

State of California  
California Environmental Protection Agency  
AIR RESOURCES BOARD

# **Proposed California Phase 3 Reformulated Gasoline Regulations**

**Proposed Amendments to the California Reformulated  
Gasoline Regulations, Including a December 31, 2002  
Prohibition of Using MTBE in Gasoline, Adoption of Phase 3 Gasoline  
Standards, a Phase 3 Predictive Model, and Other Changes**

## **Final Statement of Reasons**

**June 2000**

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State of California  
California Environmental Protection Agency  
**AIR RESOURCES BOARD**

**Final Statement of Reasons for Rulemaking  
Including Summary of Comments and Agency Response**

PUBLIC HEARING TO CONSIDER AMENDMENTS TO THE CALIFORNIA  
REFORMULATED GASOLINE REGULATIONS, INCLUDING A DECEMBER 31, 2002  
PROHIBITION OF USING MTBE IN GASOLINE, ADOPTION OF PHASE 3 GASOLINE  
STANDARDS, A PHASE 3 PREDICTIVE MODEL, AND OTHER CHANGES

Public Hearing Date: December 9, 1999  
Agenda Item No: 99-10-3

**I. GENERAL**

In this rulemaking the Air Resources Board (ARB or Board) is adopting major amendments to the California Reformulated Gasoline (CaRFG) regulations, which have applied in the state since 1996. The amendments prohibit California gasoline produced with the use of methyl tertiary-butyl ether (MTBE) starting December 31, 2002, establish Phase 3 CaRFG (CaRFG3) standards, establish a CaRFG3 Predictive Model that includes an evaporative emissions element, and make various other changes. MTBE is an oxygenate that is used to add oxygen to gasoline and to improve properties of gasoline such as octane level. Since 1995, most of the state's gasoline has contained about 11 percent MTBE.

The rulemaking has been conducted in response to Governor Davis's March 25, 1999 issuance of Executive Order D-5-99, in which he found that, on balance, there is a significant risk to the environment from using MTBE in gasoline in California. He made this finding on the basis of a University of California report (the U.C. Report) that concluded there are significant risks and costs associated with water contamination due to the use of MTBE and information received at two public hearings. MTBE is highly soluble in water and will transfer faster and travel farther and more easily in water than other gasoline constituents such as benzene when gasoline leaks from underground storage tanks or pipelines. The Executive Order directed the California Energy Commission (CEC) to issue a timetable for the removal of MTBE from gasoline at the earliest possible date, but not later than December 31, 2002. The CEC subsequently determined that December 31, 2002 was in fact the earliest feasible time. The Executive Order also directed the ARB by December 1999 to adopt CaRFG3 regulations that will provide additional flexibility in lowering or removing the oxygen content requirement while maintaining current emissions and air quality benefits and ensuring compliance with the State Implementation Plan (SIP).

Subsequent legislation signed by the Governor October 10, 1999 (Stats. 1999 Ch. 812; S.B. 989, Sher) also required the CEC to develop a timetable for the removal of MTBE from gasoline at the earliest practicable date. New section 43013.1 of the Health and Safety Code further required the ARB to ensure that the CaRFG3 regulations adopted pursuant to the Governor's Executive Order maintain or improve upon emissions and air quality benefits achieved by CaRFG2 as of January 1, 1999, and also provide additional flexibility to reduce or remove oxygen from motor vehicle fuel.

The rulemaking was initiated by the October 22, 1999 publication of a notice for a December 9, 1999 public hearing to consider the CaRFG3 amendments. A "Staff Report: Initial Statement of Reasons" (referred to as the Staff Report) was also made available for review and comment starting October 22, 1999. The Staff Report, which is incorporated by reference herein, contains an extensive description of the rationale for the proposal. The text of the proposed amendments to title 13, California Code of Regulations (CCR) sections 2260-2272, and a proposed new "California Procedures for Evaluating Alternative Specifications for Phase 3 Reformulated Gasoline Using the California Predictive Model" (referred to as the CaRFG3 Predictive Model Procedures), incorporated by reference in section 2265, were included as appendices to the Staff Report. These documents were also posted on the ARB's Internet site for the CaRFG3 rulemaking: <http://www.arb.ca.gov/regact/carfg3/carfg3.htm>.

At the December 9, 1999 hearing, the Board received numerous written and oral comments. At the conclusion of the hearing, the Board adopted Resolution 99-39, in which it approved the originally proposed amendments with several modifications. All of the modifications had been suggested by ARB staff in a three-page document entitled "Staff's Suggested Changes to the Original Regulatory Proposal" that was distributed at the hearing and was Attachment B to the Resolution. In accordance with section 11346.8 of the Government Code, the Resolution directed the Executive Officer to incorporate the modifications into the proposed regulatory text, with such other modifications as may be appropriate, and to make the modified text available for a supplemental comment period of at least 15 days. He was then directed either to adopt the amendments with such additional modifications as may be appropriate in light of the comments received, or to present the regulations to the Board for further consideration if warranted in light of the comments.

One of the approved modifications was to revise the CaRFG3 Predictive Model Procedures to reflect a new version of the ARB's mobile source emissions inventory – known as EMFAC 2000 – once the Board approved it at a meeting expected to be held in early 2000. However, the Board did not act on EMFAC 2000 until May 25, 2000, and the approval was conditioned on several corrections to be made subsequent to the meeting. As discussed in Section IV.G., the Executive Officer determined that it was not feasible to incorporate the EMFAC 2000 changes before final adoption of the CaRFG3 regulations in June 2000.

The text of the substantive modifications to the originally proposed regulations and incorporated document (without the EMFAC 2000 modifications) were made available for a supplemental 15-day comment period by issuance of a "Notice of Public Availability of Modified Text and Supporting Documents and Information." This Notice and its four attachments were mailed by April 7, 2000, to all parties identified in section 44(a), title 1, CCR

and to other persons generally interested in the ARB's rulemakings concerning gasoline.<sup>1</sup> Five comments were received during the 15-day comment period. After considering these comments, the Executive Officer issued Executive Order G-00-029, adopting the amendments to title 13, CCR, and adopting the CaRFG3 Predictive Model Procedures.<sup>2</sup>

This Final Statement of Reasons updates the Staff Report by describing the peer review conducted on the proposed amendments, the subsequent environmental review conducted by the Environmental Policy Council, and the rationale for the modifications made to the originally proposed amendments. It also summarizes and responds to comments submitted during the rulemaking.

**Incorporation of the CaRFG3 Predictive Model Procedures.** As noted above, section 2265(a)(2) incorporates the CaRFG3 Predictive Model Procedures by reference. The regulation identifies the incorporated document by title and date. The incorporated document is readily available from the ARB upon request, was made available in the context of this rulemaking in the manner specified in Government Code section 11346.5(b), and was posted on the ARB's Internet site for the rulemaking.

The CaRFG3 Predictive Model Procedures are incorporated by reference because it would be impractical to print the 62-page document in the CCR. Existing ARB administrative practice has been to have the Predictive Model procedures incorporated by reference rather than printed in the CCR because these procedures are highly technical and complex, have pages of equations and fourteen tables, include various worksheets, and have a very limited audience. The affected public is accustomed to the incorporation format used for these procedures. The ARB's Predictive Model procedures and other test procedures are quite lengthy and technically complex, and have a limited audience. It would be both cumbersome and expensive to print these documents in the CCR.

**Fiscal Impacts.** The ARB has determined that this regulatory action will not result in a mandate to any local agency or school district, the costs of which are reimbursable by the state pursuant to part 7 (commencing with section 17500), division 4, title 2 of the Government Code.

**Consideration of Alternatives.** The amendments proposed in this rulemaking were preceded by extensive discussions and meetings involving staff, the affected oil refiners and gasoline marketers, and others. Staff seriously considered all of the alternatives proposed by interested parties. As described in comment 10, the Western States Petroleum Association (WSPA) proposed alternative CaRFG3 standards that would reduce refiners' production costs and increase their production volumes somewhat. As indicated in the response to that comment, the Board determined that those alternative specifications were not consistent with S.B. 989

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<sup>1</sup> Because the complete set of regulations being amended was 64 pages, only a 17-page compilation of all of the substantive modifications was included in the mailing of the 15-Day Notice. On April 6, 2000, the complete set of regulations – including some nonsubstantial changes to portions not mailed with the 15-Day Notice – was posted on the Internet site for the rulemaking; this posting was announced in the 15-Day Notice.

<sup>2</sup> The adopted amendments contained a few nonsubstantial modifications made after the 15-day comment period. These are listed in Attachment A.

because they did not provide adequate assurance that the emission and air quality benefits achieved by the CaRFG2 program would be maintained. Accordingly, the ARB has determined that neither the WSPA alternative specifications nor any other alternative considered by the agency would be more effective in carrying out the purpose for which the regulatory action was proposed or would be as effective and less burdensome to affected private persons that the action taken by the ARB.

## II. PEER REVIEW

Health and Safety Code section 57004 requires that an external peer review be conducted on the scientific basis of the scientific portions of proposed rules the ARB is considering for adoption. Since the Predictive Model and the various CaRFG standards are premised on scientific conclusions regarding the relationships between fuel characteristics and air quality, an external peer review was initiated for the scientific elements of the proposed regulations.

On September 24, 1999, the ARB requested, under Interagency Agreement 98-004 between the University of California (U.C.) and the California Environmental Protection Agency, a scientific peer review of the proposed CaRFG3 regulations. On October 13, 1999, Niall J. Mateer, Director of Research Outreach and Initiatives for the U.C. - Office of the President, replied in a letter and identified three peer reviewers for the proposed CaRFG3 regulations. The U.C. peer reviewers selected were:

Professor Catherine Koshland, University of California, Berkeley

- Professor of Environmental Health Sciences, and Energy and Resources.
- Wood-Calvert Professor in Engineering
- Ph.D., Stanford University, Mechanical Engineering – 1985
- Member, Research Screening Committee, Air Resources Board: 1998 – Present
- Chair and Member, Advisory Council, Bay Area Air Quality Management District: 1991 – 1992

Dr. Donald Lucas, Staff Scientist – University of California, Berkeley, Lawrence Berkeley National Laboratory

- Environmental Energy Technologies Division - Principal Investigator in the Combustion Group
- Ph.D., University of California, Berkeley, Chemistry – 1977
- Program Chair, Executive Committee, Western States Section - Combustion Institute

Dr. Laurence Caretto, California State University, Northridge

- Dean, College of Engineering and Science: 1998 – Present
- Ph.D., M.S., B.S., University of California, Los Angeles, Mechanical Engineering
- Alternate Voting Member, South Coast Air Quality Management District Board.
- Vice-Chairman and Member, Air Resources Board: 1976 - 1982.
- Chairman, Committee on Heavy-Duty Vehicle Emissions, National Academy of Sciences.

