



Western States Petroleum Association
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Catherine H. Reheis-Boyd

Chief Operating Officer and Chief of Staff

June 4, 2007

Clerk of the Board
Air Resources Board
1001 I St.
Sacramento, CA 95814
Via electronic mail to <http://www.arb.ca.gov/lispub/comm/bclist.php>

Re: **07-6-3 – Public Hearing to Consider 2007 Amendments to the Phase 3 California Reformulated Gasoline Regulations**

Dear Clerk of the Board:

The Western States Petroleum Association (WSPA) is pleased to provide you with our comments relative to the above-referenced hearing item. WSPA's members represent the majority of the exploration, production, refining and marketing interests in the state, and therefore the rulemaking has a direct impact on our everyday and future business interests and operations.

WSPA supports two staff positions in the proposed regulatory amendments, however, we have several items we are requesting the Board direct staff to revise before the package is adopted. The highest priority issues for our industry are:

- Direct staff to revise the implementation date and allowable time from 2 years (YE 2009) to the traditional 4 years from the finalization of the regulations.
- Direct staff to take into consideration the CEC's refinery/supply/cost modeling work before the regulation is finalized.
- Direct staff to delete the AERP and instead work with the industry and others to develop an alternative mechanism for achieving early emissions reductions.

We look forward to hearing the Board's views relative to all of our issues in the attached comment package, and would be happy to clarify or discuss any of them with you prior to the hearing. If you wish to contact me, please feel free to do so at (916)498-7752, or you can contact my staff, Gina Grey at (480)595-7121.

Sincerely,

A handwritten signature in black ink, which appears to read "Catherine H. Reheis-Boyd". The signature is fluid and cursive, with the first name "Catherine" being the most prominent.

**Comments of the Western States Petroleum Association on
Proposed 2007 Amendments to
Phase 3 California Reformulated Gasoline Regulations**

I. SUMMARY

On April 27, 2007, the Air Resources Board (ARB) of California proposed amendments to the Phase 3 California Reformulated Gasoline Regulations which are aimed at mitigating the impact of ethanol use in gasoline on emissions from on-road vehicles, and at updating the Predictive Model. Other changes are also included, that ARB staff claims are intended to increase the flexibility, enforceability and consistency of the regulations. The Western States Petroleum Association's (WSPA's) comments on these proposed amendments are included in this package.

WSPA **supports** the following sections of the proposed amendments:

- Approach to mitigating permeation emissions from off-road equipment
- Emissions averaging to ensure no emissions backsliding for an inadvertent exceedance of the sulfur specification. Will still be below sulfur cap.

WSPA **recommends ARB modify** several aspects of the proposed amendments:

- The implementation date should be at least four years from finalization of the regulations, and should be subject to regularly scheduled formal reviews.
- Refinery, cost and gasoline supply modeling, currently being done by the California Energy Commission, should be completed, reviewed and taken into consideration before the regulations are finalized.
- The Alternative Emissions Reduction Plan should be dropped.
- Incentives should be developed to encourage early compliance.
- The sulfur cap should stay at the current limit of 30 ppm.
- The Predictive Model should be modified to reflect all the relevant data, not just some.
- ARB staff should carry out a multi-media assessment of the proposed regulations, as required by California law.
- Flexibility should be provided to allow refiners and blenders to change ethanol levels.
- Ethanol should be included in the emissions certification fuel, and the allowable sulfur levels in ethanol should be reduced.
- Regulations should recognize test method variability when considering downstream compliance.

Details of these comments and additional points are described below.

II. INTRODUCTION

WSPA appreciates the opportunity to comment on the proposed amendments to the Phase 3 California Reformulated Gasoline regulations which were published by the Air Resources Board on April 27, 2007. ARB has led an effort over many months and involved many stakeholders in a public process to develop these amendments. ARB is to be commended for their efforts that involved a great deal of technical effort and which have resulted in a proposal that, for the most part, is technically valid and deals in a substantive way with some very difficult issues. WSPA offers these comments to help improve the regulations and to make their implementation and enforcement more efficient and productive for all involved.

III. GENERAL COMMENTS ON PROCESS

Overall, WSPA feels that the process that ARB used to develop the proposed amendments to Phase 3 California Reformulated Gasoline regulations was well conceived and structured to obtain input from stakeholders. Three components of the process contributed to this effort: public workshops, expert groups and individual stakeholder meetings. While all three components had great potential, in practice there were some serious shortcomings.

A. Workshops

ARB held regular and frequent public workshops at which staff presented their latest findings and stakeholders presented comments on the regulations. Topics covered at these workshops were often broader than just the RFG regulations, and we encouraged ARB staff to continue to hold similar workshops as necessary to discuss the entire range of fuels regulations.

Although the workshops were a good opportunity for individual stakeholders to air their views and listen to the views of others, they were not conducive to detailed discussions and decision making. Those detailed discussions generally occurred in the expert groups or in individual meetings with stakeholders.

B. Expert groups

Three expert groups were formed – statistics, inventory and reactivity. Of the three expert groups, WSPA considered the reactivity group to work the best, the statistics group second, and the inventory group was the least effective. These groups provided an excellent forum to engage in serious detailed discussions concerning each group's responsibility.

Unfortunately, many of the important decisions were made without adequate - or any - discussion in the groups. A good example is the decision by ARB to delete a number of important studies from the database when analyzing the NOx response to sulfur of Tech Group 5 vehicles. This decision was made without any prior discussion in either the statistics expert group or in a public workshop. The importance of this decision is discussed later in these comments.

The inventory expert group was formed late in the process and did not meet as often as it should have. The process of developing an estimate of the impact of ethanol on fleet-wide permeation emissions was not as open as others. Part of the problem was that the inventory estimate was the responsibility of the Planning and Technical Support Division

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(PTSD), while the expert group was the responsibility of the Stationary Source Division. This split responsibility probably led to some inefficiencies. On the positive side, representatives of PTSD were present at most, if not all, all of the public workshops and made numerous presentations. They also made themselves available for a number of useful individual meetings with stakeholders.

The inventory group did not deal with some important issues, such as the multiplicative approach versus the additive approach for inventory estimation. The choice of approach impacts the magnitude of the permeation effect that needs to be mitigated. The issue appeared to have been decided before the group was formed, and was not revisited.

