I. SUMMARY

A. Reasons for Rule Development and Implementation

Industrial glass making is a continuous process with raw materials supplied to the furnace at the front end, and product taken off the line at the back end of the process. The raw materials for making glass are silica sand and soda ash. Melting these basic materials and forming them into the desired product geometry creates the final glass product. Beyond that, the different end products vary widely in raw material additives, processing equipment and conditions, and product quality requirements.

During a rule amendment in 2002, the District imposed requirements to limit the amount of excess oxygen ($O_2$) to less than 5% to minimize emissions from glass melting furnaces during a start-up, since the typical add-on controls are not operational. At the time of rule development, oxy-fuel firing was a new technology, and District staff was unaware that the 5% oxygen requirement was incompatible with this new technology. Based on new information, District staff has determined that oxy-fuel firing technology, by design, operates in an oxygen-rich environment in excess of the existing requirement, but still has inherently low NOx emissions during start-up.

The proposed amendments will address this deficiency and allow oxy-fuel fired glass melting furnaces from having to comply with an unnecessary start-up requirement. The San Joaquin Valley is home to seven glass-making facilities and a total of 13 glass melting furnaces subject to Rule 4354 and the proposed amendments will allow these facilities to utilize this distinctive low-NOx firing technology and continue meeting the District’s stringent emission limits. There will be no emissions impact associated with this rule action given the low emissions inherent to oxy-fuel technology.
B. Description of the Project

The purpose of this rule project is to modify a furnace start-up provision to accommodate a particular firing technology. Oxy-fuel firing, meaning replacing the air for burning fuel with an air stream that is mostly or completely O\textsubscript{2}, is a firing technology that has inherently low NOx emissions because the nitrogen has been removed from the air stream.

C. Rule Development Process

District staff held a public workshop on January 13, 2011 in order to present and receive comments on the proposed amendments to Rule 4354. Comments received from affected source operators, consultants, vendors and manufacturers of control technologies, the California Air Resources Board (ARB) and the United States Environmental Protection Agency (EPA) would be evaluated and, if appropriate, incorporated into proposed rule provisions.

The proposed rule and final draft staff report will be published and mailed to affected sources and interested parties prior to a public hearing to consider the adoption of proposed amendments to Rule 4354 by the District Governing Board on May 19, 2011.

II. CLIMATE CHANGE

The California Global Warming Solutions Act of 2006 (AB 32) created a comprehensive, multi-year program to reduce greenhouse gas (GHG) emissions in California, with the overall goal of restoring emissions to 1990 levels by the year 2020. In the coming years, ARB and the Legislature will be developing policies and programs to implement AB 32. The District believes that the evidence and the rationale that climate change is occurring is compelling and convincing. In addition to the long-term consequences of climate change, the District is concerned with the potential ramifications of more moderate but imminent changes in weather patterns. The Valley depends heavily on agriculture for its economy and has developed agricultural practices based on the last several decades of weather patterns. Unanticipated and large fluctuations in these patterns could have a devastating effect on the Valley’s economy.

While there are many win-win strategies that can reduce both GHG and criteria/toxic pollutant emissions, when faced with situations that involve tradeoffs between the two, District staff believes that the more immediate public health concerns that may arise from an increase in criteria or toxic pollutant emissions should take precedence.
III. BACKGROUND

In addition to being the most stringent rule limiting criteria pollutant emissions during normal furnace operation; Rule 4354 outlines the specific requirements to minimize emissions during a furnace start-up. For example, the current rule limits the maximum number of days for start-up based upon the type of glass produced. There is also a direct requirement to bring the emission control systems on-line as soon as technologically feasible.