The U.C. selectees agreed to provide a scientific peer review of the proposed CaRFG3 regulations and the California CaRFG3 Predictive Model. The peer reviewers selected Dr. David Roche, U.C. Davis, to assist with scientific peer review of the CaRFG3 Predictive Model. They agreed to complete their peer review and complete a written report of their findings by November 30, 1999. This completion date provided some leadtime prior to the December 9, 1999, hearing to allow ARB staff to review and respond to the peer review findings.



The peer reviewers transmitted letters to the Executive Officer and Dr. Koshland attended the December 9, 1999 hearing. Their overall findings are set forth below. Attachment B outlines the specific concerns identified in the peer review and the ARB's responses.

From a qualitative perspective, the peer reviewers found that the staff's CaRFG3 recommendations and supporting analyses are sound. They appear to meet the stated objectives outlined in Executive Order D-5-99, S.B. 989, and S.B. 529. Those objectives are to develop the CaRFG3 regulations to "provide flexibility to refiners to make or import CaRFG3 without MTBE, to preserve the significant emissions benefits realized from the current CaRFG2 regulations, and to obtain additional emissions reductions where technically feasible and economically reasonable." The Staff Report provides a descriptive rationale for the adjustments made both to phase-out the oxygenate MTBE, and to take advantage of advances since 1994 in the understanding of the impacts of fuel formulation changes on air quality through effects on both evaporative and tailpipe emissions.

The peer reviewers found that the rationale for the proposed changes is clearly presented, and, where possible, data is presented to justify the choices. Where data does not exist or is too uncertain to provide guidance, reasonable choices are made. The original proposal would provide some additional emissions reductions over those achieved with the CaRFG2 regulations. While the emissions gains can be quantified, not all of the decisions can be defended with such precision. These include the cost/benefit analysis and the desire to maintain a sufficient California fuel supply. An example of this is the provision that the changes be "economically feasible." This is more of a policy or political question than a scientific one, and the criteria involved are different. Many of these decisions were made in consultation with affected parties, such as the automobile manufacturers and the producers of gasoline and ethanol, through workshops and other communications. This approach is warranted and appropriate.

Overall, the proposed CaRFG3 regulations increase refinery flexibility while preserving air quality benefits. The changes in the requirements for the distillation temperature of T50 and T90 are directionally correct and coupled with a requirement for low sulfur and reduce benzene should maintain the air quality benefits described previously, the changes in distillation temperatures made the desired goal and increasing refinery flexibility and maintaining the volume gasoline available.

### III. PROCEEDINGS OF THE ENVIRONMENTAL POLICY COUNCIL

#### A. THE ROLE OF THE ENVIRONMENTAL POLICY COUNCIL

With the removal of MTBE, refiners would be expected to substitute ethanol in at least some of their California gasoline in order to meet minimum oxygen requirements and to improve octane. The CaRFG2 regulations currently mandate a minimum oxygen level (1.8 percent by weight (wt.%) only for gasoline sold in October through February in Los Angeles, Orange, Ventura, San Bernardino, Riverside and Imperial Counties. Adding oxygen to gasoline reduces emissions of carbon monoxide (CO) from the existing in-use vehicle fleet, and there are still exceedances of the national and state ambient CO standards in the Los Angeles area during the wintertime. In addition, the 70 percent of the state's gasoline that is sold in San Diego County and the greater Los Angeles and Sacramento areas must meet a federal RFG requirement for a minimum average of at least 2.0 wt.% oxygen year-round – even when it is not needed to avoid exceedances of the ambient CO standards and formulations with less or no oxygen will achieve equivalent reductions in emissions of hydrocarbons and toxics.<sup>3</sup>

The Governor's Executive Order D-5-99 included a direction that the ARB and the State Water Resources Control Board (SWRCB) conduct an environmental fate and transport analysis of ethanol in air, surface water and ground water. It also directed the Office of Environmental Health Hazard Assessment to prepare an analysis of the health risks of ethanol in gasoline, the products of incomplete combustion of ethanol in gasoline, and any resulting secondary transformation products. These reports were to be peer reviewed and presented to the Environmental Policy Council by December 31, 1999 for its consideration. The Environmental Policy Council is a seven-member body established by section 71017(b) of the Public Resources Code. It consists of the Secretary for Environmental Protection, the Chairpersons of the ARB, SWRCB and California Integrated Waste Management Board (IWMB), and the Directors of the Office of Environmental Health Hazard Assessment (OEHHA), the Department of Toxic Substances Control (DTSC), and the Department of Pesticide Regulation (DPR).

In addition, new legislation (Stats. 1999, Ch. 812; S.B. 529, Bowen) amended section 43830.8 of the Health and Safety Code to expand the requirements for a multimedia review of proposed changes to the ARB's specifications for motor vehicle fuels. Section 43830.8(h) established a streamlined, substitute mechanism for conducting environmental assessments for amendments to the ARB's motor vehicle fuels specifications that are proposed prior to January 1, 2000 and adopted prior to July 1, 2000. Since the hearing notice for the CaRFG3 rulemaking was published October 22, 1999 and the Executive Order adopting the amendments is being signed before July 1, 2000, the CaRFG3 rulemaking qualified for the section 43830.8(h) mechanism.

Under the streamlined section 43830.8(h) review mechanism, the ARB's environmental assessment of the proposed revisions to its fuels specifications must be reviewed by the Environmental Policy Council. The streamlined mechanism will substitute for the more elaborate statutory process if, following its review, the Environmental Policy Council:

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<sup>3</sup> California has petitioned the U.S. Environmental Protection Agency to waive the year-round oxygen requirement pursuant to Clean Air Act section 211(k)(2)(B) (42 U.S.C. §7545(k)(2)(B)).

“determines that that there will be no significant adverse impact on public health or the environment, including any impact on air, water, or soil, that is likely to result from the change in motor vehicle fuel that is expected to be implemented to meet the [ARB]’s revised motor vehicle fuel specifications.”

Section 43830.8(h) further provides that if the Environmental Policy Council makes this determination, it “shall be deemed final and conclusive.”

## B. THE ENVIRONMENTAL FATE AND TRANSPORT ANALYSES OF ETHANOL AND THE ENVIRONMENTAL ASSESSMENT OF THE CaRFG3 STANDARDS

In response to Executive Order D-5-99, the ARB conducted an air quality fate and transport analysis of the use of ethanol in CaRFG, and the SWRCB conducted a similar ground and surface water fate and transport analysis. OEHHA prepared an analysis of the potential health risks of ethanol in gasoline. These studies were each peer reviewed and made available for comment. They were then presented at a January 18, 2000 meeting of the Environmental Policy Council, along with a presentation by ARB on the Board-approved CaRFG3 standards. The public was provided an opportunity to comment to the Environmental Policy Council on these matters either orally or in writing.

### *(1) The ARB’s Air Quality Analysis*

In its segment, the ARB conducted four analyses: (1) a review of several recent, comprehensive assessments of the impact of oxygenated gasoline in the environment, (2) a literature review of studies that have measured the direct impact of the use of ethanol in gasoline, (3) emission and air quality predictions of CaRFG with four different oxygenate contents, and (4) a resolution of uncertainties and data gaps. A primary air quality concern involved the reaction of ethanol to form acetaldehyde and peroxyacetyl nitrate – commonly called PAN. The ARB staff conducted individual stakeholder meetings and three workshops. The ARB contracted with U.C. Berkeley Professor Robert Harley to perform some emission calculations and review the overall approach, and contracted with Dr. Daniel Verjone to assess all observations regarding PAN.

The ARB report, *Analysis of the Air Quality Impacts of the Use of Ethanol in Gasoline*, was peer reviewed by the following scientists designated by the U.C. Office of the President: Professor Roger Atkinson (U.C. Riverside); Professor Barbara J. Finlayson-Pitts (U.C. Irvine); Dr. Donald Lucas (U.C. Berkeley - Lawrence Berkeley National Laboratory); and Professor John Seinfeld (California Institute of Technology). The reviewers agreed with the report’s basic findings on ethanol and alkylates, but they noted the need for a number of corrections, clarifications and caveats which were subsequently incorporated. On December 9, 1999 – before considering the CaRFG3 rulemaking proposal – the Board accepted comment on the report and then approved it for presentation to the Environmental Policy Council.

In preparing the report, ARB staff reviewed eight major assessments of the impact of oxygenated gasoline on the environment. The staff identified two mechanisms by which

evaporative hydrocarbon emissions could increase as a result of the introduction of ethanol. One is that commingling ethanol-blended gasoline with nonethanol gasoline in a vehicle fuel tank will increase the Reid vapor pressure (RVP) of the nonethanol component. Current estimates of the overall effect of commingling when gasoline both with and without ethanol is marketed range from an RVP increase of less than 0.1 pound per square inch (psi) to an increase of as much as 0.4 psi, depending on market shares of the different gasoline blends, consumers' brand and grade loyalty, and fuel tank levels before refuel. The ARB staff believes that the impact is most likely to be on the lower side of the range, and to mitigate the commingling effect the CaRFG3 regulations require a 0.1 psi decrease in RVP when the evaporative emissions model is used. The second mechanism is that additional evaporative emissions may result from increased permeation of ethanol through rubber and plastic hoses and reduced working capacity of the charcoal canisters used to control evaporative emissions. Further research is needed to compare the effects of ethanol, MTBE, and alkylates on evaporative emissions.

The staff also reviewed 16 journal articles and reports that describe measurements of air quality impacts of ethanol. The most comprehensive studies were in Denver, Albuquerque, and Brazil. Ethanol has been used as a wintertime gasoline additive in Denver since 1988 and in Albuquerque since 1994. Brazil is the only country where a national large-scale ethanol fuel program has been implemented. Ethanol was first introduced there in 1979, and by 1997 approximately 9 million cars ran on 100 percent ethanol or gasoline blended with 22 percent ethanol by volume – more than twice the maximum allowed in California.

The main component of the analysis was the prediction of emissions and air quality impacts in the South Coast Air Basin of four fuels assumed to fully comply with the CaRFG2 standards. One was a current MTBE base fuel allowing a scale between 1997 and 2003. Two of the fuels contained ethanol, one with 2.0 wt.% oxygen and one with 3.5 wt.% oxygen. The fourth fuel contained no oxygenate – as is expected for nonoxygenated gasolines that would be produced to meet the CaRFG3, a higher alkylate content substituted for the oxygenate. There is expected to be very little variation in ambient concentrations of individual toxic air contaminants resulting from the four fuels in 2003 except that acetaldehyde is predicted to increase to 1997 levels with 3.5 wt.% oxygen from ethanol. OEHHA determined this is an insignificant increase because of small reductions in more potent toxic pollutants. The 2003 ethanol blends would result in essentially zero ambient concentrations of MTBE, while ambient concentrations of ethanol would increase by 40% and 63% respectively for the two ethanol blends. OEHHA's assessment identified no health concerns for ethanol at these levels. Due to the constraints of the Predictive Model, no variation among the four 2003 fuels is predicted for the chemical formation of ozone, nitrogen dioxide, and PM. The nonoxygenated fuel results in higher predicted CO concentrations, but the CaRFG program requires oxygenates in the South Coast Air Basin in the winter when there have been exceedances of the ambient standards for CO. OEHHA determined there is no indication of a toxicological problem with any of the alkylates, because of limited data. The maximum values estimated for n-heptane, n-hexane, isobutene, toluene, and xylenes are a factor of ten or more below any level of concern.