One serious problem with the expert groups was that ARB's outside reviewers were generally not part of the expert group process. Each of the major technical areas was subject to review by experts from the California university system. These reviewers should have been present at the expert group meetings and provided their opinions to the groups, not just to ARB staff. The expert groups did not even have access to all of the written opinions of the outside reviewers.

C. Individual meetings

WSPA held a number of individual meetings with ARB staff as did individual petroleum companies. These meetings provided an opportunity to discuss business sensitive information (meetings with individual companies) and to have detailed discussions about items of particular interest. WSPA found that ARB staff were always willing to meet with us, listened to our arguments, responded to our concerns, and sometimes were willing to change their views. We wish to emphasize that individual meetings, while useful, are only an adjunct to the public process of workshops and expert groups.

IV. IMPLEMENTATION ISSUES

A. Implementation date should be at least four years from the time that ARB finalizes the proposed amendments

WSPA very strongly believes that ARB staff has underestimated the length of time needed to comply with the revised regulation. It has been common and prudent practice in implementing regulations for ARB to leave adequate time after the regulations are finalized for the affected industry to carry out the necessary changes - conduct engineering studies, obtain permits, construct new facilities and modify existing facilities. Historically, the lead time for gasoline reformulation and Predictive Model changes relative to the petroleum industry has been four years after the regulations are approved by the Office of Administrative Law (OAL), signed by the Secretary of State and published. Our industry has typically needed the full amount of lead time available. Currently, the lead time and amount of effort required to meet the proposed amendments is not known with certainty, because the engineering studies that will allow companies to scope out the extent of changes required have not been completed. Neither has the California Energy Commission (CEC) completed its modeling studies. However, it appears that the scale of change required is similar to past changes and that a lead time of four years, at a minimum, will be required.

In the Initial Statement Of Reasons (ISOR), ARB did not provide specifics about the data used to conclude that four years was not needed. The California Energy Commission is conducting a refinery modeling/cost/supply study to evaluate the same question. Since

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CEC is the agency responsible for these types of studies, and since CEC has the necessary expertise, it is imperative to wait until the CEC effort is completed and undergoes adequate peer review before ARB finalizes an implementation date.

After the regulations are finalized, each company will evaluate their individual requirements to meet the regulations. While it is not possible to say with any degree of certainty at this time what the requirements will be, we do know that there is a general shortage of in-house and third-party expertise required for design and construction of facilities and that it will be challenging to complete the required changes in the usual four year timeframe.

Individual refiners and operators of pipelines and terminals must be involved in the decision about how much ethanol will be used in California RFG. Typically, only one level of ethanol is used in the fungible pipeline system that delivers the majority of gasoline in California. This is because the pipeline and storage system can handle only a limited number of grades. The concentration of ethanol in California RFG will be decided after the regulations are finalized and after preliminary engineering studies are conducted. Pipeline operators typically conduct a poll of shippers to decide on the specific CARBOB specification that will be allowed in the fungible pipeline system. After this vote is taken and an ethanol level is decided upon, each individual company will be able to start making detailed plans for complying with the regulations.

ARB believes the amended regulations will result in the use of more ethanol in gasoline blends. While WSPA has no opinion on this prediction, if the level of ethanol use increases, there would likely need to be changes in the distribution system for ethanol in California. Distribution terminal operators might have to modify tanks, add more tanks, upgrade blending pumps, and expand truck handling facilities. The time required to make these changes needs to be factored into plans for future ethanol use.

Refiners and pipeline and terminal operators will need to apply for permits to construct and operate new or modified facilities. It is well documented that the time required to obtain permits can be as long as 2 - 3 years for significant projects. Under a historical four-year timeline, materials procurement, construction and commissioning must be completed within 1 - 2 years, which is extremely tight.

Additionally, the Low Carbon Fuel Standard (LCFS) may impact the investment strategies that individual refiners and other affected parties adopt to comply with the new Predictive Model. CARB has presented a target of year-end 2008 for development of the draft LCFS regulation, which is 1½ years after the upcoming Predictive Model adoption hearing.

WSPA therefore recommends ARB set an implementation timeline of four years after the regulations are approved by OAL and published. After 1 year, or in concert with the LCFS work, it would be appropriate for ARB to conduct a formal review, and decide whether four years is adequate, too long, or too short, and to therefore maintain or modify the implementation date accordingly.

B. ARB should allow adequate time for review of all reports and components of the regulations

ARB has allowed the statutory length of 45 days for review and comment on the staff report and proposed regulations. Unfortunately, other pertinent documents will not receive the same length of time for review. The CEC refinery modeling report is an

important component of the regulatory decision making process and has not been published at the time of submission of these comments. In addition, certain expert reports have not been made available for review and the required multimedia assessment has not been carried out. While we have reviewed early versions of the Predictive Model, the final version has not yet been issued. WSPA urges ARB to allow time for adequate review of all components of the regulations.

C. ARB should not adopt the AERP proposal

ARB has proposed a new approach to meeting the regulations called an Alternative Emissions Reduction Plan (AERP). WSPA believes the AERP, as proposed in the staff report, is inappropriate and is a bad precedent for emissions reduction policy. We believe the AERP is a poor substitute for setting a realistic compliance date. It is a separate regulatory proposal that represents a substantial deviation from past policies and should receive full public review. The AERP should not be sequestered within a proposal that ARB characterizes as merely "amendments" which "do not change the specifications of CaRFG3" (ISOR, page 52).

In the past, ARB has set realistic timetables for industry to meet and then evaluated those timetables at interim periods to see if they had to be modified. This has been the approach to fuel regulations as well as vehicle emission standards. In the case of the AERP, ARB is in essence admitting two years is not enough time for some subset of the industry to meet the regulations, and ARB will require those in the petroleum industry who need the traditional regulatory timeframe, to pay a penalty through other emissions mitigation steps until the regulations can be met through implementation of the new fuel formulations. Full implementation of AERP would mean extensive planning, reviews by ARB, multiple public hearings, and other steps associated with public programs that will place a large burden on both the industry and California's agencies.

If ARB wants to mitigate the effects of permeation by reducing other sources of emissions, it should be the subject of a separate program and rule-making, not part of the RFG regulations. The obligation to address ethanol permeation should be shared by not only our industry but the ethanol production industry and the automotive industry, so perhaps all parties could engage in the development of a program to reduce permeation emissions. WSPA is willing to work with ARB staff to define such a separate alternative program.

