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Ms. Kim Heroy-Rogalski
Chief , Mobile Source Regulatory Development Branch
California Air Resources Board
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Subject: Comments for Proposed Amendments to the Exhaust Emissions Standards and Test Procedures for 2024 and Subsequent Model Year Heavy-Duty Engines and Vehicles, Heavy-Duty On-Board Diagnostic System Requirements, Heavy-Duty In-Use Testing Program, Emissions Warranty Period and Useful Life Requirements, Emissions Reporting Requirements, and Corrective Action Procedures, In-Use Emissions Data Reporting Requirements, and Phase 2 Heavy-Duty Greenhouse Gas Regulations, and Powertrain Test Procedures

Dear Ms. Heroy-Rogalski,

About one year ago, South Coast AQMD staff provided comments on "California Air Resources Board Staff Current Assessment of the Technical Feasibility of Lower NOx Standards and Associated Test Procedures for 2022 and Subsequent Model Year Medium-Duty and Heavy-Duty Diesel Engines" (Whitepaper) calling to more stringency and more aggressive phase-in timeline. South Coast AQMD staff has reviewed the recently proposed August 27th Public Hearing documents in consideration of the Proposed Heavy-Duty Engine and Vehicle Omnibus Regulation and Associated Amendments. Staff continues to support CARB's on-going effort on implementing real-world NOx reductions as soon as practical and ensuring emissions limits are being met over the full useful life of the vehicle.

As noted in the ISOR, the proposed regulation is projected to be responsible for 52 tons per day (tpd) of NOx emission reductions, nearly half of the entire NOx emission reduction commitment in the state strategy for 2031. While that is a laudable achievement, the proposed regulation falls significantly short of the NOx reductions needed to attain the ozone standard in the South Coast Air Basin (Basin), providing only 0.1 tpd of NOx reductions by 2023 and 7 tpd by 2031. Given the substantial emissions contribution of heavy-duty vehicles and the urgency of upcoming ozone attainment deadlines, we urge CARB to adopt the most stringent standard feasible as further discussed below.

Recent progress in demonstrated technology has shown the realistic possibility of implementation and commercialization of heavy-duty diesel engines that meet the 0.02 g/bhp-hr low NOx standard sooner

than currently proposed. In a press release at the 2020 Vienna engine conference, Cummins Inc. announced the implementation of their version of Cylinder Deactivation Hardware (CDA) called Diesel Dynamic Skip Fire (dDSF). The system was demonstrated on a Class 8 heavy-duty X-15 engine with over 45% NOx emission reductions and some CO2 benefits (Cummins 2020). CDA has proven to be a key strategy to achieving 0.02 g /bhp-hr NOx levels, as it addresses exhaust temperatures during low-load operation such as the CARB proposed Low-Load Cycle. The combination of CDA, modified aftertreatment such as the close-coupled catalyst (already used in Europe), and heated dosing (coming MY 2021) has demonstrated NOx levels throughout all certification cycles to be at 0.02 g /bhp-hr or below for conventional diesel engines (MECA 2020).

South Coast AQMD staff firmly believes that an established technology pathway is already available and can be implemented in a commercial product prior to 2024 for a 0.02 g/bhp-hr NOx standard. In light of the current developments, OEM progress and technology readiness, the draft Omnibus Regulation should be more stringent than proposed. South Coast AQMD staff is particularly concerned about the proposed 2024-2026 low-load cycle (LLC) standards and the "50-State-Directed Engine Standard Option" which are not stringent enough to help the South Coast Air Basin to meet the 2023 and 2031 ozone attainment goals. While staff agrees with CARB's assessment that the proposed LLC initial phase-in level of 0.20 g/bhp-hr NOx is more technically-feasible and cost-effective, however, the current proposed LLC limit is also 4 times higher than the 2024-2026 FTP certification limit and 6 times higher when considering low-load in-use standards. Meanwhile, vehicle activity studies funded by South Coast AQMD and others continues to show that low-load operation is the primary concern for urban areas like the South Coast Air Basin especially for the adjacent communities to railyards, ports and warehouses that are already disproportionally impacted by heavy truck traffic that travel at lower speeds. At the same time, while staff concurs with CARB's flexible intent of the optional "50-State-Directed Engine Standard" and its potential for greater emissions reduction from inter-state commerce trucks. However, as the ISOR highlighted, the proposed optional "50-State Directed" NOx level of 0.10 g/bhp-hr is already achieved by today's engines. Staff is concerned that the proposed flexibility might instead significantly delay commercialization of critical low-NOx enabling technologies such as CDA for achieving the more aggressive 2027 or later NOx standard of 0.02 g/bhp-hr. While South Coast AQMD recognizes the CARB's response on South Coast AQMD's previous comments on adopting the proposed amendment three years early, for the reasons listed in this comment letter, staff continues to urge CARB to adopt the most stringent standards for 2024-2026 that encourages critical low-NOx technology advancement and to ensure future attainment goals can be met.