Despite the acetaldehyde increase associated with high ethanol blends, levels of PAN and its cousin PPN are not predicted to vary among the four fuels in 2003. Simpler models for the South Coast Air Basin and Brazil indicate that other components of gasoline and other emission

sources are primarily responsible for PAN. Even in Brazil, where ethanol and acetaldehyde levels are very high, these compounds are not the major contributors to PAN formation. The long-term trend in PAN levels in the South Coast Air Basin also supports this finding – PAN has dropped by a factor of ten over the past three decades, apparently due to reductions of all hydrocarbons under California’s ozone control program.

The ARB analysis concluded that as long as the CaRFG3 regulations address the potential for ethanol to increase evaporative emissions through commingling and permeation, and to cause more rail and truck traffic, the substitution of ethanol and alkylates for MTBE in California’s fuel supply will not have any significant air quality impacts. This finding is supported by model calculations in the South Coast Air Basin and state-of-the-science tools, an analysis of the impact of uncertainties, air quality measurements in areas that have already introduced ethanol into their fuel supply, and the independent peer review. The results of this analysis do not necessarily extend to other states, since California does not have an RVP exemption for gasoline containing ethanol, and emissions are constrained by the CaRFG regulations and the Predictive Model.

## *(2) The SWRCB’s Ground and Surface Water Analysis*

The SWRCB’s fate and transport analysis was presented to the Environmental Policy Council by David Rice of the Lawrence Livermore National Laboratory, who was contracted to coordinate the analysis. In order to evaluate the potential ground and surface water impacts associated with the use of ethanol in gasoline, the study participants began the development of a comprehensive life-cycle model; performed literature reviews of the transport and fate of ethanol and benzene in the presence of ethanol; used screening models to evaluate ground and surface water impacts; evaluated chemical analysis techniques used to measure ethanol in the environment, and examined the environmental properties of ethanol. The findings were submitted to three peer-reviewers from the U.C. system: Patricia Holden, Ph.D., of the Donald Bren School of Environmental Science and Management at U.C. Santa Barbara; Michael Stenstrom, Ph.D., of the Civil and Environmental Engineering Department at UCLA., and Environmental Science Professor Michael Hoffman of the California Institute of Technology. The peer review comments were focused on clarifying communications in the report, and were addressed as time constraints permitted.

The ethanol release scenarios focused upon were leaking underground tank releases and, to a much lesser extent, railcar releases into a river. The investigators conducted modeling to evaluate the potential impact of the “co-solubility” effect – since ethanol highly soluble in water, high concentrations in groundwater could be in contact with BTEX (shorthand for benzene, toluene, ethyl benzene and xylenes) and promote the dissolution of the BTEX compounds into the groundwater. However, the modeling showed that the co-solubility effect is going to be negligible for California gasoline with ethanol, affecting an area no greater than a centimeter below the free product source area.

Most of the presentation to the Environmental Policy Council focused on whether the preferential degradation of ethanol in groundwater may result in longer benzene plume lengths where gasoline has leaked into the ground. Ethanol is degraded very rapidly in soils and water,

with the degradation half-life in ground water ranging between 1.3 and 7 days. Because of this rapid degradation, the degradation of benzene could be reduced and its plumes extended. Three independent screening modeling assessments indicated that the average benzene plumes could increase 23-33 percent in the presence of ethanol. These however are very much upper-bound assessments, reflecting two important simplifying and conservative assumptions – that benzene is not degraded in the zones where ethanol is being rapidly degraded, and that the biodegradation rate for benzene is uniform over the length of the benzene plume. If these assumptions are not representative of actual processes – if there is in fact degradation of benzene going on within the zone where ethanol is being digested, and if there are in fact higher degradation rates in the tails of the plume – then benzene plume rates may be shorter than estimated by the screening models.

The investigators attempted to evaluate the comparative potential impact of increased benzene plume lengths to MTBE. Relative location information for public drinking water wells and all known active leaking underground fuel tank (LUFT) sites in California was used. For each LUFT site in California, the distance from known drinking water wells within 30,000 feet of the LUFT site was calculated. Then, based on the population of modeled plume lengths, the probability of a benzene plume reaching drinking water wells near each of these LUFT sites was calculated for each time interval. These steps were repeated for MTBE plumes and plumes of benzene in the presence of ethanol, and a series of probability curves were prepared. For both benzene curves, the impacts peak at about 10 years and then decline. The benzene with ethanol scenario shows about 20 percent greater impact than the baseline benzene. At the same time, MTBE impacts are about 40 percent over baseline.

The impacts of ethanol-containing gasoline on surface water resources were also evaluated. The loss mechanisms for MTBE and ethanol from surface waters is different – ethanol is removed by biodegradation while MTBE is removed through volatilization at the water's surface. The toxicity of ethanol is about 2000 times less than MTBE. Thus if there are spills of equal mass, MTBE will have a much greater impact to surface water drinking supplies.

The potential impact from the increased use of alkylates in gasoline was also evaluated. Significant quantities of alkylates are already present in gasoline. Alkylates have low solubility in water, a lower density than water, a high volatility and low mobility in soils. Properties like biodegradability or toxicity are not easily extrapolated to all alkylate compounds, and the cancer risk, reproductive and development effects have not been studied.

The conclusion of the water fate and transport analysis was that the water resource impacts associated with the use of ethanol would be significantly less and more manageable than those associated with the continued use of MTBE. The key factor is that ethanol is so much more biodegradable than MTBE. While there is still some uncertainty, additional information is unlikely to change the overall decision.

There were several recommendations for future research should the decision be made to use ethanol as a fuel oxygenate in California. A complete life cycle analyses should be performed. Experiments should be performed to evaluate the degradation of benzene by ethanol-degrading microbial populations. Field and laboratory studies should be performed to evaluate changes in benzene degradation rates over the length of a benzene plume. A series of field sites

should be identified and studied to support modeling assumptions. The chemical analysis techniques used to measure ethanol in field samples should be refined to lower limits of detection. Finally, additional historical case data should be collected and analyzed.

### *(3) Analysis of the Potential Health Risks of Ethanol in Gasoline*

The Office of Environmental Health Hazard Assessment (OEHHA) prepared the document "Potential Health Risks of Ethanol in Gasoline". This report was prepared in response to the Governor's Executive Order D-5-99 and was based on analyses undertaken by the California Air Resources Board (ARB) and the State Water Resources Control Board (SWRCB). This report and its findings was presented to the California Environmental Policy Council on January 18, 2000 by Melanie Marty, Ph.D., Chief of the Air Toxicology and Epidemiology Section of OEHHA.

The Governor's Executive Order required OEHHA to prepare an analysis of the health risks of ethanol in gasoline including evaporative emissions, tailpipe emissions, secondary transformation products, and compounds present in drinking water. The chemicals that OEHHA was concerned with in its analysis were oxygenates (i.e., MTBE and ethanol), combustion products (i.e., butadiene, formaldehyde, acetaldehyde, and carbon monoxide), evaporative emissions for benzene, hexane, and toluene, and secondary transformation products such as PAN, ozone, and PM<sub>10</sub>.

Dr. Marty indicated the results of the risk analysis were dependent on the information that came from the ARB and SWRCB modeling efforts. Since both agencies continued to refine their models after the peer review, the latest results were not obtained by OEHHA until after the final OEHHA report was completed. Hence, an addendum was prepared with the latest findings after the completion of the final OEHHA report.

The final report findings were submitted to three peer reviewers from the University of California (U.C.) system: Catherine Van de Vert, Ph.D., of U.C. Davis who is a toxicologist who specializes in reproductive toxicity; Alvin Greenberg, Ph.D., who is a toxicologist who specializes in risk assessment issues; and Joe Landolph, Ph.D., University of Southern California, who is a toxicologist who specializes in assessment of carcinogenicity. The peer reviewers comments and the OEHHA responses are in the final OEHHA report.

ARB conducted an urban airshed modeling analysis of the air quality impacts associated with four fuels as described in the ARB analysis of the air quality impacts of ethanol based on emission estimates for 2003. In addition, ARB used the 1997 emissions inventory and MTBE-containing fuel used to calibrate the model against measured data for that year.

Dr. Marty discussed the OEHHA report and began with a discussion of the results of the ARB modeling, which formed the air quality basis of the OEHHA risk assessment. ARB modeled ambient air concentrations of a number of chemicals using ethanol-based fuels at 2.0 weight percent oxygen, 3.5 weight percent oxygen, the nonoxygenated fully-complying fuel, and an MTBE-based fuel. The ARB model produced estimates of the total concentrations of specific

pollutants from all sources including stationary, mobile, evaporative, and others. The ARB analysis focused on the relative differences associated with the use of one fuel or another.

Dr. Marty also indicated that OEHHA looked at existing information on concentrations of a variety of chemicals associated with fuel use to determine which ones OEHHA really needed to focus on. OEHHA also looked at the toxicology of those compounds to ascertain whether it was reasonable to expect any health impacts associated with changes in emissions for those compounds. OEHHA focused on the oxygenates MTBE and ethanol and looked at their combustion products of butadiene, formaldehyde, hexane, toluene, isobutene, and heptane. Further, OEHHA looked at atmospheric transformation products, primarily peroxyacetone nitrate or PAN, ozone, and PM<sub>10</sub>.

OEHHA expressed concerns about some of the health risk assessment uncertainties and data gaps. In particular, they expressed concerns with the exposure assessment some of the uncertainties in the ARB model, as well as the exposure assumptions implicit in some of the health assessment values (e.g., breathing rate). Also, there were concerns with water contamination issues (e.g., breakdown products, likelihood of contamination of wells, impacts of transportation accidents and watercraft use).

OEHHA made the following key findings and recommendations:

1. There are no substantial differences in the different non-MTBE 2003 scenarios
2. Data is not available for quantitative risk estimates regarding water contamination with ethanol in gasoline, however, it is likely to be substantially less severe than MTBE.
3. The OEHHA analysis is dependent on CARB and SWRCB modeling information.
4. OEHHA will continue to update its analysis as new data becomes available.
5. OEHHA does not expect to have ethanol contamination of drinking water because of rapid degradation rate of ethanol.

There were several recommendations by OEHHA for future research. Dr. Marty indicated there is a need for basic toxicological information on presently identified pollutants and to develop health assessment values. Also, to have exposure assessment data on the chemicals analyzed. Further, to have information on localized "hot spots" and a life-cycle analysis.