In addition, operators are required to minimize the amount of excess oxygen in the combustion air during start-up. Minimizing the amount of excess oxygen minimizes the amount of oxygen that would be available to form NOx from a normal combustion air-fuel mixture. However, with oxy-fuel fired furnaces, the combustion air stream in these types of furnaces is essentially pure oxygen (greater than 50% O2). The amount of nitrogen available for conversion to NOx is much lower in an oxy-fuel furnace because nothing except pure oxygen comes in with the combustion air. Therefore, the oxy-fuel firing technology achieves a similar effect in limiting NOx formation during the start-up of a furnace.

As discussed above, oxy-fuel firing was a new technology for glass furnaces and there was no industry experience to draw from when District staff was formulating its emission-minimizing regimen for furnace start-up. PPG Industries was one of the first facilities to install this new technology and, at that time, expressed a concern that oxy-fueled furnaces would be unable to comply with the start-up requirements, but had no supporting data. There have been several other glass melting furnaces that have also installed oxy-fuel firing technology for their glass melting furnaces and have expressed similar concern. Therefore, based on the recent information and the broad applicability of the start-up requirement; District staff is proposing to remove the requirement to meet an excess oxygen limit for oxy-fuel fired glass melting furnaces.

IV. CURRENT RULE 4354 AND PROPOSED AMENDMENTS

A. Current Rule 4354

Rule 4354 was adopted in September 1994, and it was last amended in September 2010. The rule applies to any glass melting furnace, but the rule exempts electric glass furnaces, glass furnaces that are located at a stationary source with a total potential to emit, for all processes, of less than ten tons per year of NOx or less than ten tons per year of volatile organic compounds (VOCs). The current rule limits emission of NOx, VOC, carbon monoxide (CO), oxides of sulfur (SOx) and particulate matter with aerodynamic diameter of 10 micrometers or less (PM10). The emission limits depend on type of glass produced, furnace firing technology and emission averaging period. Table 1 shows the range of emission limits for various pollutants.
Table 1 – Current Rule 4354 Selected Emission Limits

<table>
<thead>
<tr>
<th>Glass Type</th>
<th>NOx lb/ton glass</th>
<th>SOx lb/ton glass</th>
<th>PM10 lb/ton glass</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Current</td>
<td>Future</td>
<td>Current</td>
</tr>
<tr>
<td>Container</td>
<td>4.0</td>
<td>1.5</td>
<td>0.9 - 1.1</td>
</tr>
<tr>
<td>Fiberglass</td>
<td>4.0</td>
<td>1.3 - 3.0</td>
<td>0.9</td>
</tr>
<tr>
<td>Flat (Float)</td>
<td>7.0 - 9.2</td>
<td>2.9 - 3.7</td>
<td>1.2 - 1.7</td>
</tr>
</tbody>
</table>

For detailed requirements, please refer to current Rule 4354, which is available on the District’s website at www.valleyair.org.

B. Proposed Amendments to Rule 4354

1. Section 3.0 – Definitions

Language has been removed from the definition of furnace rebuild that only applied to a compliance schedule in the 2002 version of the rule. Definitions for acronyms have been modified to have the name spelled out before the acronym, except for PM10, which was left as is. Two definitions have been added to improve reader clarity: “oxidant stream” and “standard conditions”.

2. Section 5.5.4 – Length of Start-up

One word, “actual,” would be removed from the provision and replaced by “approved.” The change clarifies the intent of the provision.

3. Section 5.5.5 – Excess Oxygen Limit during Start-up

Section 5.5 specifies the necessary steps to minimize emissions during furnace start-up. The current rule already has a maximum number of days for start-up. The maximum start-up period depends on the type of glass produced. During start-up, there is a direct requirement to bring the emission control systems on-line as soon as technologically feasible. Indirectly, operators are required to minimize the amount of excess $O_2$ in the combustion air during start-up. Minimizing the amount of excess $O_2$ minimizes the amount of $O_2$ that would be available to form NOx from a normal combustion air-fuel mixture. At the very beginning of the start-up, when the emission control systems cannot provide adequate emission control, operators have much more control over how much air is fed into the burners compared to operation of an add-on emission control system.

