



Patty Senecal

Senior Director, Southern California Region

March 1, 2023

Via e-mail at: mmorris@aqmd.gov

Mike Morris
Manager, Planning and Rules
South Coast Air Quality Management District
21865 Copley Drive
Diamond Bar, CA 91765

Re: *SCAQMD Proposed Amended Rule 1178, Further Reductions of VOC Emissions from Storage Tanks at Petroleum Facilities – WSPA Comments on Cost-Effectiveness Analysis and Lack of Consideration of O&M Costs*

Dear Mr. Morris,

Western States Petroleum Association (WSPA) appreciates the opportunity to participate in the Working Group Meetings (WGMs) for South Coast Air Quality Management District (SCAQMD or District) Proposed Amended Rule 1178, Further Reductions of VOC Emissions from Storage Tanks at Petroleum Facilities (PAR 1178). WSPA is a non-profit trade association representing companies that explore for, produce, refine, transport, and market petroleum, petroleum products, natural gas, renewable fuels, and other energy supplies in five western states including California. WSPA has been an active participant in air quality planning issues for over 30 years. WSPA-member companies operate petroleum refineries and other facilities in the South Coast Air Basin that will be impacted by PAR 1178.

The California Health & Safety Code requires the District, in adopting any Best Available Retrofit Control Technology (BARCT) standard, to ensure the standard is technologically feasible, and take into account “environmental, energy, and economic impacts” and to assess the cost-effectiveness of the proposed control options.¹ Cost-effectiveness is defined as the cost, in dollars, of the control alternative, divided by the emission reduction benefits, in tons, of the control alternative.² If the cost per ton of emissions reduced is less than the established cost-effectiveness threshold, then the control method is considered to be cost-effective. Cost-effectiveness evaluations need to consider both capital costs (e.g., equipment procurement, shipping, engineering, construction, and installation) and operating (including expenditures associated with utilities, labor, and replacement) costs. Currently, the District is applying a cost-effectiveness threshold of \$36,000 per ton of VOC emissions reduced, consistent with the 2022 Air Quality Management Plan (2022 AQMP).³

¹ California Health & Safety Code §40406, 40440, 40920.6.

² California Health & Safety Code §40920.6.

³ SCAQMD Draft Final 2022 Air Quality Management Plan. Available at: <http://www.aqmd.gov/home/air-quality/clean-air-plans/air-quality-mgt-plan>.

SCAQMD released PAR 1178 Preliminary Draft Rule Language and Preliminary Draft Staff Report on February 17, 2023.^{4,5} WSPA offers the following comments on the information presented therein.

- 1. In estimating costs for doming of external floating roof crude oil tanks, the District has not included potential operation and maintenance (O&M) costs. This is not a complete view of costs and fails to align with the Discounted Cash Flow (DCF) method. O&M costs must be considered (along with capital costs) in the calculation of the present value of the proposed controls, and the cost-effectiveness of the proposed control must be reevaluated.**

SCAQMD's cost-effectiveness thresholds presented in the 2022 AQMP are based on the DCF method, in which the present value of control costs over the life of the equipment is calculated by incorporating capital costs, annual operation and maintenance (O&M) costs, and other periodic costs over the life of the equipment.⁶ For this rule, SCAQMD has stated that they are using the DCF method but have assumed that O&M costs would be \$0.⁷ Therefore, costs related to annual O&M and other periodic costs over the life of the equipment have not been included in SCAQMD's estimate of lifetime costs. Staff have provided no evidence to support this zero O&M cost assumption.

In its comment letter dated January 19, 2023, WSPA commented that SCAQMD needed to reevaluate exclusion of O&M costs. SCAQMD responded to this comment in the Preliminary Draft Staff Report, stating⁸:

"No costs have been provided by facilities for maintenance of a dome, nor have facilities made mention of maintenance requirements for a dome"

WSPA is hereby providing additional information on costs for O&M of tank domes over the 50-year proposed lifetime which show that the zero O&M cost assumption is unsupported.

The type of fixed roof most commonly used in domed external floating roof tanks is a self-supporting aluminum dome roof.⁹ These domes are crafted with triangular high strength aluminum alloy panels that are 0.050 inches thick to reduce the additional weight placed on the external floating roof storage tanks. This is generally necessary to minimize the need for additional structural retrofits of the tank.¹⁰ Although these aluminum alloys are found to be more corrosion resistant than other metals used in storage tank applications (e.g., steel), aluminum does

⁴Proposed Amended Rule 1178, Further Reductions of VOC Emissions from Storage Tanks at Petroleum Facilities: Preliminary Draft Rule Language. Available at: <http://www.aqmd.gov/docs/default-source/rule-book/Proposed-Rules/1178/par-1178-preliminary-draft-rule-language.pdf?sfvrsn=6>.