#### *(4) The Determination of the Environmental Policy Council*

After considering the analyses on the potential air, water and health impacts of ethanol in gasoline and the sort of nonoxygenated gasoline expected to be produced under the CaRFG3 regulations, as well as public comments, the Environmental Policy Council unanimously adopted a Resolution which approved the overall *Health and Environmental Assessment of the Use of Ethanol as a Fuel Oxygenate* and the individual elements prepared by the ARB, SWRCB and OEHHA. The Council found that, for purposes of determining the potential environmental



impacts of motor vehicle fuels expected to be marketed in California as a result of the approved CaRFG3 regulations, the gasoline blends evaluated by ARB, SWRCB, and OEHHA in the EPC Report adequately represent the range of CaRFG3 gasoline formulations expected to be marketed in the state. Based on the report and comments received, the Resolution expressed the Council's determination that:

“there will be not be a significant adverse environmental impact on public health or the environment, including any impact on air, water, or soil, that is likely to result from the change in gasoline that is expected to be implemented to meet the CaRFG3 regulations approved by the ARB.”

## IV. THE BOARD'S MODIFICATIONS TO THE ORIGINAL PROPOSAL

### A. CHANGES TO THE CARFG3 FLAT AND AVERAGING LIMITS FOR T50 AND T90

Along with the prohibition of MTBE, the central element of this rulemaking is the new set of CaRFG3 standards. The CaRFG2 and CaRFG3 standards consist of limits on eight gasoline properties – sulfur, benzene, olefin, oxygen and aromatic hydrocarbon contents, the 50-percent and 90-percent distillation temperatures (T50 and T90), and summertime Reid vapor pressure (RVP).<sup>4</sup> The CaRFG2 and CaRFG3 standards include a set of “cap” limits for the eight regulated properties that apply throughout the gasoline distribution system. They also include sets of generally more stringent “refiner” limits that apply to each batch of California gasoline supplied from the production facility (usually a refinery) or import facility. This approach allows the imposition of very stringent standards at the refinery while allowing refiners to vary the composition of individual batches in a cost-effective way up to the cap limits as long as overall equivalent emissions performance is achieved.

Producers and importers may meet the CaRFG2 and CaRFG3 refiner limits by opting to comply with “flat” limits or “averaging” limits specified in the regulations (there is no averaging option for the RVP and oxygen standards). The averaging limits for each of the six relevant properties are numerically more stringent than the comparable flat limits. A producer using averaging for one or more properties may assign differing “designated alternative limits” (DALs) to different batches of gasoline being supplied from the refinery. Each batch of gasoline must meet the DAL for the batch. A producer or importer supplying a batch of gasoline with a DAL above the averaging limit must, within 90 days before or after, supply sufficient quantities of gasoline subject to more stringent DALs to fully offset the excess over the averaging limit.

As an option, a producer or importer may use the Predictive Model to identify alternative flat and averaging limits applicable when gasoline is supplied from the refinery. The Predictive Model consists of mathematical equations which predict the changes in exhaust emissions of hydrocarbons, oxides of nitrogen (NO<sub>x</sub>), and potency weighted toxics for four toxic air contaminants that result from different gasoline formulations. The four toxic air contaminants are benzene, 1,3-butadiene, acetaldehyde, and formaldehyde. The Predictive Model is based on data from 18 vehicle emission test programs analyzing the relationship of gasoline properties and emissions. An alternative gasoline formulation is acceptable if there will be essentially no increase in emissions of hydrocarbons, NO<sub>x</sub>, and potency-weighted toxics under the Predictive Model. Currently, most of the gasoline sold in California complies with the CaRFG2 regulations through the use of the Predictive Model.

The Board made one set of modifications to the originally proposed CaRFG3 flat and averaging limits, which included tighter flat and averaging limits for sulfur and benzene, and less stringent flat and averaging limits for T50 and T90. The Board increased the flat T50 limits by two degrees Fahrenheit, from 211 to 213°F. It similarly increased the averaging T50 limits by two degrees Fahrenheit, from 201 to 203°F. This provides additional flexibility for any refiner

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<sup>4</sup> The original CaRFG3 proposal included specifications for a ninth gasoline property – Driveability Index (DI). As discussed in Section IV.B. below, one of the Board's modifications was to drop the proposed DI specification.

or importer using the flat and averaging limits. It also provides additional flexibility for the great majority of refiners who use the Predictive Model mechanism. Under the CaRFG3 Predictive Model, increasing T50 by 2 degrees Fahrenheit in the 200 - 210°F range increases exhaust HC by about 0.6 percent, increases potency-weighted toxics by about 0.4 percent, and negligibly increases NOx emissions. These increases are more than offset by the decrease in sulfur and benzene content. Particularly since removing MTBE from CaRFG raises T50 substantially, the modified T50 specifications provide significantly greater leeway in producing complying CaRFG3 without MTBE. Based on calculations in MathPro's report *Analysis of California Phase 3 RFG Standards*, commissioned by the CEC, increasing T50 by 2°F will decrease the expected need for imports by about 10,000 to 15,000 barrels per day, and is also expected to decrease the expected volume of rejected blend stocks.

The modifications to the T50 limits resulted from two primary factors. First, new and much more robust data that the CEC released after issuance of the original staff proposal showed that average 1998 in-use gasoline resulted in somewhat greater emissions than those estimated by staff in preparing the original proposal. This meant that the CaRFG3 standards could result in correspondingly higher emissions and still achieve real-world benefits equivalent to those achieved by the CaRFG2 standards. The CEC data also provided the basis for more reliable estimates of the compliance margins that gasoline produced to meet new CaRFG3 standards is expected to reflect. Second, the ARB concluded that the need to minimize any drop in gasoline production volumes resulting from the CaRFG3 standards outweighed the need to achieve the modest *additional* emissions reductions that staff had projected for the originally proposed CaRFG3 standards.

**Estimating the average properties of in-use 1998 gasoline.** The most accurate way to estimate the average properties of 1998 summertime gasoline would be to rely on the results of a large number of tests of representative samples of 1998 gasoline. In preparing its original proposal, however, ARB had access only to a comparatively small number of tests of samples taken by ARB compliance personnel that might not have been representative of the overall gasoline pool. Rather than rely entirely on those tests, the staff used the methodology described of pages 16-17 of the Staff Report.

Almost all batches of California gasoline are supplied by refiners using the Predictive Model to establish alternative sets of specifications. The refiners report the alternative Predictive Model specifications to ARB compliance staff. Refiners also typically produce fuels with actual properties that overall are "cleaner" than the set of Predictive Model specifications they report to the ARB. This happens because refiners build in a safety margin to allow for some variation between their own test results and results of tests conducted by ARB inspectors, and to account for blending variations. The staff identified the average measured properties from 64 samples taken by ARB inspectors at refineries during the 1998 RVP season and compared them to the average properties reported for these batches by the refiners in their Predictive Model notifications to the ARB. The differences between the two sets of average properties represented the average compliance margin for each property. Staff then subtracted these average compliance margins from the average reported values of *all* Predictive Model flat specification batches of 1998 summertime gasoline to obtain the estimated average in-use properties in 1998. These properties were shown in Table II-5 in the Staff Report.

In support of development of the CaRFG3 standard, the CEC surveyed California refiners in late 1999 to determine in-use gasoline properties on an industry-wide basis for 1998. Each refiner tests the batches produced at its facility for the eight properties to verify compliance with the CaRFG2 standards, and maintains records of the test results. The survey called for each refiner to calculate and submit the production volume weighted average set of properties for the 1998 summertime gasoline produced at its facility using flat specifications under the Predictive Model. The CEC then calculated the industry average set of fuel properties, and released the calculated properties in early November 1999. Measurements on over 4000 batches went into the calculation of the average gasoline properties. Table 1 shows the average summertime 1998 properties used in the analyses in the Staff Report and the average properties identified by the CEC.

**Table 1**  
**Average Properties of the 1998 In-Use Fuel**

Fuel Properties	Original ARB Estimate	CEC Survey and Analysis
Aromatic HC, vol.%	22.4	23.4
Benzene, vol.%	0.6	0.59
Olefin, vol.%	5.8	4.5
Sulfur, ppmw	25	22
T50, (°F)	197	201
T90, (°F)	310	310
Oxygen, wt% (max)	2.1	2.0
(min)	1.9	
RVP, psi	6.7	6.8

**Projecting the average in-use properties of fuels produced to meet the CaRFG3 standards.** Table V-3 in the Staff Report listed the average in-use properties that staff estimated would result when refiners produced gasoline to meet the originally proposed CaRFG3 flat standards. The properties reflected adjustments to account for compliance margins, and to incorporate some of MathPro’s estimates of the properties most likely to be varied when refiners used the CaRFG3 Predictive Model. These average in-use properties under CaRFG3 were compared to the corresponding estimated 1998 average in-use properties to confirm that the 1998 emissions benefits from the CaRFG2 program would be preserved. Table V-4 in the Staff Report showed the expected differences in emissions, it is repeated here as Table 2.

**Table 2**  
**Expected Change in Emissions from the CaRFG3 Staff Report**  
**1998 Average In-Use Fuel Versus Future Representative In-Use Fuel**

Pollutant	1998 Average In-Use Fuel	Future Representative In-Use Fuel Based on Flat Limits	Difference
NOx	0.3%	-2.0%	-2.3%
Exhaust Hydrocarbons	-3.6%	-3.7%	-0.1%
Evaporative Hydrocarbons	-6.6%	-6.6%	0%
Total Hydrocarbons	-4.5%	-4.6%	-0.1%
Potency-Weighted Toxics	-8.0%	-15.2%	-7.2%

In developing its suggested T50 *modifications* to the originally-proposed CaRFG3 standards, staff started with the compliance margins identified by the CEC for the average 1998 gasoline – the difference between the 1998 average in-use fuel and the average of the reported formula to estimate compliance margins for refiners. But staff concluded it was very likely that the CEC’s 4°F compliance margin for T50 was too small. Because the measurement method is the same for T50 and T90, the compliance margins should be very similar. The CEC’s compliance margin for T90 was 7.0°F, and the staff’s estimated compliance margins for T50 and T90 were 7°F and 8°F, respectively using the Staff Report methodology. The staff accordingly changed the T50 compliance margin to 7.0°F and used the CEC’s remaining compliance margins. Table 3 shows the compliance margins used by staff in developing its suggested modifications, and the in-use gasoline that would result from applying these compliance margins to staff’s originally proposed CaRFG3 flat standards.

**Table 3**  
**Fuel Properties and Compliance Margins**

Gasoline Property	Originally Proposed CaRFG3 Flat Limits	Compliance Margin	Future In-Use Fuel Derived by Applying Compliance Margins to Original Limits
Aromatic HC, vol.%	25.0	1.9	23.1
Benzene, vol.%	0.8	0.18	0.62
Olefin, vol.%	6.0	2.3	3.7
Sulfur, ppmw	20	4.0	16
T50, (°F)	211	7.0	204
T90 (°F)	305	7.0	298
Oxygen, wt%	2.0	NA	2.0
RVP, psi	6.9	0.22	6.68

When the future in-use fuel shown in the above table is compared to the CEC’s average 1998 in-use fuel, the CaRFG3 Predictive Model shows that the original proposal provides significantly greater benefits for hydrocarbons, NOx and toxics. Benefits for all three pollutant

categories are maintained when T50 is raised 2°F, but a 3°F increase in T50 causes the future fuel's HC emissions to exceed those in 1998.

