South Coast
Air Quality Management District
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June 13, 2007

Clerk of the Board
California Air Resources Board
1001 I Street
Sacramento, CA 95814

Re: CARB Hearing of June 14, 2007, Item 07-6-3

Comments of the South Coast Air Quality Management District on the ARB Staff Proposed Amendments to Phase 3 California Reformulated Gasoline Regulations

The South Coast Air Quality Management District (AQMD) staff appreciates this opportunity to present comments on the ARB's proposed changes to Phase 3 Gasoline regulations. The ARB staff has proposed a wide range of changes and we commend them for establishing an excellent process for bringing these proposed changes to you. The detailed reports developed by your staff provide excellent detail and careful analysis. While there are a few areas in which we would like to offer differing perspectives, I do want to say at the outset that in general we endorse the changes being proposed today by your staff. We are fully supportive of the recommendations being made in 6 areas, specifically, sulfur averaging, adjustments to RVP, oxygen content flexibility, denaturant levels, ASTM harmonization, and implementation dates. Of the nine areas addressed in the staff proposal, the AQMD staff have detailed comments on 3 of these areas:

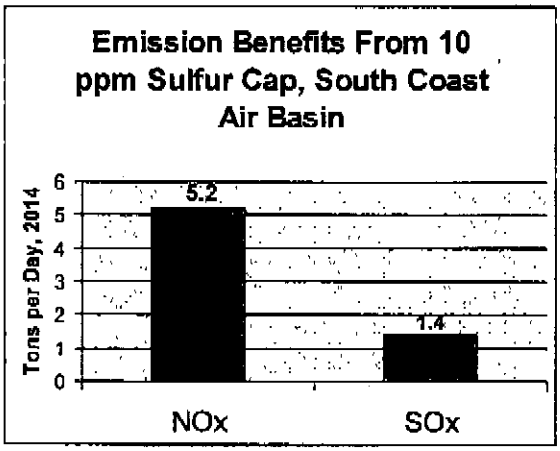
1) Sulfur Limits
2) Predictive Model Issues
3) Alternative Emissions Reduction Plan

1. Sulfur Limits

The proposed sulfur cap limit of 20 ppm is an important step forward over the existing specification. We appreciate ARB opening up this rulemaking to adjust this important parameter. However, the AQMD strongly recommends that sulfur levels be further tightened to 10 ppm. This lower sulfur level would fully align California gasoline requirements with those of numerous governments around the world. We know with certainty that a maximum sulfur fuel level of 10 ppm at retail dispensing sites is very feasible, as the average levels today are 9 to 11 ppm. Now that the California average

fuel quality exceeds the ARB's proposed sulfur cap by a large margin, it is very reasonable – and in fact most responsible – to adjust this level downward as a matter of state policy. Japan has already implemented this standard in use, and it has been adopted by European Union countries. California should not concede any ground with respect to its world leadership on gasoline specifications.

Setting a lower standard is crucial for several reasons. First, it is an essential enabler of higher fuel efficiency vehicle technologies such as lean NOx catalysts. Such technology will simply not be introduced in the absence of 10 ppm sulfur limits on gasoline. Second, while a nation-wide fuel specification of 10 ppm sulfur would be preferable, California should consider its role in this regard to be similar to its adoption of its greenhouse gas standards under AB 1493. California's actions on this important topic would send an immediate signal to the EPA and refiners that ultra-low sulfur gasoline should be the standard benchmark going forward. Third, we know that refinery technology exists to readily achieve lower sulfur levels at reasonable cost and with no significant impact on gasoline production volume. Fourth, there are incremental benefits of having the entire gasoline pool at no more than 10 ppm – effectively 5 ppm on average - to ensure the broadest compliance margin for mitigating the NOx emission impacts associated with higher ethanol blends. We estimate that in 2014, a sulfur cap of 10 ppm will result in emission reductions of 5.2 tons per day of NOx and 1.4 tons per day of SOx, as shown below.



Lastly, there is no reason that gasoline sulfur specifications should be less stringent than those applicable to diesel fuel. While we recognize that the Predictive Model places additional constraints on fuel properties, more stringent gasoline desulphurization causes virtually no compromises with respect to other gasoline parameters. For all of these reasons we strongly urge the adoption of a 10 ppm sulfur cap.

2. Predictive Model Issues

The staff proposed revisions to the Predictive Model (PM) are in general a very valid and constructive step forward in addressing the obligations of SB 989 (Sher). Increased permeation HC emissions associated with the use of Phase 3 gasoline need to be recognized as an important ozone contributor, and the proposed changes are an

essential means of achieving mitigation of these emission increases. Accordingly, the AQMD staff supports the overall proposed revisions. There are several areas, however, where we believe additional modifications would significantly strengthen the model to ensure a more complete accounting of permeation emissions in the South Coast Air Basin, and to achieve additional needed emissions mitigation.

