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Air Resources Board

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Gray Davis
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September 20, 1999

Ms. Margo T. Oge
Director
Office of Mobile Sources
United States Environmental Protection Agency
Washington, D.C. 20460

Dear ~~Ms. Oge~~ Margo:

This is in response to your August 6, 1999, letter posing several follow-up questions to my July 9, 1999, submission of supplemental data regarding our request for a waiver from the oxygen requirement of the federal RFG program.

The response provided below fully addresses each of your questions. We are hopeful that this supplemental information will allow you to expeditiously provide California the waiver it needs to remove methyl tertiary butyl ether (MTBE) from gasoline without impeding our ability to expeditiously attain federal national ambient air quality standards. For ease of reference, I am providing your original questions followed by our response.

Question 1. Based on our review we understand that the federal requirement of 2.0-wt% oxygen can be met with 5.7-vol% ethanol (your Scenario 2). For Scenario 2 you state that the reductions in NOx for this level of ethanol fall short of your NOx reduction goal of 1.5% by 0.2% even with reduction of sulfur to 0 ppm. Have you considered the potential impacts of other fuel parameters, such as aromatics and olefins?

Response: *Our analysis demonstrated that maintaining the oxygen mandate reduced potential additional NOx emissions reductions that might otherwise be achieved in a cost-effective manner that preserved essential flexibility in meeting California reformulated gasoline regulations. We recognized that compliance with the specifications could be met by changing other properties. The demonstration was to show that the oxygen mandate restricts our ability to achieve the greatest possible NOx emissions reductions.*

Our analysis stressed the effects of RVP and sulfur for setting new baseline fuel specifications because emissions are most sensitive to these parameters and when either is reduced, emissions of regulated pollutants tend to go down. If the other properties were changed, emissions of one or more pollutants would decrease (usually to a much smaller degree) but emissions of at least one other pollutant would increase. Therefore, these other parameters are much less useful in making complying fuels with the needed NOx reductions.

Question 2: For Scenario 2 the staff analysis states that all pentanes would need to be removed to reduce RVP from 7.8 to 7.0 psi to preserve existing hydrocarbon benefits. Yet the staff analysis indicates a reduction in hydrocarbons of 1.0% which is beyond the 0.3% reduction projected for your Scenario 1 in which there is 0.0 wt% oxygen in the fuel. Are we correct in assuming that Scenario 2 would exceed hydrocarbon reduction goals? If so, could RVP be reduced by less than 0.8 psi for the 5.7-vol% ethanol case?

Response: *Yes, the hydrocarbon estimate in Scenario 2 is lower than the 0.3% reduction shown in Scenario 1. However, hydrocarbon emissions are very sensitive to changes in RVP. If RVP was increased by just 0.1 psi, then the current evaporative emissions model predicts there would be a 3.5 % increase in the hydrocarbon evaporative emissions. Even such a small change in RVP would lead to an increase in hydrocarbon emissions and would not be practical because it would not preserve the emission benefits.*

Question 3: Your letter states that ARB would consider appropriate a waiver of the 2.0 wt% oxygen requirement based on averaging. That is, a minimum of 2.0-wt% oxygen would be required for the four winter months, and for the remaining months any given fuel could contain from 0 to 3.5-wt% oxygen. If the minimum oxygen requirement of 1.5 wt% were eliminated, would that change the results and/or conclusions of your analysis?

Response: *No, solely removing the 1.5 wt% minimum oxygen requirement and keeping the 2.0 wt% oxygen average would not change the conclusions of our analysis.*

If the 2.0-wt% average were required, with no minimum, a significant percentage of the summer gasoline would still require oxygen. If the oxygen level for the four winter months were at the 3.5% level, then to average 2.0%, the oxygen content in RFG for the remaining months would still have to average about 1.25% oxygen. In reality, given the California gasoline distribution system, such an approach would provide very little flexibility to produce non-oxygenated RFG. Thus, it would still be very difficult to achieve additional cost/effective NOx reductions during the summer.

Question 4: Your July 9 letter frequently cites concerns that the 2.0 wt% oxygen mandate will create barriers to implementation of "Phase 3 CaRFG regulations". Please clarify, in light of the fact the ARB has not yet finalized the Phase 3 regulations, what assumptions were made about the Phase 3 fuel in the analysis.

Response: *There was no need to assume anything for Phase 3 CaRFG other than there still exists a need for further reductions in emissions. The only assumptions in the analysis were that reductions of sulfur and RVP could provide additional emissions benefits in complying with our current or future regulations. No matter which scenario you consider, or which properties you vary, the ability to reduce NOx and evaporative hydrocarbon emissions or maintain the existing emissions benefits is greater without oxygen.*

Question 5: Please provide information of how CO and THC changes were calculated.

Response: *The changes were calculated using the existing Predictive Model for exhaust, and the proposed evaporative model which is being developed as part of a revised Predictive Model. Both the current Predictive Model and the initial draft model for public comment are available on the ARB Cleaner Burning Gasoline web page. The evaporative hydrocarbon results from the evaporative portion of the initial draft model and the exhaust hydrocarbon results from the current Predictive Model were combined by using the ARB EMFAC7G inventory weightings of exhaust and evaporative emissions. Weights were calculated for the inventory years; 1996, 2000, and 2005. The weights were averaged to provide a composite weight. The NOx portion of the analysis was generated using the current Predictive Model.*

For CO, we used the relationship that increasing fuel oxygen by 2% results in approximately a 10% reduction in exhaust CO. This is consistent with the estimates from the Auto/Oil research program. This is also consistent with estimates of the effectiveness in reducing ambient concentrations of CO for the wintertime oxygen program. The analyses of the ambient data for sites primarily impacted by motor vehicles emissions estimated the reductions in CO to be between 7% and 12%.

Question 6: Has ARB considered the effect on ozone associated with reduction in CO emissions associated with oxygen levels above 2.0 wt%? If so, please provide information on how such reductions were accounted for.

Response: *We accounted for reductions in CO by converting tons of CO into tons of equivalent evaporative hydrocarbons emissions. We used the Maximum Incremental Reactivity (MIR) factors to adjust the ozone reactivity differences for CO and evaporative emissions to be on the same basis. The MIR factor for CO was 0.07 and the average MIR for evaporative emissions was about 2.2. This yields a conversion factor of approximately 31.4 to 1. Or, it takes about a reduction of 31.4 tons of CO to offset an increase of 1 ton of evaporative emissions. We used a revision of the Predictive Model, discussed in the response to Comment 5, that includes an evaporative emissions component to estimate the fuel property effects on THC. We then compared the reactivity weighted CO and THC to adjust the THC emissions accordingly.*

If you have any further questions or wish to discuss these issues in more detail, please call me at (916) 445-4383 or Michael H. Scheible, Deputy Executive Officer, at (916) 322-2890.

Sincerely,

Michael P. Kenny
Executive Officer

cc: Michael H. Scheible
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