In estimating the overall emission impacts from the modified CaRFG3 limits, the staff made one last adjustment. After reviewing the various refinery modeling studies conducted by MathPro Inc. for the CEC, the staff concluded that an emissions-equivalent future fuel would tend to have lower sulfur than a fuel produced strictly to the flat limits. Because of relationships such as between olefins and sulfur in the various refinery blending streams, (lower sulfur is generally associated with lower olefins), the staff adjusted the specifications to reflect the type of changes the MathPro Inc. analysis suggested. Staff's estimated emissions impacts presented at the December 9, 1999 hearing were based on these adjusted specifications. Table 4 shows the expected in-use fuel properties based on the original staff proposal, the adopted flat limits adjusted for the compliance margins, and the adopted flat limits with the staff's adjustments described earlier in this paragraph.

**Table 4  
Projected Future In-Use Fuel Properties**

Gasoline Property	Based on the Original Staff Proposal and Analysis	Adopted CaRFG3 Flat Limit Fuel Adjusted for Compliance Margins	Adopted CaRFG3 Flat Limit Fuel With Staff's Modified Compliance Margin Adjustments
Aromatic HC, vol.%	22.0	23.1	22.5
Benzene, vol.%	0.4	0.62	0.4
Olefin, vol.%	4.0	3.7	3.2
Sulfur, ppmw	15	16	14
T50, (°F)	203	206	206
T90 (°F)	298	298	298
Oxygen, wt%	2.0	2.0	2.0
RVP, psi	6.7	6.68	6.68

**B. REVISING THE CARFG3 CAP LIMITS FOR T50 AND T90 TO MAKE THEM IDENTICAL TO THE CARFG2 CAP LIMITS, AND ELIMINATION OF THE PROPOSED SPECIFICATION FOR DRIVEABILITY INDEX**

The original proposal included T50 and T90 cap limits that were each 5°F higher than the cap limits for CaRFG2, in order to provide refiners with additional flexibility in meeting the CaRFG3 standards without MTBE. At the same time, staff proposed regulating Driveability Index (DI) for the first time by imposing a CaRFG3 flat limit of 1225. The DI is calculated from the T10, T50 and T90 of gasoline. The Board ultimately modified this approach by returning the CaRFG3 cap limits for T50 and T90 to the cap limits that apply under CaRFG2, and eliminating the proposed DI specification. The marginal flexibility added by the originally proposed cap limits for T50 and T90 was outweighed by the benefits from eliminating DI constraints which were no longer needed as the T50 and T90 caps would maintain adequate fuel performance.

### C. ALLOWING EARLY OPT-IN TO THE CARFG3 STANDARDS

In response to comments from Tosco and the Renewable Fuels Association, the Board added a mechanism in section 2261(b)(3) that allows refiners and importers to opt to meet the CaRFG3 standards and the CaRFG3 Predictive Model before December 31, 2002. This modification will make it easier for refiners and importers to supply non-MTBE gasoline prior to the mandatory phase-out deadline at the end of 2002.

Allowing early compliance with the CaRFG3 standards would necessarily mean that the higher CaRFG3 cap limits for RVP and aromatics would become applicable for all downstream gasoline, including gasoline still subject to the CaRFG2 standards; at the same time, the more stringent CaRFG3 sulfur and benzene cap limits could not yet apply downstream because of the continuing presence of gasoline subject to the CaRFG2 standards. This necessarily would hamper the ARB's downstream enforcement efforts, as inspectors would not be able to enforce the more stringent CaRFG2 cap limits for gasoline that would otherwise be subject to those caps.

Accordingly, the modified regulations only allow early compliance with the CaRFG3 standards if a producer or importer demonstrates the intent and ability to produce or import substantial quantities of one or more grades of gasoline complying with the CaRFG3 standards – in which case the benefits from the early reduction in MTBE use will outweigh the reduction in downstream enforceability. A refiner or importer wishing to use early CaRFG3 compliance will have to apply to the Executive Officer to do so. Once the Executive Officer specifies a date on which compliance with the CaRFG3 standards will be allowed, it will be allowed for all producers and importers.

To make clear that early compliance with the CaRFG3 standards includes the prohibition on the use of MTBE, a separate row on MTBE and other oxygenates was added to the CaRFG3 standards table in section 2262. Since the early opt-in language provides that early opt-in CaRFG3 is subject to the CaRFG3 standards applicable December 31, 2002, this gasoline is subject only to those portions of section 2262.6 (Prohibition of MTBE and Oxygenates Other than Ethanol in California Gasoline Starting December 31, 2002) that apply on December 31, 2002.

### D. ALTERNATIVE CARFG3 STANDARDS FOR QUALIFYING SMALL REFINERS IF OFFSETS ARE PROVIDED

In Resolution 99-39, the Board found that the cost of compliance with the CaRFG3 standards for small refiners now producing CaRFG2, and the additional capital expenditures to enable, would be substantially greater on a per-gallon basis than the comparable costs for large California refiners. Because of this, it is likely that it would not be economically feasible for Kern Refining – the one small refiner now producing CaRFG2 – to produce gasoline meeting the CaRFG3 standards applicable to large refiners. Given these disparate costs, and preexisting investments made to comply with the CaRFG2 standards, the Board added provisions allowing such refiners to comply with adjusted flat limits for aromatics of 35 volume percent (vol.%), benzene of 1.0 vol.%, T50 of 220°F, and T90 of 312°F, as long as any increased hydrocarbon,

NOx, and potency-weighted toxic emissions associated with these alternative specifications are fully mitigated through a mechanism to be added to the small refiner diesel regulations.

The CaRFG3 small refiner provisions were overlaid onto the provisions that gave small refiners up to a two-year exemption from some of the CaRFG2 standards when those standards were implemented in 1996. The modifications include a four-step formula for determining the maximum “qualifying volume” that the small refiner could produce each year subject to the small refiner standards; in the case of Kern Oil’s Bakersfield refinery, that volume cannot exceed 8000 barrels per day on an annualized basis. This is designed to assure that the small refinery does not exceed highest historic production capabilities.

Gasoline subject to the small refiner CaRFG3 standards must still meet the basic CaRFG3 cap limits, so that the small refiner provisions will not adversely affect downstream enforcement. The preexisting reporting requirements would be modified to reflect the revised approach towards qualifying small refiners. Modifications to the CaRFG Phase 3 Predictive Model enable qualifying small refiners to use the Predictive Model to meet the small refiner CaRFG3 standards.

The regulations include a requirement that a small refiner is subject to the small refiner provisions must comply with all applicable federal RFG requirements (§ 2272(d).) This designed to assure that the small refiner provisions will not result in elimination of the “California enforcement exemption” in 40 CFR § 80.81. The California enforcement exemption would apply to the small refiner, so it would still be able to benefit from that provision.

**Offsetting Excess Emissions.** In order to supply gasoline subject to the small refiner CaRFG3 standards, the small refiner must offset the excess emissions of NOx, hydrocarbons and potency-weighted toxics pursuant to section 2282 (Aromatic Hydrocarbon Content of Diesel Fuel), title 13, CCR. The section 2282 offset provisions will be part of the upcoming rulemaking to be considered by the Board in October 2000; small refiners will be able to produce gasoline subject to the small refiner CaRFG3 standards only after the § 2282 offset provisions are in place.

Section 2272(c)(5) identifies the pounds of excess emissions that must be offset per barrel of gasoline subject to the small refiner CaRFG3 flat limits – 0.0206 pounds of exhaust hydrocarbons per barrel, 0.0322 pounds of NOx per barrel, and the potency-weighted toxic emissions equivalent of 0.0105 pounds of benzene per barrel. Consistent with the requirements of last year’s S.B. 989, the CaRFG3 standards have been designed to assure that the hydrocarbon, NOx and potency-weighted toxics emissions from in-use gasoline produced to meet the CaRFG3 standards will be no greater than the emissions from the average 1998 in-use gasoline produced to meet the CaRFG2 standards. In identifying the excess emissions from small refiner CaRFG3 that must be offset, it is similarly appropriate to compare the expected additional emissions from in-use gasoline produced to meet the small refiner CaRFG3 standards with emissions from the average 1998 in-use gasoline produced to meet the CaRFG2 standards. In making this comparison, staff used the CEC survey data for 1998 in-use gasoline, and assumed that the same compliance margins would be reflected in gasoline produced to meet the small refiner CaRFG3 flat limits.



Using this approach, the CaRFG3 Predictive Model shows the small refiner flat limits resulting in a 2.04 percent increase in exhaust hydrocarbons, and a 1.76 percent increase in NO<sub>x</sub>. The pounds per barrel emissions increases for these two pollutants were calculated by applying the percentage increases to the statewide gasoline vehicle emissions estimate made by EMFAC7G for the year 2005 (450.8 and 817.37 tons per day for exhaust hydrocarbons and NO<sub>x</sub> respectively), converting to pounds, and then dividing the result by the EMFAC7G estimate of the statewide daily gasoline usage, 894,163 barrels.

The potency-weighted toxics element is expressed as the potency-weighted toxic emissions equivalent of a 0.0105 pounds per barrel increase in benzene. Expressing the excess emissions in benzene-equivalent terms is more readily understandable than using an abstract potency-weighted toxics index. The potential offsets are not limited to reductions in benzene emissions; rather reductions in emissions of any toxic air contaminants may be provided as long as they are the potency-weighted toxic emissions equivalent of the specified increase in benzene emissions. Table 5 and the following discussion shows how the 0.0105 pounds per barrel value was derived.

**Table 5**  
**Derivation of Potency Weighted Toxic Emissions**

Pollutant	Column 1 Predicted Emissions at Ph. 3 Flat Limits (mg/mi)	Column 2 Predicted % Increase from Small Refiner Limits	Column 3 Pounds per day Increase	Column 4 Potency (per ug/m <sup>3</sup> )	Column 5 Total Pounds Increase x Potency (per ug/m <sup>3</sup> )	Column 6 Pounds Increase x Potency Per Barrel (per ug/m <sup>3</sup> )	Column 7 Equivalent pounds per barrel increase in benzene emissions
Ex. Benz.	13.55	34.7	8,821	2.9E-5	0.2558		
Ev. Benz.	3.16	38.5	2,283	2.9E-5	0.0662		
Butadiene	2.47	-5.9	-273	1.7E-4	-0.0464		
Formald.	6.00	-15.0	-1,689	6.0E-6	-0.0101		
Acetald.	2.05	64.0	2,462	2.7E-6	0.0066		
Total					0.2721	3.04E-7	0.0105

The values in column 1 are derived from outputs of the CaRFG3 Predictive Model, after applying a conversion factor to convert from the Predictive Model scale to the EMFAC7G scale. The column 2 values are also derived from the Predictive Model. Column 3 shows the pounds per day increase for each toxic pollutant if every barrel of gasoline were produced at the small refiner CaRFG3 flat limits. To arrive at the column 3 figures, the mg/mi values in column 1 were multiplied by the fraction representing the percentage increase shown in column 2, and the result was multiplied by 851,773,000 the statewide total daily vehicle miles traveled in 2005 from EMFAC7G. Column 4 shows the ARB's potency values for the four toxic pollutants. The column 3 values were multiplied by the column 4 values to arrive at the column 5 values for each pollutant, and the individual values were then totaled.