Permeation Emissions Estimates

With regard to permeation emissions, it is central to recognize that such HC emissions are exponentially – not just linearly - related to temperature.[1] The maximum temperature assumed in the PM methodology is therefore a defining parameter and effectively establishes the degree of stringency required by the PM model. ARB staff proposes a temperature profile with a peak temperature of only 87 ° F for the Los Angeles County portion of the ozone planning inventory used in the model. This temperature assumption is used despite the fact that last year the South Coast Air Basin experienced the highest number of consecutive days above 100 degrees on record. While we appreciate that the staff had limited time and resources to make adjustments on a statewide basis to reflect worse case higher temperature conditions, it is clear that an undercount of HC permeation emissions exists for Los Angeles County due to the disproportionate effect of the cooler coastal sub-region compared to the San Fernando and San Gabriel Valleys.

Although the staff note that the average temperature used in the California 8-hour ozone profile is 3 degrees higher than the default inventory, this does not fully account for the full permeation impacts from the use of Phase 3 gasoline. Maximum temperature days do not typically achieve the highest ozone levels. However, high temperature conditions in the high 90's to over 100 also directly impact ozone concentrations before the Basin's inversion layer is broken by especially high temperatures, especially in the more urbanized portion of the Basin.[2] ARB's permeation emission rate assumptions reflect temperature profiles which occur on the highest ozone day.

As ARB staff has acknowledged, this is certainly not the highest emission rate scenario. As a matter of public health policy, we believe that ARB is obligated to address the full range of possible adverse ozone air quality effects and not solely the peak ozone meteorological day. A more robust temperature assumption is crucial in order that the PM adequately meet the full range of real world scenarios anticipated under SB 989. Temperatures significantly above 87° F should therefore be modeled to ensure that the maximum emissions condition is fully mitigated under the PM, rather than just the peak ozone modeling scenario. To ensure that permeation emissions are fully accounted for in the PM inventory, the AQMD staff therefore recommends that ARB adjust the Los Angeles County portion of the statewide inventory used in the PM model by raising its maximum temperature to at least 95 degrees.

[1] For each 10 degrees C increase in temperature, permeation emissions have been found to double.

[2] The absolute peak concentrations of ozone often occur in the downwind mountain region of the air basin.

Inventory Year

A key policy decision embodied in the proposed update to the predictive model is the choice of inventory year from which to calculate the mitigation obligations needed to meet the SB 989 criteria. The SCAQMD staff strongly believes that the 2010 inventory year is the appropriate baseline from which to implement requirements, rather than the proposed 2015 inventory year. First, it must be noted that at least five years of unmitigated HC emission increases have occurred already. By moving the inventory baseline year back to 2010, there would be more underlying equity, as the majority of the unmitigated emissions will occur during the current decade. Second, since the Alternative Emissions Reduction Plan (AERP) goes into effect in 2010 [3], it is logical to establish the same year as the Predictive Model baseline year. Using the 2015 inventory for this portion of the PM is clearly inconsistent with the 2010 start date for the AERP. Third, full gasoline compliance commences in 2012 [4]. The closest inventory year is therefore 2010, not 2015. Fourth, the start date for the implementation of the Low Carbon Fuel Standard (LCFS) is 2010. Aligning the Predictive Model inventory with the LCFS is therefore the most logical and direct policy. Ethanol blends of 10% are likely to be a key means of compliance with the LCFS, especially in the early years. Aligning the inventory year to the LCFS is especially appropriate since the LSFS standard is the major reason that E10 blends will be produced and such higher levels of ethanol blending are the immediate cause of the permeation issues at issue in this proceeding.

Lastly, the 2010 inventory is a much closer approximation to today's emissions. The 2015 inventory is inherently lower, and in effect provides a less stringent level of control. Given the air pollution public health emergency status of the South Coast Air Basin, ARB should take all feasible steps to expedite emission reductions, rather than delay them. From our perspective, the choice of the inventory date is a straight forward policy judgment which should be heavily weighted toward the near-term public health impacts of ozone exposure. SB 989 did not envision that there would be a 13 year lag between the phase out of MTBE (starting in 2002) and the full mitigation of ethanol-induced permeation emissions as implied by the use of a 2015 inventory year [5]. For all of these reasons, the SCAQMD staff strongly recommends the use of the 2010 inventory rather than the current staff proposal of 2015.