D. Consider incentives for early compliance

WSPA believes the best approach is for ARB to set a realistic implementation deadline the refining industry can meet, and then provide incentives for early compliance. The form of the incentives would recognize individual companies are reducing emissions by a greater amount than required. Clearly, WSPA is not suggesting other sources of emissions be allowed to increase, but if individual companies can be creative, ARB may have a win-win outcome - better air quality for the people of California, and a better operating environment for the refining industry.

V. SULFUR CAP SHOULD STAY AT 30 PPM

WSPA strongly opposes the staff proposal to lower the sulfur cap from 30 ppm to 20 ppm. There are no emissions benefits to be gained, and it will not make enforcement any easier. There is no evidence it will result in the introduction of advanced vehicles by

the auto/truck manufacturers. Finally, there may be significant negative producibility consequences for this step. Each of these points is discussed more fully below.

A. Lowering the cap will not reduce exhaust emissions

Under California regulations, gasoline must meet standards that guarantee low vehicle emissions. Individual refiners have the option of choosing different formulations that achieve this goal. No matter what formulations are chosen, the gasoline fueled vehicles will produce low emissions. If sulfur is a little higher, some other parameters must be a little lower. The ranges of all fuel parameters, including sulfur, are already restricted in a way that assures low emissions. Gasoline blends made with sulfur levels between 20 ppm and 30 ppm still meet the regulations and still exhibit low emissions. Lowering the sulfur cap just means that there will be fewer possible formulations available that can meet the standards, thereby reducing refinery flexibility.

B. Lower sulfur is not needed for new vehicles

In the ISOR, page 35, ARB states that auto manufacturers

“ ... have indicated that before lean-burn gasoline technology can be successfully introduced, they need assurance that sulfur content will be less than 20 ppmw”.

WSPA acknowledges there is a possibility that lean-burn technology will require low levels of gasoline sulfur. This technology has the potential to reduce fuel consumption but may not be ready for introduction even if extremely low sulfur gasoline were available in California. It is likely that in order to meet California's low exhaust emission standards lean-burn technology will require efficient and robust catalytic systems to control NOx emissions under lean exhaust conditions. Such technology for light-duty gasoline engines is not widely available.

The history of lean-burn technology in Europe and Japan may be instructive. Extremely low sulfur gasoline standards were adopted in Europe (2005-09 phase-in) and Japan (2005-08 phase-in) in the expectation that lean-burn technology would be widely introduced. To date, this has not happened, even though vehicle exhaust emission standards are less stringent in Europe and Japan. In Japan, less than 10% of new gasoline vehicles have direct injection engines, and only a small fraction of those have lean-burn technology.

Precedents exist for defining the fuel needs of new technology. The petroleum industry and the automotive manufacturers are members of the Coordinating Research Council (CRC). In the past, CRC-sponsored research has been an effective mechanism for testing future vehicle and fuels technology and for generating data that can be used as the basis for new regulations. In fact, most of the emissions data used in developing the proposed amendments were generated in CRC projects. If the automotive manufacturers expect to introduce lean-burn systems in the near future, it is imperative to generate the data that will allow definitions of their fuel needs.

C. Lower sulfur cap is not needed for enforcement

ARB claims reducing the sulfur cap will “increase the enforceability of the program” (ISOR Page 35). Presumably this is because non-complying gasolines with high sulfur levels will be easier to detect and therefore unscrupulous sellers would be less likely to

provide non-California gasoline and try to label it as CaRFG. WSPA believes this argument is not valid. With the implementation of the Federal Tier 2 gasoline sulfur limits, the difference between California and non-California gasoline sulfur levels has been greatly reduced. As a result, examining sulfur content alone will not be an effective "litmus test" for CaRFG compliance, as is currently the case. Fortunately, high sulfur is only one way to identify non-complying gasoline. ARB Enforcement should test all properties to see if the sample in question is valid rather than relying on just one property. Non-complying or adulterated fuel should be easily identifiable, if not by one particular property, then by all properties considered together. For instance, levels of T₅₀ and olefins are typically much lower in California RFG than in non-California fuels.

If ARB believes WSPA is wrong about this point, they should provide data to support the view that it is difficult to detect non-complying gasoline. They have not done so.

D. Lower sulfur cap may negatively affect producibility

ARB staff has argued that in the future, very little gasoline will be made with sulfur above 20 ppm, so that this step does not impose a burden on California fuel blenders. WSPA is concerned this may not be the case. Under current regulations, significant volumes of gasoline are produced with sulfur levels between 20 and 30 ppm. As reported in the ISOR, page 13, during 2005-2006, 6% of refinery samples in the summer and 16% of wintertime refinery samples had sulfur levels above 20 ppm. This represents a significant fraction of production and suggests that under current rules, lowering the cap to 20 ppm could have a significant impact on producibility. The data show this impact will likely be more severe in the winter, when control of hydrocarbons and ozone levels are less of a concern than in the summer. The impact will also be felt during refinery turnarounds and outages, when a refinery must operate at sub-optimal conditions and still meet the standards and regulations. Further restricting operability by lowering the sulfur cap can only exacerbate a difficult situation.

It is interesting to note field sampling shows a smaller percentage of samples above 20 ppm than refinery sampling. This undoubtedly is the result of mixing in the distribution system. After gasoline blends are produced, there are a number of opportunities to mix with tank heels and other blends before fuel is ultimately sold in service stations. Experience suggests ARB should not be concerned about sulfur levels between 20 ppm and 30 ppm in customer tanks.

Neither CEC nor WSPA has carried out modeling that will allow an assessment of the variability of gasoline sulfur levels under the new regulations, or an assessment of the impact of a 20 ppm sulfur cap on overall producibility. Prudence dictates that a reduced sulfur cap should not be adopted until there is a better understanding of the impact.

ARB estimates most, if not all, CaRFG will contain ethanol at levels equal to or higher than today's levels. While this may be an accurate outlook, there may be instances when individual refiners must deal with conditions such as shortages of ethanol that are beyond their control. There may also be refineries that choose to blend without ethanol. In these cases, it is possible a refiner will choose higher sulfur in order to increase the volume of gasoline that can be produced. Considering the fact higher sulfur content will not increase emissions as long as the blend meets the Predictive Model test, making these blends illegal will do nothing but restrict the amount of CaRFG that can be produced.