District staff is proposing that language be added to Section 5.5.5 of the rule to exempt oxy-fuel fired furnaces from the excess oxygen requirement when the furnace’s combustion air is greater than 50% oxygen. The 50% oxygen level was chosen because oxy-fuel fired is defined in the rule as “an operation of a glass melting furnace where greater than 50% of the oxidant for the fuel is provided from enriched oxygen.
In the situation where the operator of an oxy-fuel furnace uses a gas stream that is less than 50% oxygen, the operator would be subject to the limit of 5% excess $O_2$. As previously stated, oxy-fuel firing a control device and reduces NOx by reducing available nitrogen in the combustion air, independent of the amount of excess oxygen.

V. STATE IMPLEMENTATION PLAN (SIP) IMPLICATIONS

EPA has a policy for SIPs regarding excess emissions during malfunctions, start-up, shutdown, and maintenance. While the current rule’s start-up, shutdown, and idling provisions are already approved into the California SIP, because the proposed amendments make changes to the SIP-approved procedures, the start-up section is being re-evaluated in light of the changes. The EPA policy on start-up and shutdown contains seven specific requirements in order for a rule to have an exemption from emission limits during start-up/shutdown. The following paragraphs discuss how the proposed amendments would affect the policy for start-up exemptions set out by EPA.

A. Narrowly-Defined Source Category and Control Technology

- The revision must be limited to specific, narrowly-defined source categories using specific control strategies.

Current Rule 4354 applies to a specific source category – glass melting furnaces. In order to be exempt from the emission limits, the furnaces must be undergoing start-up. The scope of the proposed amendment is limited to glass melting furnaces that are oxy-fuel fired. Further, the proposed amendments cap the exception to the excess-oxygen limit by allowing the exception only when the combustion air meets the definition of oxy-fuel firing.

B. Minimize Impact of Uncontrolled Emissions during Start-up

The EPA policy has four criteria that can be grouped together as aspects of minimizing emissions during start-up. Section 5.5 of the current rule addresses all of these issues.

- Use of the control strategy for this source category must be technically infeasible during start-up or shutdown periods.

In the general sense, add-on emission control systems are not operating during start-up because the furnace exhaust is not hot enough for the control system(s) to work effectively, and therefore, controlling emissions to a specific limit is technically infeasible. Oxy-fuel fired furnaces, however, are inherently controlled during start-up since this process reduces NOx formation in the combustion process.
- The frequency and duration of operation in the start-up or shutdown mode must be minimized to the maximum extent practicable.
- All possible steps must be taken to minimize the impact of emissions during start-up and shutdown on ambient air quality.
- At all times, the facility must be operated in a manner consistent with good practice for minimizing emissions, and the source must have used best efforts regarding planning, design, and operating procedures to meet the otherwise applicable emission limitation.

Operators are required to file a request for start-up detailing how they plan to bring the furnaces from ambient temperature to glass-melting temperature as well as listing all of the interim steps. Additionally the plan must include how the operator intends to minimize emissions during the start-up process. The plan must be approved by the District and EPA prior to beginning the shutdown of the furnace for the repair. In approving the start-up plan, both the District and EPA can evaluate whether the operator has met the requirement to minimize emissions and set the maximum time that the start-up can take. Since glass furnaces must heat tons of sand without heating the furnace so quickly that the insulating refractory cracks or breaks from thermal shock, starting up a glass furnace takes weeks. The EPA criteria listed above are satisfied by Section 5.5 and would not be affected by the proposed amendments.

C. Records for Start-Up
- The owner or operator's actions during start-up and shutdown periods must be documented by properly signed, contemporaneous operating logs, or other relevant evidence.

The current rule requires that an operator notify the District when they are beginning start-up and to keep appropriate documentation to support the claim. Since each facility subject to the rule is different, the exact required records are determined as part of the approval of the start-up plan. The proposed amendment will not change the records required for start-up.