Vehicle Mix

With regard to the update of the motor vehicle inventory vehicle mix, the AQMD staff consider the staff changes to be very reasonable and appropriate. The mix of Tech 3, Tech 4 and Tech 5 categories as recommended by staff is well justified based on the staff's careful analysis of this extensive data set. We also concur with the ARB that the Tech 4 data base should not be subject to a dual model at this time. If subsequent testing supports a definitive differentiation of normal and high emitters relative to their

[3] December 31, 2009.
[4] December 31, 2011.
[5] For example, the emission mitigation obligation would increase statewide from 12 to 18 tons per day of HC emissions for cars and light and medium duty trucks by switching from 2015 to 2010.

response to gasoline sulfur levels, however, some future modification may be appropriate in this regard.

Fundamentally, the continuum of emission performance among vehicle types makes it difficult to split the Tech 4 data base into finer portions, as recommended by some stakeholders. We note that such recommendations cite a 14 year old SAE paper on the issue as well as general premises about catalyst efficiency differences between moderate and higher emitter Tech 4 vehicle classes. While catalyst efficiency undoubtedly varies in use, it is also possible that engine out emissions vary as well for vehicles with different maintenance histories. We see no definitive basis for any specific criteria on which to bifurcate this data base; to the contrary, the proposal to use a 0.6 factor to split the NOx data base is somewhat arbitrary. Accordingly, at the present time, the approach outlined by staff is the most appropriate from our perspective.

Ozone Reactivity

The ozone reactivity adjustment factors proposed by staff generally reflect the most up-to-date adjustments possible. However, a broader question of ambient ethanol impact on acetaldehyde emissions has been raised. It would be very constructive if additional studies were conducted to refine and better calibrate the maximum incremental reactivity (MIR) associated with ethanol to better reflect multi-day ozone episodes under varying HC and NOx ratio conditions. The following table illustrates the range of MIR values for typical MTBE substitutes used in Phase 3 gasoline compared to MTBE:

HC Specie	MIR [6]
• MTBE	0.78
• Ethanol	1.69
Aromatic HC's:	
• Benzene	0.81
• Toluene	3.97
• p-xylene	4.24
• m-xylene	10.61

This data suggests that if aromatic compounds such as benzene, toluene and xylene are used to make up the lost volume difference between 11% MTBE and 5.7% ethanol, the overall reactivity of exhaust would be expected to increase. The original Phase 3 specifications allowed for a slight increase in aromatic content to accommodate the volume loss associated with ethanol substitution for MTBE used in Phase 2 gasoline. ARB staff estimates that Phase 3 exhaust reactivity increased by 2 percent compared to Phase 2 gasoline. [7] This added reactivity is independent of the additional evaporative emissions resulting from the solubility properties of ethanol.

[6] Appendix E, ARB Predictive Model Initial Statement of Reasons, April, 2007, Table 1, p. E-10, http://www.arb.ca.gov/regact/2007/carfg07/appe.pdf .

[7] Table 8, Appendix E, ARB Predictive Model Initial Statement of Reasons, April, 2007, p. E19, http://www.arb.ca.gov/regact/2007/carfg07/appe.pdf .

Although the ARB's latest proposed PM ozone reactivity adjustments reflect the best science available at this time, it would be very constructive for ARB to conduct additional air quality modeling and atmospheric sampling to update the state's MIR factors for ethanol and other species where appropriate. This is especially important in light of the likely transition from E5.7 to E10 blends driven by the intersection of the updated Predictive Model and the upcoming Low Carbon Fuel Standard. An updated MIR assessment is also important to help address concerns raised by certain researchers about the potential for ethanol emissions to convert to acetaldehyde in the atmosphere over multiple day ozone episodes. Because the Carter factors essentially are derived from a single day EKMA box model assessment, there may be multi-day carryover effects associated with added ethanol reactivity which are under-accounted for in the current version of the PM analysis.

CO Ozone Impact

With respect to the impact of CO on ozone, we believe that the ARB staff has carefully evaluated all concerns raised throughout the PM workshop process. The proposed approach to accounting for CO benefits is very appropriate. We agree that it is generally reasonable to adjust the model to reflect the impact of all 7 key gasoline parameters on CO, and not just oxygen content. The AQMD therefore supports the approach outlined by ARB staff on this issue.