A lower sulfur cap also limits the number of crude sources that can be considered for use in California refineries. Crudes with higher sulfur may be less likely to be usable if the sulfur cap is lowered to 20 ppm. This may have a negative impact on crude availability and therefore possibly on producibility and cost. If the high sulfur crudes are sourced in California, crude producers may then be in the unusual situation of exporting crude oil to other locations and importing other crude oil into California.

E. Lower sulfur cap is especially problematic before full compliance

As harmful and unjustified as the proposed sulfur cap is in the long term, it is even more of a problem in the period before full compliance is required. The sulfur cap portion of the regulation is not designed to help reduce permeation emissions, and will likely require refinery modifications. However, the sulfur cap is proposed to take effect before refinery modifications can be made. Therefore, the proposed sulfur cap could have an even greater negative impact on gasoline producibility during this interim period.

VI. WSPA SUPPORTS EMISSIONS AVERAGING FOR INADVERTANT EXCEEDANCE OF SULFUR SPECS (WILL STILL BE BELOW CAP)

WSPA supports ARB's proposal to allow emissions averaging for low sulfur blends where the sulfur specification has been inadvertently exceeded. We also agree the mechanism should not be used for blends that exceed the sulfur cap. While there is no way of predicting future sulfur levels with any certainty, this approach provides a reasonable mechanism to avoid unexpected problems as refiners try to cope with new regulations. It also preserves emissions benefits of the new regulations and provides assurance that the ultimate benefits will outweigh the initial shortfall. As shown in the example in the ISOR, it is virtually impossible to make up emissions in all components (Ozone Forming Potential, NOx and toxics) at exactly the same time. Therefore, some emissions components will over-comply with the required targets in order to assure all components meet them and emissions averaging will yield additional emission reductions.

ARB proposed emissions averaging because staff expects sulfur levels to be very low. The potential to exceed low sulfur specifications is exacerbated by the relatively high uncertainty in the analytical test for sulfur concentration at low levels. In the proposed regulations, Section 2622 (b)(1), two test methods are listed for sulfur - ASTM D 2622 and ASTM D 5453. Of the two tests, only ASTM D 5453 is suitable below 10 ppm. The latest version of ASTM D 5453 has a reproducibility level of 3.3 ppm at a gasoline sulfur level of 10 ppm, and 1.9 ppm at a gasoline sulfur level of 5 ppm. These are relatively high fractions of the average gasoline sulfur levels expected by ARB and are consistent with a higher probability of unintentionally exceeding a low refinery specification for sulfur.

WSPA urges ARB to broaden the concept of emissions averaging for off-spec blends to include T₅₀ in addition to sulfur. While sulfur is a natural choice because its concentration is expected to change and because the measurement method has high variability, T₅₀ is important too, since it has a large impact on emissions.

After a period of time, ARB should analyze the performance of refiners and determine whether continuation of the program is necessary, and if so, which parameters should be included and which should be excluded.

VII. INVENTORY CALCULATION METHODOLOGY

A. ARB approach is unnecessarily complex

ARB has adopted a very complex approach to model permeation emissions. This approach briefly described as the "Percentage Approach" uses data developed in a project jointly sponsored by ARB and the Coordinating Research Council, E-65. In this project, fuel systems were isolated from the rest of the vehicle, equilibrated on a test fuel, and then tested at two constant temperatures and under diurnal variable temperature conditions. ARB staff took these admittedly limited data and constructed a model which matches up with the EMFAC inventory model. Using this approach, they had to make a number of assumptions which resulted in overestimating of the impact of ethanol on permeation. The estimate rests on using ratios between MTBE-containing gasoline and ethanol-containing gasoline at different temperatures. ARB had to estimate the fraction of total evaporative emissions that comes from permeation, liquid leaks and canister breathing losses. They also had to estimate the temperature of the fuel in the fuel tank as ambient temperatures varied over the course of a day, and for different driving conditions. While their assumptions are not unreasonable, they introduce unnecessary uncertainty into the estimate.

WSPA's approach, described as the "Additive Approach", is simpler and more consistent with the level of detail in the data from the E-65 project. It is possible to calculate the additional emissions generated by gasoline containing ethanol directly from the experimental data if one uses an additive approach. Over the course of a diurnal cycle, or at specific temperatures, there is a difference between gasoline containing ethanol and gasoline that does not contain ethanol. Gasoline containing MTBE and non-oxygenated gasoline had equal permeation rates. WSPA calculated the absolute differences in emissions and applied those differences, adjusted for ambient temperatures to the existing and future fleets.

Another difference between the WSPA and ARB estimates is the treatment of the base case. In the inventory calculation, ARB compared permeation with gasoline containing ethanol to permeation with gasoline containing MTBE. WSPA averaged the two non-ethanol gasolines to use as the base case. The rationale for this was both the gasoline containing MTBE fuel and the non-oxygenated gasoline had permeation rates that were indistinguishable. ARB recognizes this fact on page 17 of the ISOR when it states:

"For non-oxygenated fuel, staff assumes the evaporative emissions are the same as the MTBE emissions. Therefore, the non-oxygenated regression models are identical to the MTBE models."

ARB should be consistent in applying this conclusion to the permeation portion of the evaporative emissions inventory as well.

Over the course of developing the regulations, ARB and WSPA had many fruitful discussions, both at the public workshops and in individual meetings. Both groups made changes to their calculation methodology, and at this time only a few differences remain. WSPA's estimates are 10-20% below those appearing in the ISOR and we urge ARB to continue the dialogue to resolve the differences.

VIII. PREDICTIVE MODEL

A. Tech 5 NOx-sulfur response is too steep

1. Summary

In the ISOR, ARB presented its rationale for including data from two studies in the determination of the Tech 5 NOx-sulfur response while excluding data from two other studies. WSPA continues to disagree with staff's decision. WSPA is also very disappointed that our submissions to ARB on this subject (two workshop presentations, a statistical workgroup presentation, a private presentation to ARB, and private teleconference conversations with ARB) were not included in the staff report. Specific comments on staff's assertions in the ISOR follow.

2. Range of sulfur in the studies

ARB claims their decision to exclude the two studies can in part be justified because their use would require extrapolation from 30-40 ppm sulfur down to the 1-5 ppm range of the studies they included. However, ARB provides no evidence to demonstrate any adverse impact of such an extrapolation. To the contrary, WSPA has presented evidence that any concerns about such extrapolation are unfounded.