D. Potential Emissions during Start-up
- As part of its justification of the SIP revision, the state should analyze the potential worst-case emissions that could occur during start-up and shutdown.

Oxy-fuel furnaces have NOx control as an inherent part of the combustion system, so the exemption from the 5% excess O$_2$ requirement will not increase NOx emission. Oxy-fuel oxidant streams can contain up to 50% N$_2$ but are more likely to contain less than 5% N$_2$, especially during start-up. Burner manufacturers recommend 100% O$_2$ (or, equivalently, 0% N$_2$) to be used during these times. Using this logic, there is less N$_2$ available for conversion to NOx than an oxidant stream of ambient air, which contains about 79% N$_2$. The proposed amendment to Section 5.5.5 does impose the limit of
excess $O_2$ for those unusual times during start-up when the oxidant stream is not an oxy-fuel stream, thereby protecting the environments as much as is technologically feasible.

Within the District, the oxy-fuel furnaces control SOx and PM10 through the use of an add-on control system. The proposed amendment does not affect other provisions of Section 5.5 to use best efforts regarding planning, design and operating procedures during the start-up period to minimize emissions. Compared to the current SIP-approved start-up provisions, the proposed amendments are not expected to change the level of SOx and PM10 emissions from start-up.

VI. IMPACT OF PROPOSED AMENDMENTS ON OTHER DISTRICT COMMITMENTS

A. Impact of Proposed Amendments on District Attainment Strategies

This rule project is not a control measure in any attainment plan and is not expected to reduce or increase emissions from glass melting furnaces. For these reasons, District staff has concluded that attainment of any ambient air quality standard will not be affected by this rule project. The proposed amendments will not affect either the District’s 2007 Ozone Plan or the District’s 2008 PM2.5 Plan (particulate matter with aerodynamic diameter of 2.5 micrometers or less) because no emission limits have been changed, nor are the amendments expected to affect emissions from this source category.

The federal Clean Air Act (Act) requires that attainment plans meet reasonable further progress (RFP) by achieving incremental emission reductions to ensure attainment of the National Ambient Air Quality Standards (NAAQS) by the attainment date. The Act does not identify specific emission reduction benchmarks that must be met for particulate matter attainment plans. EPA has interpreted the Act’s RFP requirement using the concept of achieving (generally) linear progress toward the standard. The District’s 2008 PM2.5 Plan contains an RFP demonstration. However, the proposed amendments do not have emission reductions associated with them, so it is not expected that the RFP will be affected.

B. Consideration for the Condensable Fraction of PM2.5

Certain high-temperature processes emit gaseous pollutants that rapidly condense into particle form in the ambient air. After January 1, 2011, areas that are nonattainment for the National Ambient Air Quality Standard (NAAQS) for PM2.5 are to consider the condensable fraction of directly emitted PM2.5 for purposes of establishing the emissions limits for:
• Reasonable Further Progress (RFP), in which an area shows continuous reductions of directly emitted PM2.5 and precursors, with sufficient emissions reductions to demonstrate attainment by the applicable deadline
• Reasonably Available Control Technology (RACT) and Reasonably Available Control Measures (RACM), in which a nonattainment area shows that it is adopting technologies and measures reasonably available, considering technical and economic feasibility; sufficient to demonstrate expeditious attainment; and meet RFP.

(Code of Federal Regulations Title 40 Section 51.1002(c))

The District established emissions limits for its attainment, RFP, and RACT/RACM demonstrations in the *2008 PM2.5 Plan* for the PM2.5 NAAQS as set by EPA in 1997. The District continues to evaluate condensable particulates and other directly emitted PM2.5 to improve its PM2.5 emissions inventory for future attainment plan efforts.