CARB's whitepaper published in 2019 and MECA's whitepaper published earlier this year, further supplemented with recent announcements by OEMs, include ample data and references supporting that diesel engines today can be subjected to a more stringent NOx standard and can simultaneously be optimized for GHG requirements without impacting fuel economy. Staff is pleased to see that CARB has provided new innovative technology certification pathways including optional powertrain test procedure for certifying low-NOx hybrid powertrains to engine standards. However, South Coast AQMD staff has concerns that the added hybrid components warranty as well as additional engine certification requirements might lead to an increase in the system cost and ultimately limit the technology development. As stated in the ISOR, CARB has previously adopted Innovative Technology Regulation (ITR) that provides regulatory streamlining to encourage early technology innovations like diesel-hybrid vehicles. South Coast AQMD staff believes the new diesel hybrid powertrain option could lead to another near-term cost-effective low-NOx option and achieve much needed NOx reduction early. Staff recommends CARB to add provisions similar to ITR to remove certification burden of this new technology pathway.

CARB stated in the ISOR that most of today's Otto-cycle heavy–duty engines were already certified much below the lowest Optional Low NOx Standards (OLNS) of 0.02 g/bhp-hr. Thus, staff believes that

it is technically-feasible and cost-effective to further improve current technology and ensure the emissions reduction are realized over all duty-cycles by adopting the lower OLNS of 0.01 g/bhp-hr starting in as early as 2022 instead of proposed 2027 phase-in date. At the same time, CARB should properly recognize the air quality benefits that's already achieved by engines that certified to OLNS since 2016 by considering a retroactive credit provision to allow OEMs to bank and transfer those credits. Furthermore, to further support early NOx reduction and obtain attainment goal in 2023, South Coast staff proposes that CARB significantly increase to early compliance credit multipliers to support the rapid deployment of low-NOx trucks early.

Lastly, with regard to the proposed Heavy-Duty Zero-Emission Credit provision, South Coast AQMD staff recognize the proposed provision is intended to "incentivize production of HD ZEVs, especially in early years before they are required by the ACT Regulation." Although South Coast AQMD generally support incentive measures to accelerate the deployment of HD ZEVs, staff is concerned that this provision as written would essentially double count NOx credits for HD ZEVs and reward manufacturers for simply complying with the ACT sales requirements starting MY 2024. Furthermore, as this provision allows HD ZEV credits be transferred to other vehicle weight classes, manufacturers may opt to produce lighter weight class ZEVs (Class 4-6) and use the credits to sell higher emitting heavy duty diesel engine families which could result in further delay of the development and deployment of low NOx technologies. South Coast staff recommend ZEV credit generation to be limited to early compliance and surplus productions above and beyond the ACT sales as well as restrict credit transfer between weight classes. These measures will close potential loopholes and ensure intended emissions reduction are realized.

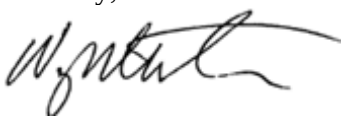
In conclusion, based on currently available and certified engines, further supported by success of the Southwest Research Institute demonstration projects, heavy duty engines can meet the 0.02 g/bhp-hr standard for NOx by 2024. Therefore, in order to maximize the emission reductions in 2023 and 2031, **South Coast AQMD staff strongly urges CARB to adopt the most stringent standard feasible with the following recommendations:**

- Adopt the most stringent standard earlier as stated in 2019 South Coast AQMD comment letter
- Provide additional flexibility for innovative low-NOx technologies such as hybrid powertrains by reducing certification burdens
- Adopt the more stringent 0.01 g/bhp-hr OLNS starting MY 2022 to encourage gaseous fueled engine improvement and increase early compliance credit multipliers to 2.5, 3.0 and 3.5; adopt program to allow credits for engines previously certified to OLNS since MY 2016
- Only early compliance or surplus HD ZEV sales over and above the ACT requirements should be eligible for the HD ZEV credits and limit HD ZEV credits only to be used to offset emissions from the same weight class

South Coast AQMD staff firmly believes the earliest implementation of a 0.02 g/bhp-hr NOx standard for heavy-duty trucks is a necessary but insufficient measure to achieve healthful air quality for the 17 million California residents living in the South Coast Basin. We are tasked to reduce NOx emissions by 57% by 2023 and 70% by 2031 to meet the federal ozone attainment requirements, and the Omnibus regulation alone cannot get us there. So, we urge you to adopt the most stringent NOx standard as possible and identify how the state and the South Coast AQMD can work together to meet our joint goals for clean air.

I want to again thank CARB for its ongoing efforts and support for reducing mobile source emissions. If you have questions, please contact Dr. Matt Miyasato at 909-396-3249.

Sincerely,



Wayne Nastri
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