- The excluded studies contain data very close to the CARB operating range, minimizing the magnitude of the extrapolation.
- The available data indicate that NOx response to sulfur at very low (<100 ppm) levels is linear, removing any expectation of large differences in response that would argue against extrapolation.
- All four studies contain data within the range of 40-100 ppm sulfur, and examination of the relative responses observed in each study over this common range reveals no difference from the relative responses in the extrapolated range.

3. Technology representation in the studies

In the ISOR, Table 14, the AAMA/AIAM Study (1997) actually included 2 ULEVs (one was a prototype, but it should be noted that the AAM/AIAM Study also included prototypes). The description "LEV 1 and older" is misleading since there was only one pre-LEV 1 vehicle tested (a TLEV), compared to 55 LEV 1s. WSPA cannot comment on the accuracy of the claim of 3 ULEVs in the AAM/AIAM Study (2001), since that information was always described as "unavailable" in response to the many requests for that information at workshops; ARB should disclose the source of this information. ARB's characterization that the two earlier studies focused on early LEV technology while the two newer studies focused on "a much broader range" is inaccurate. The AAM/AIAM study did not examine a significantly different range of technologies than the two earlier studies – that observation is only valid for CRC E-60. Finally, as ARB itself has pointed out on several occasions, while the number of vehicles has an impact on the relative impact ("bias") of data subsets, the number of observations does not.

4. 2015 fleet and inventory

ARB correctly points out that in 2015 “emissions in Tech 5 will be dominated by LEV I and newer technology vehicles”. However, it is not clear how this is relevant to their choice of studies since the resulting data from the inclusion of all four studies is also dominated by LEV I and newer vehicles (69 out of 70). While there is some discussion of numbers of vehicles and VMT, the environmentally significant issue is the relative contributions of various technology categories to the NOx inventory. Table 15 reveals that the majority (62.3%) of the 2015 NOx inventory for Tech 5 will still come from LEV I and older vehicles. By ARB’s choice of data, the majority of the available data on these LEV I and older vehicles (41 vehicles excluded, 14 included) have been excluded from the determination of the sulfur response.

5. Conclusions

ARB’s decision to exclude data sacrifices the accuracy of the model predictions for the bulk of the emissions inventory. As WSPA has pointed out and ARB has confirmed, the sulfur sensitivity is much greater using the data they have chosen than it would be if they had used all of the data. Unfortunately, ARB’s decision has eliminated the bulk of the data for the vehicle technologies that ARB itself predicts will contribute the bulk of the NOx emissions in 2015. This error means that lower gasoline sulfur levels will be credited with a greater NOx reduction than will actually occur. **Since compliance is predicated on emissions equivalence, overestimation of NOx emissions impacts due to sulfur reductions will result in real-world NOx increases.**

B. Benzene permeation should have been included

The proposed equations for evaporative benzene emissions do not include the impact of permeation on benzene emissions. The equations are composed of an estimate of the total hydrocarbon evaporative emissions for each process in mg/mi, multiplied by an estimate of benzene emissions as a fraction of the total hydrocarbons. Both of these components appear to be direct carry-overs from the previous Predictive Model. In the absence of new data, this is appropriate for the component that deals with the benzene fraction. However, the component that deals with g/mi hydrocarbon emissions has not been updated to include the impact of ethanol on permeation and is thus inconsistent with the evaporative models used elsewhere. WSPA recommends this inconsistency be removed to ensure that the impact of permeation on benzene emissions is characterized accurately.

C. Evaporative model cannot be “optional”

The “Procedures for Using the Predictive Model” (ISOR, Appendix A-2) provide the option to choose whether or not the evaporative and CO models are used. However, the impact of ethanol on permeation emissions is included only in the evaporative model. Therefore, making the evaporative model optional constitutes a serious loophole relative to ensuring that permeation emissions are offset within the model. This option should be removed.

However, it should be noted the above change will require other changes to make the Predictive Model compatible with the non-RVP control season. In the current regulations, the option to use the evaporative model exists only during the RVP control season. Therefore, the evaporative model was eliminated from the non-RVP control

season by default. Making the evaporative model mandatory for the RVP control season will require specific language directing blenders to not use the evaporative model during the non-RVP control season.

Finally, it should be noted the spreadsheet version of the Predictive Model includes the evaporative model in both summer and winter calculations. It is therefore inconsistent with both the existing proposal and the changes recommended above. While WSPA recognizes that the spreadsheet is not an official part of the rulemaking package, we urge ARB to make it consistent with the regulatory package to avoid confusion among the various stakeholders who seek to evaluate the new model.

D. Quadratic-induced anomalous responses

As WSPA has indicated in workshop presentations, there are several examples of exhaust model responses that are not the result of data used in developing the model, but rather an artifact of a quadratic function being extrapolated beyond the range of the data. In these cases, the model response should be held constant beyond the range of the data in order to avoid the inclusion of such inappropriate responses in the model.

E. Representation of oxygen content ranges

WSPA supports the inclusion of text in the "Procedures for Using the Predictive Model" that stipulates oxygen content ranges of 0.4 wt% or less should be evaluated only at the midpoint of the range. However, we urge staff to incorporate this provision into the spreadsheet in order to avoid confusion among the various stakeholders who seek to evaluate the new model.

F. Cleanup

Both the proposed regulatory text and the accompanying procedures include references to dates and specifications that are no longer in effect. WSPA recommends such items be removed at this time to avoid future regulatory cleanup.

G. Comments by expert reviewers

ARB staff requested comments on specific issues raised during the Predictive Model development process and the resulting draft spreadsheet from Robert Harley and David Rocke. WSPA generally concurs with their observations. In particular, comments were made on the concept of bifurcating the data into "low emitters" and "not-so-low emitters", detailing several technical reasons why this technique is not appropriate. WSPA has expressed our agreement with this finding in the Statistics Expert Group. We also have concerns about the ability to properly characterize higher emitters. While broken vehicles are inherently highly variable (both vehicle-to-vehicle differences and observations on a given vehicle), there are relatively little data on them. Changing the definitions into "low emitters" and "not-so-low emitters" is not an appropriate means of acquiring additional data. There are also concerns that the way the data were divided might emphasize differences in the fuels on which the different vehicles were tested. Finally, we disagree on the proper treatment of high emitters even if sufficient data existed. These vehicles should be the target of other programs, not the fuels program. Therefore, it would be more appropriate to exclude these vehicles from the model.