To put the column 5 total increase on a per barrel basis, the 0.2721 number was divided by the projected daily gasoline use (894,163 bpd), resulting in the column 6 potency-weighted pounds increase of  $3.04\text{E-}7$  lb. per  $(\text{ug}/\text{m}^3)$  per barrel. In order to express this value as the equivalent to a pounds per barrel increase in benzene emissions, the column 6 value was divided by the potency weight for benzene ( $2.9\text{E-}5$  per  $(\text{ug}/\text{m}^3)$ ). The result, shown in column 7, is 0.0105 pounds of benzene per barrel.

#### E. ELIMINATION OF PROPOSED SPECIFICATIONS FOR DENATURED ETHANOL

Part of the original staff proposal was a new section 2262.9, title 13, CCR, which established a set of specifications for denatured ethanol intended for use as an additive in California gasoline. Since ethanol is typically not added to the base gasoline until loading of the delivery tank at the terminal or truck loading facility, a set of denatured ethanol standards would provide predictable specifications that could be taken into account when refiners are producing California reformulated blendstock for oxygenate blending (CARBOB). Stringent specifications for the denatured ethanol would also help refiners produce fully complying CaRFG3.

Ethanol producers commented that some of the proposed specifications were too stringent in light of ethanol production processes and the characteristics of denaturants now being used. The Board decided to eliminate the proposed specifications as a part of this rulemaking, and directed staff to work with interested parties and come back with a proposal for consideration by the Board at an October 2000 hearing.

The proposed denatured ethanol specifications in the original proposal had enabled staff to recommend deletion of the existing requirement that producers of CARBOB enter into a protocol with the ARB Executive Officer demonstrating how the producer would assure that the oxygenate used in testing the oxygenated CARBOB at the refinery was representative of the oxygenate that would actually be added downstream. (section 2266.5(a)(2)(B).) With elimination of the proposed ethanol specifications the Board reinstated the provisions on representativeness of the oxygenate used in testing.

#### F. EXPANDING THE PROHIBITION OF ETHERS OTHER THAN MTBE TO INCLUDE ANY OXYGENATE OTHER THAN MTBE OR ETHANOL ABSENT A MULTIMEDIA EVALUATION

The Staff Report indicated that the original proposal would, as of the December 31, 2002 date of the MTBE ban, conditionally prohibit the use in California gasoline of ethyl tertiary-butyl ether (ETBE), tertiary amyl methyl ether (TAME), any other non-MTBE ether, and alcohol's other than ethanol. (Staff Report, p. 23) The prohibition would apply unless a multimedia evaluation of the use of the other ether or alcohol in California has been conducted and the Environmental Policy Council has determined that such use will not cause a significant adverse impact on public health or the environment. However, due to a drafting error, section 2262.6(c) in the originally proposed regulatory text did not refer to alcohols. The Board approved a modification which would apply the conditional prohibition to alcohols other than ethanol to

reflect the staff's original intent, and to expand the conditional prohibition to any other oxygenates, such as esters.

The regulatory text made available with the 15-day notice substituted the language "any oxygenate other than ethanol," although the commentary immediately following the text referred to "any oxygenate other than MTBE or ethanol." A commenter pointed out that, as drafted, the regulatory language would conditionally prohibit MTBE in California gasoline as of December 31, 2002, despite the fact that section 2262.6(a) and (b) provided a detailed phase-out process for MTBE. The final regulatory text reflects a nonsubstantial modification clarifying that the conditional prohibition in section 2262.6(c) applies to oxygenates other than ethanol and MTBE – thus assuring there could be no conflict with the more specific provisions in section 2262.6(a) and (b).

#### G. MODIFYING THE CaRFG3 PREDICTIVE MODEL TO REFLECT THE NEW EMFAC 2000 EMISSIONS INVENTORY – INABILITY TO INCORPORATE THE MODIFICATIONS WITHIN THE AVAILABLE TIME

As noted above, the Board directed in Resolution 99-39 that modifications be incorporated into the CaRFG3 Predictive Model Procedures to reflect the EMFAC 2000 mobile source emissions inventory once that new inventory was approved by the Board. The modifications would affect the weightings of evaporative, exhaust, and CO emissions and the balancing of Tech Groups in the Predictive Model. At the time of the CaRFG3 hearing, it was expected that the Board would consider approval of EMFAC 2000 in March 2000. However, the Board was not able to consider the new inventory until May 25, 2000, at which time the Board approved EMFAC 2000 conditioned on the incorporation of various modifications that would take at least a month to complete. Once EMFAC 2000 was finalized, the modifications to the CaRFG3 Predictive Model Procedures reflecting the final EMFAC 2000 would have to be made available prior to adoption for another 15-day comment period that would necessarily close after June 30, 2000.

The ARB has conducted the CaRFG3 rulemaking in anticipation that the abbreviated environmental review mechanism in Health and Safety Code section 43830.8(h), enacted by S.B. 529 in 1999, would be used. If the CaRFG3 amendments were not adopted by June 30, 2000, that mechanism would no longer be available and the rulemaking would be subject to the more time-consuming environmental assessment mechanism in sections 43830.8(a)-(g), which would be difficult to implement without substantial further delay. In light of these considerations, the Executive Officer determined in Executive Order 00-29 that it was necessary and appropriate to adopt the CaRFG3 amendments without the modifications to the CaRFG3 Predictive Model reflecting EMFAC 2000.

#### H. THE BOARD'S DIRECTIONS FOR FOLLOW-UP ACTIONS

Along with approving the CaRFG3 amendments with various modifications, in Resolution 99-39 the Board directed the Executive Officer to take a number of follow-up actions, listed below. Most of these directions are more specifically addressed in other parts of this FSOR.

- Propose to the Board, for consideration at a hearing by October 2000, further amendments to the CaRFG3 regulations to assure the practical and effective implementation of the provisions on CARBOB and imported gasoline, and specifications for denatured ethanol for use in motor vehicles.
- Propose to the Board, for consideration at a hearing by October 2000, amendments to the ARB's diesel fuel regulations to incorporate a mechanism for small refiners to fully mitigate any increase in emissions from the small refiner provisions in the CaRFG3 regulations.
- Provide an update to the Board in October 2000 on potential increases in hydrocarbon emissions from permeation through materials associated with the use of ethanol in gasoline, and to report to the Board on the results of permeability testing by December 2001.
- Further evaluate the expected real-world emissions impact in 2003 and beyond of the commingling of CaRFG3 containing ethanol with CaRFG3 not containing ethanol – considering the ultimate decision of the U.S. EPA Administrator or Congress to waive or otherwise eliminate the year-round minimum oxygen requirement for federal RFG under Clean Air Act section 211(k)(2)(B), the expected prevalence of CaRFG3 containing ethanol and CaRFG3 not containing ethanol in 2003 by supplier, grade and geographic area, other pertinent available data, and any new studies deemed necessary on factors such as refueling patterns and customer brand and grade loyalty – and report his findings to the Board with any appropriate recommendations by December 2001.
- Further evaluate the practicality of the allowable MTBE residual limits for CaRFG3, including conducting one or more workshops if appropriate, and report back to the Board by July 2002 with a recommendation on whether the limits should be revised.
- Upon implementation of the CaRFG3 regulations in 2003, evaluate whether the regulations actually maintain or improve upon emissions and air quality benefits achieved by CaRFG2 as of January 1, 1999 – including emissions reductions for all pollutants, including precursors, identified in the California SIP for ozone, and emissions of potency-weighted air toxics – and report to the Board by 2004 on the results of the evaluation along with any appropriate recommendations.
- Evaluate the DI of in-use CaRFG3 to determine whether the in-use DI levels are adequate to minimize any adverse impacts of the DI levels on the in-use emissions performance of motor vehicles, and report back to the Board by 2004 with the results and any appropriate recommendations.
- Transmit to the U.S. EPA Administrator the Board's recommendation that U.S. EPA adopt a nationwide gasoline DI standard to assure the adequate emissions performance of existing and advanced technology motor vehicles.
- Work with the CEC staff to evaluate the sulfur levels of gasoline produced to comply with the CaRFG3 regulations, and the expected impacts of an ultra-low-sulfur flat or cap limit for

California gasoline on California gasoline supplies, production and import volumes, production costs, and the ability of refiners to produce complying California gasoline on a consistent basis, and report back to the Board by July 2002.

- Transmit the approved CaRFG3 regulations to U.S. EPA, and reaffirm the need for the U.S. EPA Administrator to promptly grant California's request for a waiver from the federal RFG year-round 2.0 wt.% minimum oxygen requirement for California gasoline.
- Request that the U.S. EPA Administrator determine, pursuant to Clean Air Act section 211(m)(2), that, starting in 2003, the period in which Los Angeles-South Coast Air Basin is prone to high ambient concentrations of CO is November through February rather than October through February.
- Monitor refiner progress towards compliance with the CaRFG3 regulations and report to the Board semiannually on this progress and on implementation of the directives in this resolution. As part of this process, gasoline samples should be obtained and fully specified and analyzed.
- Work with local air quality management districts and local communities to address potential impacts from an increased use of cargo tank trucks to transport ethanol to gasoline refineries, terminals and bulk plants.
- Submit the ultimately adopted amendments to the U.S. EPA as a revision to the California SIP.

## V. SUMMARY OF PUBLIC COMMENTS AND AGENCY RESPONSES

The Board received numerous written and oral comments, in connection with the December 9, 1999 hearing and during the 15-day supplemental comment period. Set forth below is a summary of each objection or recommendation specifically directed at the proposed amendments or to the procedures followed by the ARB in proposing or adopting the amendments, together with the agency response. The comments have been grouped by topic whenever possible. Comments not involving objections or recommendations specifically directed towards the rulemaking are generally not summarized below.

There was little opposition expressed to the objective of phasing out the use of MTBE in California's gasoline. For instance, the Western States Petroleum Association (WSPA) expressed support for Governor Davis's plan to eliminate the use of MTBE. As discussed below, concerns with the MTBE phase-out was expressed by the Oxygenated Fuels Association, which asserted that no significant water quality benefits would be realized and that the proposed regulations would lead to significant emissions increases. Various community activists urged that action on the amendments be delayed so that the impacts from the use of ethanol could be further analyzed. And various businesses generally opposed to proposal because of gasoline price and supply concerns.