⁵ SCAQMD Proposed Amended Rule 1178 Preliminary Draft Staff Report. Available at: <http://www.aqmd.gov/docs/default-source/rule-book/Proposed-Rules/1178/par-1178-preliminary-draft-staff-report.pdf?sfvrsn=6>.

⁶ SCAQMD Draft Final 2022 Air Quality Management Plan. Available at: <http://www.aqmd.gov/home/air-quality/clean-air-plans/air-quality-mgt-plan>.

⁷ Personal communication between Yasmine Stutz, Ramboll, and Melissa Gamoning, SCAQMD on 11/9/22

⁸ SCAQMD PAR 1178 Preliminary Draft Staff Report. Available at: <http://www.aqmd.gov/docs/default-source/rule-book/Proposed-Rules/1178/par-1178-preliminary-draft-staff-report.pdf?sfvrsn=6>.

⁹ Kolmetz Handbook of Process Equipment Design. Storage Tank Selection, Sizing, and Troubleshooting. 2012. Available at: <https://www.klmtechgroup.com/PDF/EDG-SYS/ENGINEERING-DESIGN-GUIDELINES-storage-tank-Rev2.1web.pdf>

¹⁰ Geodesic Aluminum Dome & Cover Roof Specification. Available at: https://www.tankconnection.com/assets/pdf/Aluminum_Dome_Specification_API_650_G.pdf

experience pitting corrosion in marine environments, with aluminum plating near seashores showing pitting of up to 600 microns (0.0236 inches) after 20 years, nearly half the original thickness of the panels.¹¹ Further, thermal contractions and expansions can also generate gaps in the aluminum panels of domes. These gaps can be sealed with tape, covered by applying a dome coating system, or the panels can be replaced.¹² Pitting corrosion can be prevented or treated by applying a dome coating system, or the panels can be replaced.¹³ Most of the crude storage tanks subject to this regulation are located at facilities which are in the coastal environment. As such, preventative maintenance actions would be necessary to prevent corrosion and ensure the long-term functionality of these self-supporting aluminum domes over an extended period such as the 50-year useful life assumed in the Staff analysis.

The National Association of Corrosion Engineers (NACE) provides a methodology to estimate the costs of a dome coating system in their paper titled “Expected Service Life and Cost Considerations for Maintenance and New Construction Protective Coating Work”.¹⁴ These costs are intended to represent total costs that include “hourly wages, supervision, equipment rates, overhead, profit, and other cost elements.”. Project specific costs will vary depending on job size, geographic location, and other factors.

WSPA’s technical consultant, Ramboll US Consulting (Ramboll), estimated the cost of corrosion coating based on the following assumptions and methodology:

- The aluminum geodesic dome has a ratio of dome height to tank diameter of 1:6.¹⁵
- A common coating system for this application consists of an inorganic zinc primer with an epoxy intermediate coat and a polyurethane topcoat, per a case study on crude oil tank coating selection.¹⁶ The cost of such a coating system is approximated as \$1.18 per square foot (2014 \$US) if applied via spraying or \$0.92 per square foot if applied via brush and rolls by combining the costs of an Inorganic Zinc Rich coat, Epoxy Intermediate/Topcoat, and Polyurethane Aliphatic Acrylic Intermediate/Topcoat.¹⁷
- The service life, or “practical life”, of the system is estimated to be 15 years in coastal and offshore areas with high salinity.¹⁸
- Total lifecycle costs were approximated by considering the original painting and the spot touch-ups and repairs, maintenance repaints, and full repaints necessary to maintain the coating system. Spot touch-ups and repairs occur at the practical life of the system and are reported to cost 40% of the original paint.¹⁹
- The time until a maintenance repaint is estimated to be the practical life plus 33% and assumed to cost 70% of the original paint. A full repaint, which involves total coating

¹¹ Alcan Marine. Corrosion Behavior of Aluminum in Marine Environments. Available at: <https://almet-marine.com/wp-content/uploads/2021/07/Ch10-corrosion-behaviour-of-aluminium-in-marine-environments.pdf>.

¹² Basic Concepts Inc Justrite Safety Group. Geodesic Dome Repair. Available at: <https://www.basicconcepts.com/spray-coatings/above-ground-tank-geodesic-dome-roof-repair/>

¹³ Ibid.