It should be noted that there was no mention of ARB's decision to exclude data from the Tech 5 model development (see item A in this section) included in the expert reviewers'

comments. ARB staff apparently failed to ask the reviewers for comments on this topic, despite WSPA's objections to staff's decision and the major impact the resulting model will have on the direction of gasoline production and vehicle emissions in California. Staff should ask for independent review of their decision immediately.

IX. PERMEATION IN OFF-ROAD EQUIPMENT

A. WSPA Supports ARB's approach to off-road permeation

ARB has correctly recognized that insufficient data exist at the present time to enact regulations that limit permeation emissions from off-road vehicles and other equipment. WSPA supports ARB's decision to collect more data on pleasure craft, lawn equipment, storage containers, etc. These programs will allow ARB to estimate the impact of ethanol use on emissions from this category and to make informed decisions about regulations and control plans.

Considering the major improvements in the resistance of on-road vehicle fuel systems to permeation, it is important for ARB to also ensure that the performance of off-road equipment improves in the future as well. Regulations that limit permeation, especially with ethanol containing fuels, are an important component of the overall control program. ARB has already started to control evaporative emissions from off-road equipment and should continue this effort.

X. ECONOMIC AND GREENHOUSE GAS EVALUATIONS

In the Initial Statement of Reasons, ARB discusses economic evaluations and provides estimates on the capital investment required to meet the new regulations (200-400 \$M or 0.3 to 0.8 cpg) and the expected increase in cost of gasoline to the end users (3-6 cpg). These estimates provide too little detail to enable WSPA or other commenter's to evaluate their basis or accuracy and deprive WSPA and other commenter's of the ability to comment adequately at the current time. For instance, ARB states that the majority of the capital expenditures will go toward removal of sulfur from gasoline. If, as ARB also predicts, ethanol use increases by many millions of gallons per year across the state, it is reasonable to expect that substantial additional capital expenditures will be needed in the blending, distribution and storage systems statewide. Given ARB's lack of any supporting analysis, we do not and cannot know whether ARB considered these costs, as it is obligated to do under Health & Safety Code § 43013 (e)(1). ARB must publish a detailed breakdown of how it calculated the 3-6 cpg to enable review and comment on ARB's cost estimates.

By providing only very limited information, ARB has also failed to satisfy its obligation to complete an economic analysis of the proposed regulation as set forth in Section 43013 of California Health & Safety Code. Prior to adopting or amending any motor vehicle fuel specification such as these CBG rule amendments, ARB must "quantitatively document the significant impacts of the proposed standard or specification on affected segments of the state's economy" Cal. Health & Safety Code, § 43013(f). Moreover, such "economic analysis *shall* include, but is not limited to, the significant impacts of any change in motor vehicle fuel efficiency, the existing motor vehicle fuel distribution systems, the competitive position of the affected segment relative to border states, and the cost to consumers." *Id.* (emphasis added).

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The California Legislature has unequivocally set forth the non-discretionary requirement that ARB **shall** determine the cost-effectiveness of these CBG rule amendments and **shall** perform an economic analysis prior to amending its CBG regulations, and courts have consistently held that administrative agencies, such as ARB, must adhere to their statutorily prescribed obligations. See *Morris v. Williams*, 67 Cal.2d 733, 748 (Cal. 1967) (quoting Cal. Gov't Code § 11342.2). ("Whenever a state agency is authorized by statute 'to adopt regulations to implement, interpret, make specific or otherwise carry out the provisions of the statute, no regulation adopted is valid or effective unless consistent and not in conflict with the statute.'"); *Ass'n for Retarded Citizens v. Dep't of Developmental Serv.*, 38 Cal.3d 384, 391 (Cal. 1985) ("Administrative action that is not authorized by, or is inconsistent with, acts of the Legislature is void."); *Laurel Heights Improvement Assn. v. Regents of Univ. of California*, 47 Cal.3d 376, 399 (Cal. 1988) ("We find no authority that exempts an agency from complying with the law, environmental or otherwise, merely because the agency's task may be difficult."); see also *Forest Guardian v. Babbitt*, 174 F.3d 1178, 1187 (10th Cir. 1999) ("The Supreme Court and this circuit have made clear that when a statute uses the word 'shall,' Congress has imposed a mandatory duty upon the subject of the command"); *City of South Pasadena v. Slater*, 56 F. Supp 2d 1106, 1144 (C.D. Cal. 1999) ("An administrative agency's failure to comply with the law invokes a public interest of the highest order: the interest in having government officials act in accordance with the law").

Contrary to ARB's current approach in the 2007 CBG3 amendments, prior to adopting the Phase 3 CaRFG regulations in 2000, ARB contracted with Peter E. Berck of U.C. Berkeley to conduct a preliminary assessment of the economic impacts of the proposed regulations on the California economy. See *Proposed California Phase 3 Reformulated Gasoline Regulations, Final Statement of Reasons*, at 45 (June 2000). Moreover, the results of the CEC-commissioned MathPro report, *Analysis of California Phase 3 RFG Standards*, which also provided an analysis of the economic impacts of the proposed Phase 3 CaRFG regulations, were provided at the December 9, 1999 Phase 3 RFG Regulation public hearing. *Id.* at 43. ARB has failed to provide similar analyses of the current 2007 CBG rule amendments. See *Initial Statement Of Reasons, Chapter IV. Economic Impacts of the Proposed Amendments*, at pp. 43-49.

WSPA objects to ARB skipping such important and clearly prescribed legislative mandates in the current CBG rulemaking when it apparently followed such requirements in the prior California RFG rulemaking, as required by specific provisions of the Health & Safety Code. Detailed, well-documented and adequate cost-effectiveness and economic analysis requirement set forth in Section 43013 of California Health & Safety Code are essential to allow for informed and adequate public review and comment regarding the proposed 2007 regulatory changes. It is particularly important for ARB to prepare and provide such analyses to the "private entities that would be significantly impacted," such as WSPA and its members, which the Legislature mandated be consulted by ARB under Health & Safety Code § 43013 (f)(2). This proposed rulemaking raises important issues on which the public and regulated community should have a full and fair opportunity to review and comment. ARB's cursory approach to providing the requisite cost-effectiveness and economic analyses substantially impairs WSPA's ability to adequately respond.