The commenting oil companies, auto companies, and environmentalists generally supported the proposed CaRFG3 Predictive Model. Tosco Corporation (Tosco), the second largest refiner of gasoline in California, stated that it unconditionally supports the staff's proposal for CaRFG3. Tosco also announced that it would eliminate MTBE from gasoline sold at all of its Union 76 and Circle K stations by December 15, 2000, if U.S. EPA granted California's request for a waiver from the federal RFG oxygen mandate in the next 90 days. In addition, Tosco stated the belief that there would be no net cost increase for producing non-MTBE gasoline for its stations and customers.

### A. COMMENTS PRESENTED PRIOR TO OR AT THE HEARING

#### *(1) Emissions Impacts of the Proposed CaRFG3 Standards*

##### a) Comments That the Air Quality Benefits From CaRFG2 Are Not Preserved By the Proposed CaRFG3 Standards

1. Comment: The staff has made numerous assumptions in estimating the effect on emissions, and if any of these prove wrong, California could find itself needing major corrections since the proposed formula provides very little margin for error. The Board should err on the side of caution and set levels that we know will not cause any loss of benefits. (Alliance of Automobile Manufacturers, General Motors, NRDC, American Lung Association, Planning and Conservation League, Sierra Club, Coalition for Clean Air, Union of Concerned Scientists, Parallel Products, Bluewater Network, Californians Against Waste).

The current proposed regulation will lead to significant emission increases from sources other than the tailpipe of cars, and therefore, will not preserve the air quality achievement with the current program. These emissions increases from other sources (i.e., permeation, commingling, RVP, from use of ethanol) will be much greater than the 20 tons per day reduction identified by ARB. (Oxygenated Fuel Association).

Agency Response: Assuring that the emissions benefits from the CaRFG2 program will be maintained by the CaRFG3 standards has been of primary importance to the ARB in this rulemaking. We believe that the adopted CaRFG3 standards meet the requirements of S.B. 989.

Section IV.A. of this FSOR explains our methodology in estimating and comparing the average in-use summertime properties of 1998 gasoline produced under the CaRFG2 standards and gasoline that will be produced under the CaRFG3 standards. There is a sound technical basis for the comparison of emissions.

We have also considered the potential impacts of (1) evaporative emissions associated with commingling gasoline with and without ethanol, (2) emissions from off-road and nonvehicular applications, and (3) permeation associated with gasoline containing ethanol. The agency responses on these issues in Section V.A.5 support our conclusion that the CaRFG3 standards will not result in increased emissions of hydrocarbons, NOx, or potency-weighted toxics.

Our approach for evaluating emissions equivalency has been generally supported by the peer reviewers. The Environmental Policy Council has also determined that there will not be a significant adverse impact on public health or the environment, including any air quality impact, that is likely to result from the change in motor vehicle fuel that is expected to be implemented to meet the CaRFG3 regulations.

As discussed in Section IV.H., the Board has also directed staff to undertake a number of investigations of issues regarding potential emissions impacts under the CaRFG3 standards. For example, the staff will be evaluating commingling and permeation issues in depth, and the Executive Officer will report his findings, with any appropriate recommendations, by December 2001. The Executive Officer is also directed, upon implementation of the regulations, to evaluate whether they actually maintain or improve upon emissions and air quality benefits achieved by CaRFG2, and to report to the Board by 2004 with the results and recommendations.

2. Comment: The proposed CaRFG3 standards clearly do not protect the existing benefits of in-use fuels. When the proposed CaRFG3 flat limits are compared to 1998 in-use fuel, emissions of NOx increase by 0.60%, emissions of THC+CO increase by 3.57%, and emissions of toxics increase by 8.69%. This does not show up in the Staff Report and represents environmental backsliding. The compliance margins are speculative and represent refinery choices that are hard to predict. (Parallel Products)

When the proposed CaRFG3 standards are compared to the 1998 in-use fuel in an effort to demonstrate that the regulation itself ensures the baseline emission scenario as required by S.B. 989, it is clear that the air quality benefits achieved by CaRFG2 are not maintained. (Bluewater Network, Californians Against Waste)

Agency Response: Since the 1998 CaRFG2 base fuel in the comparison is the actual in-use fuel that was marketed rather than the CaRFG2 flat limits, the CaRFG3 fuel should similarly represent the fuel that is expected to be marketed rather than the proposed CaRFG3 flat limits. It is not a fair or appropriate test to say that the CaRFG3 flat limits must outperform the real in-use 1998 fuel when we know that refiners build in a compliance margin to protect against variations in test results. For instance, the CEC's 1998 survey indicated that the average summertime RVP was 6.78 psi even though the regulatory limit was 7.00. There is no reason to think that refiners will stop building in a compliance margin.

3. Comment: Senate Bill 989 requires that the new regulation must maintain benefits, including emission reductions from all pollutants including ozone precursors. The ARB staff's failure to incorporate a CO debit for fuels containing less than 2 wt.% oxygen allows refiners to produce a gasoline with greater CO emissions and the CaRFG3 standards are thus inconsistent with S.B. 989. (Bluewater Network, Californians Against Waste)

Agency Response: Health and Safety Code section 43013.1(b)(1), added by last year's S.B. 989, requires that the CaRFG3 regulations "maintain or improve upon emissions and air quality benefits achieved by" CaRFG2, "including emission reductions for all pollutants, including precursors, identified in the State Implementation Plan for ozone . . . ." Carbon monoxide is not an air pollutant or precursor identified in California's SIP for ozone, and S.B. 989 therefore intentionally does not prohibit any increase in CO emissions.

We do believe, however, that the adopted CaRFG3 standards will maintain the ozone air quality benefits from CaRFG2, even after accounting for the role of CO as an ozone precursor. The reason is that when a refiner produces a nonoxygenated gasoline meeting the CaRFG3 standards, some of the CO emission increases from eliminating the oxygen will be offset by CO decreases from reductions in sulfur and T50. The increase in ozone-forming potential from the remaining CO increase will be offset by a reduction in permeation emissions compared to a gasoline oxygenated with ethanol. See the response to comment 54.

4. Comment: I'm not sure what happened to incentivize the idea that T50 would creep up another couple of degrees. In addition to that, there seemed to be just the simple statement that that wouldn't result in any degradation of equivalency. At least in the hydrocarbon calculation, equivalency is a very close call. (Dennis Lamb, independent consultant)



Agency Response: The rationale for the increase in the T50 flat and averaging limit, and our ultimate equivalency demonstration, are set forth in Section IV.A.

5. Comment: We want to make sure that emissions benefits from the use of oxygenates are not lost, including PNAs, if refiners produce non-oxygenated gasoline. We haven't seen any analysis from the staff that has considered these other pollutants which S.B. 989 really says we should be considering. (Mike Graboski)

Agency Response: The air quality impacts of the use of California reformulated gasoline with ethanol and without oxygen were evaluated by the ARB in the *Air Quality Impacts Report* described in Section III of this FSOR. The study included effects on PAN, acetaldehydes, and PNAs. The results showed no adverse air quality impact from the use of gasoline containing ethanol and non-oxygenated gasoline. As discussed earlier in this document, the report was peer reviewed and then approved by both the ARB and the Environmental Policy Council. Also see the response to comment 52.

Unlike the federal RFG regulations, the California RFG regulations place stringent limits on the range that fuel properties can have in gasoline. Also, the CaRFG3 Predictive Model provides assurance that the use of an alternative formulation of CaRFG3 can not lead to emissions greater than that which would be expected from the use of a fuel produced to the flat limits. In the National Research Council report, "*Ozone-Forming Potential of Reformulated Gasoline*," the authors conclude that there is very little difference between the ozone-forming potential of the various formulations of reformulated gasoline. This indicates that the breakdown of the hydrocarbon species tends to be very similar. With similar species profiles and the strict limit on emissions provided by the CaRFG3 Predictive Model, there is very little opportunity for an increase in hydrocarbon emissions and toxic compounds such as PNAs.

b) Comments Urging Specific Changes to the CaRFG3 Standards to Maintain Emission Benefits

6. Comment: We are concerned that staff's proposal of a 6.9 psi RVP does not adequately provide a margin of error that will ensure that CaRFG3 will achieve equivalent emissions benefits to CaRFG2. This is largely due to the many uncertainties inherent within ARB staff's assumptions in determining the emissions benefits that may be achieved through CaRFG3. We are particularly concerned that the impact of commingling may be greater than what ARB is predicting in its Staff Report. We also are concerned about the potential for an increase in CO emissions if oxygenates are no longer required. We recommend that ARB, at a minimum, adopt an RVP standard of 6.8 psi to ensure that CaRFG3 achieves equivalent emission reductions as required by law. (Sierra Club, Coalition for Clean Air, and Union of Concerned Scientists)

Lowering the flat limit for RVP to 6.8 psi now is a more prudent approach than the recent staff suggestion that we simply reanalyze the impact of commingling at the end of 2001, because at that point the loss of benefits may already have occurred and industry capital investments will also have been made. (Sierra Club, Coalition for Clean Air, and Union

of Concerned Scientists, American Lung Association, National Resources Defense Council, Planning and Conservation)

To provide greater certainty that CaRFG3 will achieve air quality benefits, we recommend lowering the flat limit for RVP from 6.9 to 6.8 psi. (American Lung Association) With ARB's acknowledgement that the commingling effect may be substantial, we urge a greater margin of safety – move the RVP limits to 6.8 psi if using the evaporative model and 6.9 psi flat limit. (National Resources Defense Council)

The CaRFG3 proposal facilitates oxygenate use with relaxed caps or credits for RVP levels that are already in place. This is backsliding on evaporative emissions. You can at least act conservatively and retain the 7.0 cap and address commingling by setting the point for credit at the RVP level being produced at the present time, that is 6.8 psi. (Dennis Lamb, independent consultant)

Agency Response: For the reasons provided in the responses to comment 40 and the following, at this time we do not believe that the 6.9 psi flat limit for RVP, when the evaporative model is being used, needs to be reduced to 6.8 psi in order to offset evaporative emissions increases associated with commingling. Lowering the flat limit for RVP, when the evaporative model is being used, to 6.8 psi. would limit refiners' flexibility in making CaRFG3 because there is a lower limit of 6.4 psi. We have concluded it is necessary to provide as much flexibility as possible while maintaining the emissions benefits from CaRFG2.

7. Comment: The Board should retain the current T50 and T90 specifications to help preserve the significant air quality gains achieved by CaRFG2. Increasing both the flat limits and averages for T50 and T90 gives refiners too much flexibility. Staff's proposal for relaxing T50 and T90 parameters could increase emissions and impair vehicle performance. We do not believe this much flexibility is needed, and we fear it will compromise air quality and driveability. If the Board must relax one, it should focus on the average limits and keep the flat limits of Phase 2 level. (Alliance of Automobile Manufacturers).