Certification Test Fuels Underlying PM

It is important to recognize that the PM reflects Tech 5 vehicles which have not been certified with in-use fuels since the phase out of MTBE. Instead, all new gasoline vehicles are allowed to certify with inherently cleaner Phase 2 gasoline rather than commercially dispensed ethanol-containing gasoline. The use of such a non-representative fuel represents a de facto relaxation of vehicle emission standards. For example, it is possible that higher catalyst loading and higher conversion efficiency formulations would be needed to certify Tech 5 and later vehicles on Phase 3 in-use fuel. The gross disparity between certification test fuel and the in-use fuel specification is a major weakness which directly affects the validity of the proposed update of the Predictive Model. Ideally, the certification test fuel would simply track whatever fuel formulation was authorized by the Predictive Model. In the absence of an immediate harmonization in this regard, the AQMD staff strongly recommend that the ARB Board direct staff to move expeditiously to update certification fuel specifications such that all new gasoline vehicles certify on in-use Phase 3 gasoline as soon as possible.

3. Alternative Emissions Reduction Plan (AERP)

The proposed AERP is an unprecedented step in providing flexibility to refiners who are unable to qualify certain gasoline formulations as fully compliant with CARB specification requirements. Although the AQMD staff would prefer that all retail fuel comply fully with the PM requirements as soon as possible, we do recognize that full fuel compliance is not feasible for refiners starting in 2010, due to the need for refinery modifications at certain facilities. We agree that it is appropriate to initiate the mitigation process as quickly as possible, in light of the delays already experienced.

We agree with the ARB staff analysis that the cost per gallon of 0.1 to 0.3 ¢ per gallon for alternative compliance options is very low and should not be considered a burden to refiners. The AQMD staff therefore supports the ARB's proposed AERP program elements. We do suggest that the Board consider establishing a sunset provision on small refinery exemptions to this program after 2012, as such refiners have been afforded this exemption for the last 17 years. Another 5 years is more than adequate to attain regulatory parity in this regard.

Concluding Comments

We appreciate the scope and complexity of the issues before you. We also know first hand the importance of your actions in addressing the serious potential air quality problems associated with low level blends of ethanol in gasoline. California is essentially at a tipping point with respect to such low level blends. It is essential that the ARB ensure the fullest preservation of ozone benefits possible relative to the Phase 2 gasoline baseline.

In closing, I would like to refer the Board to a chart of data included in a report prepared by the Renewable Fuels Association.[8] The Table below shows clearly that the cleanest gasoline with respect to ozone forming potential and NOx emissions is a formulation with 0% ethanol.

Table ES-1. Comparison of Single and Dual Model on Four Fuels Passing the ARB Single Model

	Percent Ethanol			
Property	0.0%	5.7%	7.7%	10.0%
RVP	6.60	6.91	6.92	6.99
T50	204	206	209	212
T90	315	310	313	313
Aromatic	25.0	25.0	25.0	25.0
Olefin	8.0	9.0	9.0	6.0
Total Oxygen	0.0	2.0	2.7	3.5
Sulfur	5	5	5	5
Benzene	0.50	0.50	0.50	0.50
Single Predictive Model Criteria	% Change in Emissions			
OFP ·····→	-0.67	-0.38	-0.59	-0.05
NOx ·····→	-6.0	-4.8	-2.9	-1.1
Pass/Fail	Pass	Pass	Pass	Pass

As California moves to implement the LCFS, this comparison should not be forgotten. In effect, this data suggests that a compromise is being struck to accommodate up to

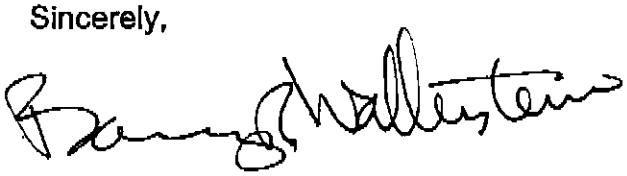
[8] Draft Final Report, "The Case for a Dual Tech 4 Model Within the California Predictive Model", May 20, 2007, for the Renewable Fuels Association, by Jonathan Cohen ICF et. al., p. 31.

10% ethanol blends. For that reason, it is imperative that the Board exercise the maximum precautionary principle possible with respect to low level ethanol blends in gasoline. The judgments being made today will lock California into such blends for decades. This sobering reality should reinforce the Board's sense of caution with the revisions being considered today.

The modifications recommended by the AQMD staff are carefully designed to be fully consistent with the goals of the upcoming LCFS while also ensuring the full retention of ozone benefits. We urge that the Board consider our proposed changes carefully.

Thank you for the opportunity to comment on this important issue. If there are any questions regarding these comments please contact me or Mr. Paul Wuebben, Clean Fuels Officer at 900-396-3247.

Sincerely,



Barry R.Wallerstein, D. Env.
Executive Officer