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In connection with the current 2007 CBG rule amendment process, ARB acknowledges that other directly relevant economic studies are being carried out by the California Energy Commission. However, ARB has decided to proceed now without the benefit of the CEC modeling and other studies. In addition, it appears from statements made in recent months by CEC representatives that ARB has seriously underestimated the costs of the current CBG rule amendments. CEC representatives estimate such capital investments to be in the 1-1.5 \$B range (versus ARB's estimate of 200-400 \$M) and an increased production cost of 5-10 cents per gallon. See attached Official Transcript of IEPR Staff Workshop, at pp. 125-26 (May 8, 2007). ARB should therefore reconcile these differences before proposing these new CBG rule amendments.

In addition, California is in the midst of other regulatory efforts such as the Low Carbon Fuel Standard and AB32, which will most certainly impact fuel specifications, ARB's CBG standards and regulations, the refining industry and many other "private entities that would be significantly impacted." It is important that all current and future CBG rulemakings be coordinated so that the efforts of WSPA members and other impacted entities to meet the regulations result in improvements in environmental quality, while providing adequate and cost-effective supplies of transportation fuel to the people of California. For instance, if this CBG rulemaking results in higher ethanol and lower sulfur concentrations than are currently found in California RFG, then the greenhouse gas emission changes need to be coordinated with the Low Carbon Fuel Standard and AB32. The Initial Statement of Reasons described a relatively simple analysis of greenhouse gas emissions, and it should be confirmed with a more rigorous analysis carried out by the California Energy Commission, which is the lead agency in these issues. If it is necessary to make investments for refinery modifications, the most efficient way is to plan for all changes at once, even if the changes must be staggered.

XI. OTHER ISSUES

A. ARB should do a multi-media assessment

Health and Safety Code Section 43830.8 requires that ARB may not adopt any regulation that establishes a specification for motor vehicle fuel unless that regulation and a multimedia evaluation are reviewed by the California Environmental Policy Council. ARB claims in the ISOR, page 52 the "proposed amendments do not change specifications of CaRFG3 gasoline" and thus do not trigger the multimedia evaluation.

The characterization that the "proposed amendments do not change specifications" is not accurate. Currently, the regulations stipulate that the primary means of compliance in CaRFG3 are the (flat) specifications listed in Section 2262 of the regulations. Use of the Predictive Model and the vehicle test option are identified as alternative methods of compliance. This will change under the new regulations. The (flat) specifications can only be used in combination with an AERP, which will sunset on 12/31/11. As a result, the primary means of compliance with the regulations will no longer be available, and the Predictive Model will become the only means of compliance. This change has occurred because significant new requirements to offset permeation emissions due to ethanol have been added to the Predictive Model, but the specifications (i.e. flat and average limits) have not been changed to reflect these additional requirements.

WSPA believes the multimedia evaluation is required because:

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- 1) the existing (flat and average) specifications will no longer be a valid compliance option for CaRFG3, and,
- 2) the new specifications represented in the Predictive Model are significantly more stringent than the current specifications.

B. ARB should provide flexibility to change ethanol levels

Flexibility for gasoline producers to vary the amount of ethanol they add to gasoline is beneficial since it allows the industry to respond to shifts in supply and demand in a timely manner. Currently there is a substantial barrier to such flexibility in Section 2266.5(f)(1)(C) which virtually prohibits changes in ethanol content. We believe significant flexibility could be added without environmental harm by making the following modifications to the regulations.

1. Eliminate 2266.5(f)(1)(C)(1). This requirement is too vague to be useful.
2. Modify 2266.5(f)(1)(C)(2) to limit changes in oxygen content to 1.4 mass % oxygen. This would allow up to a 4% change in ethanol content at any one time. For example, a blender could change from 6% ethanol to 10% ethanol in one step by following these procedures.
3. Modify 2266.5(f)(1)(C)(3) to require a volume addition of at least three times the heel, not four times the heel. The original requirement is too burdensome and the difference between three and four is not large enough to make a difference.
4. Eliminate 2266.5(f)(1)(C)(4). This requires CARBOB to have a sulfur level of less than 12 ppm. The level of sulfur in a complying CARBOB is irrelevant and should not be included. If the CARBOB passes the Predictive Model test, then any level of sulfur should be acceptable. Concerns about excess emissions caused by mixing CARBOBs will not be addressed by this step, but by controlling the size of the heel as in subparagraph (3).

C. ARB should evaluate ethanol specifications

The specification for ethanol is an important component of the overall regulatory package and ARB has, when necessary, adopted a specification that is more stringent than ASTM. In particular, WSPA believes that the current sulfur specification for ethanol - 10 ppm - is too high. ARB believes that future sulfur concentrations in gasoline will be lower than they are today and will approach zero in many cases. If this is the case, then sulfur in ethanol could raise the gasoline sulfur level significantly. We believe that the specification for ethanol sulfur should be consistent with the lowest levels of sulfur needed for gasoline blends. The exact level should be the subject of discussion between ARB, ethanol suppliers and refiners. WSPA recommends that the Board instruct ARB staff to evaluate ethanol specifications and take appropriate action on this item.

D. ARB should review and update all aspects of the gasoline specifications

In general, ARB should adopt the latest versions of ASTM specifications and methods in its regulations. They should allow adequate time after ASTM revises or modifies a specification or method to allow companies to implement the change. Some specific examples are listed below.

1. Sulfur test

In Section 2263(b), two test methods are listed for sulfur content – ASTM D 2622-94 and ASTM D 5453-93. Newer versions of these test methods were adopted by ASTM in 2005 and 2006 respectively. Furthermore, ASTM D 2622-05 may not be appropriate for California RFG. The method states (Section 14.1) that “A practical limit of quantitation (PLOQ) of ~20 µg/g [ppm] S was determined for gasoline sample types.” Since most CaRFG3 blends today are well below 20 ppm, this method is not appropriate and should be removed.

2. MTBE de-minimus value

In Section 2263 (b), MTBE content is measured by ASTM D 4815-04. In this test method, individual ethers are detected between 0.20 to 20.0 mass%. The method states that: “For concentrations less than or equal to 0.20 mass%, report as ‘not detected’”. Under current plans, the MTBE limit in gasoline will be reduced from 0.15 mass% to 0.05 mass% on July 1, 2007. This level is significantly below the detection limit and there is no practical way for refiners to assure that they are complying with the regulation. Nor is there a practical way for ARB to enforce the regulations. The limit should stay at its current value until the present test method is improved or until a better one is developed.

