Activity

G_a = 2,500 Btu/lb-moisture removed

From District Policy APR-2015, the GHG emission factor for the burning of natural gas is:

CO_2:		53.06 kg-CO2/MMBtu
CH_4:	(0.005)(24) kg/MMBtu:	0.12 kg-CO_2e/MMBtu
N_2O:	(0.001)(296)kg/MMBtu:	0.30 kg-CO_2e/MMBtu
Total		53.48 kg-CO_2e/MMBtu

Therefore, the 2,500 Btu/lb-moisture removed is equivalent to:

Ga = (2,500 Btu/lb-moisture removed)(53.48 kg CO_2e/10^6 Btu)
X (1,000 g/kg)(lb/453.6 g) = 0.29 lb CO_2e/lb-moisture removed

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

G_p = (BEF – Ga) / BEF
G_p = (3,000 Btu/lb-moisture removed – 2,500 Btu/lb-moisture removed) / (3,000 Btu/lb-moisture removed)
G_p = 17%

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 the table below:

Table 4
Ranking of Achieved-in-Practice GHG Emission Control Measures

Rank	GHG Control Measures	Potential GHG Emission per Unit of Activity (G_a) (lb CO_2e per lb moisture removed) [3]	Potential GHG Emission Reduction as a Percentage of the Baseline Emission Factor (G_p)
1	Fuel Use Standard of 2,500 Btu/ per lb Moisture Removed – based on pine or spruce 2 x 4 boards dried from green to KD-19	0.29	17%

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".

[3] As shown in Step 4.B of this document, 0.29 lb CO2e per lb moisture removed is equivalent to 2,500 Btu/lb moisture removed.

Based on the definition above and the ranking of evaluated technologies, Best Performance Standard (BPS) for this class and category is determined as:

Best Performance Standard for Direct Fired Lumber Kilns

Heat Input (Fuel use) of no more than 2,500 Btu per pound of moisture removed (based on pine or spruce 2 x 4 boards dried from green to KD-19).

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

The following Achieved-in-Practice GHG control measures identified and ranked in the table above are 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 Step 6 of this evaluation:

No other Achieved-in-Practice options were identified.

VI. Public Participation

A Draft BPS evaluation was provided for public comment. Public notification was sent on December 23, 2011 to individuals registered with the CCAP list server. The District's notification is attached as Appendix 3.

VII. Appendices

Appendix 1:	Public Notice of Intent: Notice
Appendix 2:	Comments Received During the Public Notice of Intent and Responses to Comments
Appendix 3:	Notice of Public Participation
Appendix 4:	Comments Received during the Public Participation Process and Responses to Comments

Appendix 1

Public Notice of Intent

Notice of Development Of
Best Performance Standards

NOTICE IS HEREBY GIVEN that the San Joaquin Valley Air Pollution Control District solicits public comment on the development of Best Performance Standards for the following Stationary Source class and category of greenhouse gas emissions:

Direct Fired Lumber Kilns

The District is soliciting public input on the following topics for the subject Class and Category of greenhouse gas emission source:

- Recommendations regarding process or operational activities the District should consider when establishing Baseline Emissions for the subject Class and Category.
- Recommendations regarding processes or operational activities the District should consider when converting Baseline Emissions into emissions per unit of activity.
- Recommendations regarding technologies to be evaluated by the District when establishing control measures applicable to direct sources of greenhouse gas emissions.
- Recommendations regarding technologies to be evaluated by the District when establishing control measures applicable to indirect sources of greenhouse gas emissions.

Information regarding development of Best Performance Standard for the subject Class and Category of greenhouse gas emission source can be obtained from the District's website at http://www.valleyair.org/Programs/CCAP/CCAP_idx.htm.

Written comments regarding the subject Best Performance Standard should be addressed to Mark Schonhoff by email, mark.schonhoff@valleyair.org, or by mail at SJVAPCD, 4800 Enterprise Way, Modesto, CA 95356. All comments must be received by **December 20, 2011**. For additional information, please contact Mark Schonhoff by e-mail or by phone at (209) 557-6448.

Information regarding the District's Climate Action Plan and how to address GHG emissions impacts under CEQA, can be obtained from the District's website at http://www.valleyair.org/Programs/CCAP/CCAP_idx.htm.

Appendix 2

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

No Comments Were Received During the Public Notice of Intent Period.

Appendix 3

Public Participation Notice

The San Joaquin Valley Air Pollution Control District is soliciting public comments on the development of Best Performance Standards (BPS). This email is to advise you the Draft Proposed BPS documents for Dried Fired Lumber Kilns are now available for your review.

- Draft BPS – Dried Fired Lumber Kilns is available here .
- Draft Evaluation - Dried Fired Lumber Kilns is available here.

Written comments should be addressed to Mark Schonhoff by email Mark.Schonhoff@valleyair.org or by mail at SJVAPCD, 4800 Enterprise Way, Modesto, CA 95356 and must be received by January 20, 2012. For additional information, please contact Mark Schonhoff by e-mail or by phone at (209) 557-6448.

Appendix 4

Comments Received during the Public Participation Process and Responses to Comments

No Comments Were Received During the Public Participation Process.