September 28, 2018

San Joaquin Valley Unified Air Pollution Control District
Central Region Offices
1990 E. Gettysburg Avenue
Fresno, CA 93726

Re: Comments on the Draft 2018 Plan for the 1997, 2006, and 2012 PM2.5 Standards

On behalf of the Glass Packaging Institute (GPI), I am offering the following background and comments to the San Joaquin Valley Unified Air Pollution Control District's (SJVUAPCD) Draft 2018 Plan for the 1997, 2006, and 2012 PM2.5 Standards, referred to throughout our comments as the "Draft Plan."

The glass container manufacturing industry operates three glass container plants in the San Joaquin Valley; Gallo Glass in Modesto, Owens-Illinois (O-I) in Tracy and Ardagh Glass in Madera, all of which would be impacted by changes in reduced NOx emissions. Collectively, these plants employ 2,000 Californians in high-paying, benefits-provided careers.

Our comments primarily focus on the proposed reductions for NOx limits for natural gas-fired container glass melting furnaces, regulated under District Rule 4354. The Draft Plan lowers the allowable NOx emission rates to between 1.0 and 1.2 lb./ton, based on a monthly rolling average. An action date of 2021 for adoption of revisions to Rule 4354 has also been placed into the Draft Plan, with an implementation date of 2024. This proposal is a significant reduction from the current NOx limits for San Joaquin Valley-based glass container furnaces of 1.5 lb./ton, which became effective in 2014.

Background:

NOx is formed from a reaction of nitrogen and oxygen at temperatures above 2300^0 F. Because nitrogen is present in atmospheric air at a concentration of approximately 78% and natural-gas-fired glass container furnaces operate at temperatures well above 2300^0 F to melt sand and other raw materials into glass, NOx is generated in the process.

To some extent, the amount of NOx generated in a glass melting furnace can be reduced by decreasing the amount of nitrogen in the furnace atmosphere surrounding furnace burners and by minimizing the furnace temperature. However, all NOx reduction techniques have limitations. Furthermore, due to the infiltration of ambient air, the amount of oxygen substituted for combustion air,

and electric boost levels, all of which influence the amount of NOx formed, making assurances of reduced levels of NOx is difficult or impossible to provide.

Furnace Types:

The two most widely-used types of natural–gas-fired glass container furnaces are oxyfuel firing and regenerative (non-oxyfuel firing) furnaces. In oxyfuel firing furnace technology, oxygen substitutes for much of the combustion air, reducing the amount of nitrogen in the furnace atmosphere and surrounding the burners, resulting in lower NOx emissions. In an oxyfuel furnace, oxygen at a concentration of over 90% is typically used for combustion.

It is important to note that oxyfuel furnace technology is not an add-on technology to a regenerative glass melting furnace; a regenerative furnace can only be converted to an oxyfuel furnace design during a major furnace re-bricking/rebuild project, which typically occurs only after twelve to fifteen years of continuous operation.

A technique to reduce NOx generation in a regenerative glass melting furnace is oxygen enriched air staging (OEAS). In OEAS, the air-fuel ratio near the burners is reduced, and oxygen-enriched air is added in the lower-temperature exhaust side of the furnace to complete combustion. NOx reductions of up to 25% can be achieved using OEAS, depending on circumstances, but furnace efficiency is reduced.

Glass container plants with regenerative furnaces that use ambient air for combustion, may utilize add-on NOx reduction technology such as selective catalytic reduction (SCR) systems or similar catalyst-embedded ceramic filters to meet the current limit of 1.5 lb. NOx / ton of glass.

The regenerative furnace design captures waste heat in a refractory "checker pack" and preheats combustion air by reversing air flow through the checker pack every 20 minutes or so. During the reversal, NOx levels in the exhaust gases make it difficult to inject the precise amount of ammonia needed in to react with the NOx in the SCR, thus potentially causing direct emissions of unreacted ammonia ("ammonia slip").

NOx reduction in these systems is proportional to the amount of ammonia (NH_3) injected and in contact with the NOx and catalyst, up to the limits of the system's removal efficiency, after which adding additional ammonia will not further reduce NOx. The removal efficiency of both traditional SCR systems and catalyst embedded ceramic filters is approximately 70%. Attempting to drive NOx removal efficiency higher than 70% will also increase the amount of as ammonia slip. Ammonia emissions are one of the major sources of atmospheric NOx and thus the irony of SCR is that one runs the risk of controlling fuel NOx only by creating additional atmospheric NOx.

There is no known technology that will remove 100% of NOx from glass furnace emissions. A regenerative furnace generating 4.5 lb./ton NOx would require a 96% removal efficiency to achieve a limit of 0.2 lb./ton NOx, and control equipment vendors will not guarantee more than about 70% removal efficiency.

A glass container manufacturer can only buy systems that are available, relying upon the vendor's guaranteed performance specifications. The NOx removal efficiency of the catalyst-embedded ceramic filter system is only about 70%.

Additional Considerations:

Prior to installation of any new equipment or technology, the glass container manufacturing companies require sufficient time for planning, equipment specifications, equipment delivery, construction, etc. These improvements are placed into operational budgets years in advance. We request that the District keep this in mind as their air quality plans are being finalized.

We also encourage the district to consider recent "consent decrees", which the US EPA has entered with glass container manufacturers around the country, as they formalize future NOx levels for the industry.

A 2010 consent decree with Saint Gobain had NOx limits set at 1.3 lb./ton, and a 2017 consent decree with Owens-Illinois (O-I) placed the NOx limits at 1.1 lb./ton.

The average of the two decrees is 1.2 lb./ton for NOx. We believe this level is appropriate for future NOx emissions limits for the valley, and is already within the scope of the Draft Plan proposal.

While the glass container industry remains in compliance, achieving limits below the current 1.5 lb./ton remains challenging and often with unintended consequences. The vast majority of emissions-related pollution in San Joaquin valley, contributing to NOx, and therefore Pm2.5, come from mobile sources. Imposition of risky and unproven NOx reduction demands on the glass container industry will not serve to accomplish the goals of the plan, and in fact may create negative unintended consequences.

The District has stated it must reduce PM2.5 emissions to meet requirements imposed by USEPA, and is seeking PM2.5 reductions from wood burning, steak houses and a few other sources. It takes approximately 100 tons of NOx reductions to equal 1 ton of PM2.5 reductions. Given this, we encourage the District to keep in mind other avenues not connected to NOx reductions, in its quest to bring cleaner air to the Valley and its residents.

Conclusion

Glass container manufacturing companies with plant operations in the San

Joaquin Valley have made continual and considerable investment in their glass container manufacturing plants to improve both efficiencies and air quality for the valley. In most, if not all cases, a greater than 85% reduction in NOx emissions over the last 20 years.

GPI and its members would like to continue discussion with staff on new technology, its role in reducing NOx emission levels, emissions monitoring data and practical applications to reduce NOx levels. Those discussions may also take into consideration direct PM emissions in addition to, or in lieu of, the precursor emissions targeted by the current NOx proposal.

We look forward to continuing our work with San Joaquin to determine reasonable and achievable emission reduction levels.

Regards,

Joe

Joseph J. Cattaneo
Executive Director