3. Downstream testing

Refiners currently conduct downstream product quality testing to ensure that fuels comply with industry and government requirements. If the testing reveals that any of the specifications are not met, then ARB Enforcement Division deems the product to be out of compliance and may issue a Notice of Violation. Unfortunately, this does not recognize the inherent uncertainty and variability in testing that is recognized in other enforcement evaluations. WSPA asks that this practice be modified so that the repeatability and reproducibility of the ASTM test methods be taken into account when conducting these downstream testing programs.

E. ARB should modify regulations to recognize the reality of blend certification

The current regulations contain a number of provisions that are not relevant and are not likely to be used in the future. WSPA recommends the regulatory language be revised to take into account how the regulations are used. Specifics are described below.

1. Eliminate vehicle testing option

The current regulations allow a fuel producer to certify a blend composition by conducting a vehicle test program. Initially, it was felt this was a viable option for producers considering unusual or novel blends not described by the Predictive Model. This option is expensive and complicated. As refiners have gained experience with the various versions of the Predictive Model, it is commonly accepted as a good representation of the relationship between fuel quality and emissions. Alternative formulations are unlikely to be successfully approved through a vehicle test program.

To the best of our knowledge the vehicle option has never been used and we believe it is highly unlikely to be used in the future. WSPA proposes its elimination from the regulations.

2. The Predictive Model is the only compliance option

The regulations, as currently written, implicitly suggest that complying gasoline can be made by meeting the flat or average limit specifications. This is not the case in the summer. Since gasoline meeting the limits has excess permeation emissions in the summer, the only way to produce complying summertime gasoline is by using the Predictive Model. Thus, the Predictive Model is the single most important piece of the regulations and should be recognized as such.

In the winter, when the evaporative part of the Predictive Model is not active and permeation emissions are not considered, it is possible to make a complying gasoline by using the flat and average limits. However, we believe that even in the winter, most, if not all, gasoline blends are made using the Predictive Model.

F. Include ethanol in the certification fuel for vehicle emissions

WSPA urges ARB to redefine the fuel that manufacturers of automobiles, off-road equipment and gasoline storage devices use for certifying their equipment to emissions standards. In general, certification fuel should represent the fuel that is being used by the consuming public. In this case, it is critical that equipment pass the relevant standards with gasoline containing ethanol. Much of the need for this current rulemaking came about because ethanol was not part of the certification fuel in the past. WSPA recommends the Board direct ARB staff to evaluate and take appropriate action on this issue.

In addition, ARB should continue to test whether fuel containing ethanol has different emissions performance than fuel without ethanol.

XII. DETAILED COMMENTS ON INITIAL STATEMENT OF REASONS AND APPENDICES

Initial Statement Of Reasons

Page vi: December 31 not December 11.

Page x, last full paragraph: ARB's point is not clear the way the paragraph is written. The second and third sentences should be replaced with: "Like other fuel properties governed by the CaRFG3 rules, increases in sulfur levels in individual batches result in an immediate but reversible impact on emissions. Increases in sulfur levels do not have long term effects; the effects are immediate and are reversed when sulfur levels decrease."

Page 16 last full paragraph: Make clear that increase in permeation is due to inclusion of ethanol in the gasoline blends. Future reductions are not just due a general reduction in emission levels, they occur also because modern vehicles show a lower permeation response to ethanol.

Page 20, Table 11: The table heading says "Reactivity-Weighted", but it appears to represent mass weighting, based on Table 10 data.

Page 22 last two paragraphs: Staff is essentially arguing that some Tech 5 vehicles respond differently than others. If this is true, then the basis for defining the Tech 5 group is flawed and the group should be split. A consistent approach should be used. If

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the group needs to be split for sulfur, then it should be split for other parameters too. The degree of extrapolation is exaggerated. It is only 1.5 or 2 times the sulfur level, not “many times” as the report states. Furthermore, the linearity assumption that concerns ARB was shown to be true. All test programs considered exhibited a linear response over their entire range.

Page 23, last sentence: The report lists lean-burn engines as an example of new technology that is “about to be introduced”. We are not aware of any announced plans to introduce this technology in the U.S. or California.

Page 25, first paragraph: Table 17, not Table 15.

Page 26, first paragraph: We are not aware of this data and it was not discussed in the statistics expert group or in any of the public workshops.

Page 32: The denominator in the average OFP and average NOx equations should be 6, not 5.

Page 35, third paragraph: No details are given about how the lower sulfur cap will “increase enforceability”. This represents the main argument for a lower sulfur cap, and should be supported with a more complete analysis.

Page 35, fourth paragraph: The report mentions the potential of lean-burn engines to improve efficiency and lower greenhouse gas emissions. It should also mention that there are significant emissions issues to overcome. Specifically, technology to meet California's strict exhaust emission limits, especially NOx, has not been demonstrated commercially.

Page 36, second paragraph: See comments on page x.

Page 41: Replace “start” with “staff”.

Page 44, Table 25: Replace “must” with “most”.

Page 46, second paragraph: There is no mention of the debits associated with having to find alternative disposition of blending components that can no longer be blended into gasoline.

Page 58, next to last line: Replace “is” with “are”.

Page 59, first paragraph: Replace “meaning” with “meaningful”

Appendix A - Proposed Regulations

Page 4-5, Section 3: This section implies that there is a compliance option to use only the exhaust emission model. This is not the case for the current proposal and the write-up should be edited to reflect the new procedures.

Page 5, Section 4: “Emissions equivalency” is not a relevant concept for the revised regulations. The candidate fuel must be better than the reference fuel, not equivalent to it.

Page 22: The equations should use TWF (toxics weighting factor) not VMTWF (vehicle miles traveled weighting factor), as explained earlier on page 11, Table 5. This change should also be made on pages 23, 65, 66

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Page 27: The equation for linearizing the oxygen concentration is incorrect. The equation shown is valid for the previous version of the Predictive Model in which there was an ARO-OXY interaction term. Since it's no longer in the Predictive Model, the Oxygen variable should be a constant below the critical value. This comment is valid for most of the linearizations in this section. See also pages 29, 35, 37, 38, 43 and 44.

Appendix E – Reactivity Calculations

Page E-15: Table 4 shows equal weightings of 0.5 for liquid and vapor contributions or running loss emissions. These weightings should be consistent with those of EMFAC2007, which assume the liquid fraction to be 0.10 and the vapor fraction to be 0.90.

Page E-58, first full paragraph: The reference to Graskow et al. 1998 is incorrect. That paper did not show in any way that “aromatic compounds in gasoline contribute significantly to exhaust particulates”.