This rule project for Rule 4354 was neither included in, nor does it impede, the emissions limits set in the *2008 PM2.5 Plan*. The District is not currently aware of significant uncontrolled condensable PM2.5 emissions or related condensable PM2.5 emissions control technologies for the sources affected by this amendment. Therefore, the District has satisfied any applicable requirement to consider condensable particulates from this source at this time.

**VII. EMISSION REDUCTIONS**

The proposed amendments only affect operations of oxy-fuel fired furnaces during start-up and these operations have inherently low NOx emissions due to the enriched oxygen stream in the combustion air. Therefore, no impact on emissions is anticipated for this rule amendment project.

**VIII. COSTS AND COST EFFECTIVENESS ANALYSIS**

The California Health and Safety Code 40920.6(a) requires District staff to conduct a cost effectiveness analysis of available emission control options prior to adopting each Best Available Retrofit Control Technology (BARCT) rule. The proposed amendments do not implement a new emission limit or other requirement that would change the current emission requirements; therefore, a cost effectiveness analysis was not carried out.
IX. SOCIOECONOMIC IMPACT ANALYSIS

Pursuant to state law, District staff is required to perform a socioeconomic impact analysis prior to adoption, amendment, or repeal of a rule that has significant impacts on air quality or that will strengthen emission limitations. The proposed amendments to Rule 4354 would have not have a significant impact on air quality nor would it strengthen emission limitations, but are only intended to provide operators of oxy-fuel fired furnaces relief from a requirement that does not apply to these furnaces. For this reason, a socioeconomic impact analysis was not performed.

X. ENVIRONMENTAL ASSESSMENT

Pursuant to the California Environmental Quality Act (CEQA), District staff has reviewed the project for potential environmental impacts resulting from the implementation of the project, specifically Section 5.5.5 which exempts oxy-fuel fired furnaces from the excess oxygen requirement when the furnace combustion air exceeds 50% oxygen. Rule 4354 currently contains management practices that would limit excess emission to the extent feasible. The proposed amendments exclude oxy-fuel fired furnaces from a practice that does not apply to firing technologies that do not result in the release of NOx emissions or NOx-forming compounds. Due to the nature of oxy-fuel firing (see Section V for details), NOx emissions from oxy-fuel furnaces will be no greater than if they do not meet current excess oxygen limits. Further, glass furnace start-up is a rare event. For a given furnace, start-up would occur only once every seven to twelve years depending on the type of glass produced and other variables. As such, implementation of the project would not result in an increase in NOx emissions and environmental impacts are negligible.

Greenhouse gas emissions are not expected to increase with the proposed amendments to Rule 4354. The amount of fuel burned during startup will not change if the amendments are adopted, meaning that the amount of carbon dioxide emitted during start-up will not change.

District staff concludes that there is no substantial evidence in the whole record before the District that the proposed amendments to Rule 4354 would cause any adverse effects on the environment. The District finds that the project is exempt per the general rule that CEQA applies only to projects which have the potential for causing a significant effect on the environment (CCR §15061(b)(3)). For these reasons, staff is proposing to file a Notice of Exemption upon Board adoption of the proposed amendments to Rule 4354.
XI. RULE CONSISTENCY ANALYSIS

Prior to adopting, amending, or repealing a rule or regulation, California Health and Safety Code § 40727.2 requires a written analysis that identifies and compares requirements of the proposed rule with corresponding, existing and proposed District rules and corresponding United States Environmental Protection Agency (EPA) rules, regulations, and guidelines. Based on the analysis, District staff concludes that the proposed amendments to Rule 4354 are consistent with other District rules and are not in conflict with these rules. Further, the proposed rule amendments are consistent with EPA rules, regulations, and guidelines that apply to the same source category. The analysis is presented in Appendix B of the Final Draft Staff Report.

XII. REFERENCES


2. Ray C. Yee, “PPG Industries, Inc. – Rule 4354 5.5.5 – Excess O2 on Start-up” – Correspondence dated August 17, 2010