¹⁴ NACE, Expected Service Life and Cost Considerations for Maintenance and New Construction Protective Coating Work. 2014. Available at: <https://studylib.net/doc/25402068/expected-service-life-and-cost>

¹⁵ Maxwell Continental Tankserv. Alu Geodesic Dome Roofs. Available at: <https://maxwelltanks.com/domed-floating-roof-tank/alu-geodesic-dome-roofs/>.

¹⁶ T.H.I Revetement. Protective Coating of Crude Oil Storage Tanks. Available at: <https://thi-revetement.com/en/protective-coating-of-crude-oil-storage-tanks/>.

¹⁷ NACE, Expected Service Life and Cost Considerations for Maintenance and New Construction Protective Coating Work. 2014. Available at: <https://studylib.net/doc/25402068/expected-service-life-and-cost>

¹⁸ Ibid.

¹⁹ Ibid

removal and replacement, is expected to occur at the year of the maintenance repaint plus 50% of the practical life, or 183% of the practical life, and cost 135% of the original paint.²⁰

Assuming a constant inflation rate over the 50-year lifetime of the coating system (+28% from 2014 to 2023),²¹ the costs associated with maintenance on one 180-ft diameter tank in 2023 dollars are estimated to be approximately \$345,500 if using brush/roll applications or \$444,000 if using spray applications.

SCAQMD provided data on tank diameters for 51 crude oil tanks subject to Rule 1178.²² Using the methodology defined above, Ramboll calculated the estimated cost to maintain the domes for these tanks over a 50-year period. This maintenance cost was estimated to be \$23 million using spray applications or \$18 million using brush and roll applications (2023 \$US). SCAQMD reported a total estimated capital cost to dome 54 tanks as \$79,891,000, and the total emission reductions over 50 years as 2,233 tons.²³

Adding the calculated maintenance costs to the capital costs presented by SCAQMD, the total capital plus O&M costs for doming of the 51 tanks would range from \$97.8 million to \$103 million. Inclusion of this reasonable estimate for O&M costs would yield a calculated cost-effectiveness of between \$43,808 and \$46,093 per ton of VOC reduced. This value exceeds the cost-effectiveness threshold of \$36,000 per ton of VOC reduced. We note that this estimate for O&M costs does not include additional labor costs caused by Senate Bill (SB) 54 requirements. California refineries are required to hire unionized labor which SCAQMD has previously estimated to add 20% to labor costs.²⁴ So adding SB54 consideration would further raise the estimated costs.

The above analysis clearly demonstrates that SCAQMD's zero O&M cost assumption is unreasonable. WSPA reiterates its comment that SCAQMD must reevaluate the cost assumptions presented for PAR1178 to include O&M costs and other periodic costs over the lifetime of the equipment. With that, the cost-effectiveness must be re-assessed for the proposed BARCT measure to require doming of external floating roof tanks storing crude oil.

²⁰ Ibid.

²¹ U.S. Bureau of Labor and Statistics. CPI Inflation Calculator. Available at: https://www.bls.gov/data/inflation_calculator.htm

²² Email transmittal from James McCreary, SCAQMD to Yasmine Stutz, Ramboll on November 9, 2022.

²³ SCAQMD Proposed Amended Rule 1178 Preliminary Draft Staff Report. Available at: <http://www.aqmd.gov/docs/default-source/rule-book/Proposed-Rules/1178/par-1178-preliminary-draft-staff-report.pdf?sfvrsn=6>.

²⁴ SCAQMD Proposed Rule 1109.1 – Emissions of Oxides of Nitrogen from Petroleum Refineries and Related Operations, Draft Staff Report, October 2021. Available at: http://www.aqmd.gov/docs/default-source/rule-book/Proposed-Rules/1109.1/dsr_pr_1109-1_30_day_package.pdf?sfvrsn=4.

WSPA appreciates the opportunity to provide these comments related to PAR 1178. We look forward to continued discussion of this important rulemaking. If you have any questions, please contact me at (310) 808-2144 or via e-mail at psenecal@wspa.org.

Sincerely,

A handwritten signature in black ink that reads "Patty Senecal". The signature is written in a cursive, flowing style.

Cc: Wayne Nastri, SCAQMD
Sarah Rees, SCAQMD
Michael Krause, SCAQMD
Rodolfo Chacon, SCAQMD
Melissa Gamoning, SCAQMD
James McCreary, SCAQMD