If any relaxation of the current specifications for T50 and T90 is allowed it should be treated as a temporary variance and be sunsetted by the year 2004. (Alliance of Automobile Manufacturers, DaimlerChrysler, Bluewater Network/Californians Against Waste, General Motors, AIAM, Ford).

Agency Response: The increases in the cap limits for T50 and T90 originally proposed in the staff report provided the only practical way that refiners could possibly produce gasoline that would cause the air quality and vehicle performance problems identified. Therefore, Staff proposed, and the Board accepted, that the cap limits for T50 and T90 stay the same as in CaRFG2. The increases in the T50 and T90 flat limits must be viewed in conjunction with the reductions to the sulfur and benzene flat limits. As discussed in Section IV.A., we believe that the ultimately adopted combination of standards will preserve the hydrocarbon, NOx, and potency-weighted toxics emissions

benefits from the 1998 in-use fuel. Even with these changes, most refiners will have to make significant investments and modify their refineries to be able to meet their supply obligations. Further tightening of gasoline specifications could result in supply shortages and more uncertainty in the market.

We believe it is premature to adopt more stringent specifications for a future date because vehicles and emissions control technologies continue to evolve. Future changes to the gasoline regulations can be addressed when more information becomes available regarding the response of newer vehicles to changes in fuel properties.

We do not expect vehicle driving performance to be significantly affected by the CaRFG3 regulations. California gasolines have the best driveability characteristics in the United States because of the CaRFG2 specifications, and the CaRFG3 regulations will not change that. Since, the cap limits on T50 and T90 will stay the same as for CaRFG2, the small increase in the T50 and T90 flat limits should not change the DI. California's DI levels are expected to continue to be the lowest in the country. However, as a precaution, Resolution 99-39 directs the Executive Officer to evaluate the DI of in-use CaRFG3 gasoline and to report back to the Board by 2004 with the results and any appropriate recommendations.

c) Comments Urging Changes to the CaRFG3 Standards to Achieve Additional Emissions Reductions

8. Comment: The ARB should use the CaRFG3 regulations as an opportunity to gain needed additional emissions benefits. (Alliance of Automobile Manufacturers, American Lung Association, General Motors, Sierra Club, Coalition for Clean Air, Union of Concerned Scientists, Clean Air Partnership of Sacramento, Sacramento Area Council of Governments, National Resources Defense Council, South Coast Air Quality Management District, Bluewater Network, Californians Against Waste, Parallel Products).

The ARB should adopt measures now to substantially reduce sulfur and evaporative emissions, even beyond the levels recommended in the Staff Report, so that refiners can make necessary changes at the same time they comply with the MTBE phase-out. The sulfur standard should be reduced to 5 ppm to reduce several pollutants simultaneously. The ARB Staff Report did not evaluate the feasibility of lowering sulfur levels below 20 ppm. At a minimum, ARB staff should evaluate the costs and benefits of lowering sulfur levels and report back to the Board by December 2000. (Sierra Club, Coalition for Clean Air, Union of Concerned Scientists)

We recommend that the sulfur limits be lowered to 5 ppm or as near 5 ppm as the staff believes is feasible. Lower sulfur would enable the automobile manufacturers to introduce even cleaner vehicle technology. (American Lung Association) We recommend a 5 ppm sulfur limit in place of the proposed 20 ppm. (Planning and Conservation League)

We urge you to do the very best you can to remove as much sulfur as possible from the new reformulated fuel. (Sacramento Area Council of Governments) NOx emissions reductions are very important to our region's ability to reach attainment by 2005, and therefore the sulfur content in the reformulated gas is especially important to us. (GenCorp)

Further reductions in the sulfur content of CaRFG must be considered. A reduction to 5 ppm is feasible, and that should be considered as soon as possible by the ARB. (California Air Pollution Control Officers Association)

The sulfur level proposed by the staff, although a positive step, is not sufficient to obtain the maximum possible emissions reductions from the LEV II program or to enable new lean burn technologies and lean NOx catalysts. We recommend a sulfur cap of 5 ppm by 2004 coincident with the LEV II program. (Alliance of Automobile Manufacturers, General Motors, DaimlerChrysler)

The ARB should take the sulfur flat limit, move it from 20 to 15 ppm; take the sulfur average, move it from 15 to 10 ppm. If you do that, you will have a proposal that does provide true air quality benefits, considering all the uncertainties, and one that is cost effective and will truly provide a world-class fuel. (Ford)

Agency Response: We have seriously considered adopting more stringent CaRFG3 standards to obtain additional emissions reductions. However, at this time, we agree with the many commenters who have urged that the challenge of removing MTBE without a loss of benefits is sufficiently great that additional reductions at this time are not appropriate.

Under the current CaRFG2 sulfur standards of a flat limit of 40 ppm and an averaging limit of 30 ppm, the current average in-use sulfur content is about 25 ppm. We expect that under the adopted CaRFG3 flat limit of 20 ppm and averaging limit of 15 ppm, the average sulfur content will be about 10 ppm. This is because refiners typically find reducing sulfur to be the most cost-effective single strategy to reduce exhaust hydrocarbons and NOx under the Predictive Model, and they accordingly use the sulfur reductions to allow greater flexibility for other properties such as T50 and T90. However, imposition of a sulfur cap limit at the 5 ppm or even the 10 ppm level could result in significant increased costs because refiners would have to assure that every batch of gasoline meets these very tight cap limits and they would not be able to use sulfur in the predictive model to allow changes to other parameters.

Also, refiners have raised serious concerns over the ability to consistently provide on-specification gasoline at ultra-low sulfur levels. Redundant capacities for refinery processing units would be needed to assure that every batch of gasoline complies with the standard. It would also be more difficult to recover from facility upsets. Contamination by other higher sulfur refinery streams and products in pipelines and terminals could be a major issue. Further, a sulfur content flat limit of 5 ppm would mean that refiners would

not be able to use further sulfur reductions to offset other properties when using the Predictive Model.

In preparing the CaRFG3 proposal, staff held many meetings with refiners, the CEC, other refining experts, and interested parties to evaluate the refiners' ability to produce and supply complying gasoline without MTBE, and the feasibility of various potential limits. The staff concluded that the cost of reducing sulfur further than the levels in the CaRFG3 standards would be from 3-7 cents/gallon with likely costs closer to 7 cents/gallon. In light of the challenges presented by the task of removing MTBE from CaRFG, we have concluded that it is not feasible or cost-effective at this time to impose a sulfur cap limit in the range of 5-10 ppm. The low average sulfur contents we expect to experience in the gasoline pool under CaRFG3 will provide some of the benefits of a low-sulfur standard without the cost.

This is not to say that lower sulfur limits should not continue to be seriously considered. In Resolution 99-39, the Board directed the Executive Officer to work with the CEC staff to evaluate the sulfur levels of gasoline produced to comply with the CaRFG3 regulations. The Executive Officer is to evaluate the expected impacts of an ultra-low-sulfur flat or cap limit for California gasoline on California gasoline supplies, production and import volumes, production costs, and the ability of refiners to produce complying California gasoline on a consistent basis. The Executive Officer is to report back to the Board with its findings and recommendations by July 2002.

We recognize that ultra-low sulfur levels can assist the automakers in meeting the LEV II standards. However, the ARB's feasibility demonstration for those standards was based on the use of CaRFG2 certification fuel without ultra low sulfur, and we believe the standards remain feasible on that basis.

d) Comments That the Original and Modified Staff Proposals Are Overly Restrictive

9. Comment: Staff's initial proposal is too restrictive and does not provide enough flexibility for gasoline suppliers. We believe that additional flexibility can be provided without increasing emissions compared to CaRFG2. (WSPA, Ultramar Diamond Shamrock, California Chamber of Commerce).

We think there is additional volume that can be gained back without losing air quality benefits. (WSPA, Ultramar Diamond Shamrock).

California should concentrate on removing MTBE before tightening gasoline regulations further, we are particularly concerned with lowering the sulfur content specification. (California Chamber of Commerce). ARB should return to its original mission to provide greater flexibility for refiners so that MTBE can be removed from gasoline at the least possible cost. (Cal-Tax) The reformulation proposed by ARB goes well beyond the changes necessary to produce MTBE-free gasoline. ARB's plan to add further stringency will require most of the existing refining capacity to be used to manufacture less gasoline at a higher cost. (California Business Roundtable).

Agency Response: The final CaRFG3 standards were selected to provide as much flexibility as possible for refiners to produce gasoline without MTBE while maintaining existing CaRFG2 emissions benefits as required by S.B. 989 and directed by the Governor's Executive Order. Section IV.A. of the FSOR discusses the modifications that ease the flat and averaging T50 and T90 limits, and explains the methodology used to evaluate whether the air quality benefits from CaRFG2 are maintained. Reducing the RVP standard from 7.0 to 6.9 psi, for refiners using the evaporative portion of the CaRFG3 Predictive Model, does provide a margin of safety. This margin of safety is necessary to offset evaporative emissions increases that will occur when gasoline with and without ethanol are commingled in motorists' fuel tanks (see the response to comment 40). If changes are needed in the future to address commingling or permeation effects, the adopted standards will require smaller adjustments than the commenters' proposal and lessen refiners' uncertainty regarding the final CaRFG3 specifications.

10. Comment: We recommend that the flat limit parameters in staff's modified proposal should be an RVP increase from 6.9 psi to 7.0 psi, T50 increase from 213 to 214°F, and T90 increase from 305°F to 310°F. This would still preserve existing air quality benefits for total hydrocarbons while gaining additional reductions of NOx and toxic emissions above those achieved by Phase 2 RFG. Tighter gasoline standards which will result in additional reduction of the state's refining capacity over and above the changes needed to remove MTBE are unjustified. (WSPA)

Agency Response: Under the modified staff proposal, the RVP standard is 7.0 psi when the evaporative model is not used, and 6.9 psi when the evaporative model is used. As discussed in the responses to comment 40, the 0.1 psi cushion where evaporative emissions are varied under the ARB Predictive Model is designed to accommodate evaporative emissions increases from the commingling of gasoline with and without ethanol and the loss of CO emission benefits when nonoxygenated RFG is produced.

The methodology we have used in determining the specifications needed to maintain 1998 summertime emissions benefits is described in Section IV.A. When the revised CEC compliance margins are applied to the commenter's proposed specifications to estimate the average in-use future fuel, the CaRFG3 Predictive Model shows the commenter's specifications result in greater hydrocarbon emissions than the CEC's estimated 1998 in-use fuel.

11. Comment: The biggest concern that we have is that the staff proposal builds in air emission reductions, based on the assumption that the oxygen waiver will come, and commingling will have an impact. We suggest that the staff proposal should not assume that the waiver will come and build in the emissions reductions now. If the waiver is not granted you will get an emissions reductions at the cost of production volume. (WSPA)

Agency Response: We believe that California has made a persuasive demonstration in support of the oxygen waiver request, and we are cautiously optimistic that the waiver will be granted. In addition, there are bills now being considered by Congress that would

waive the oxygen requirement; as more states move to eliminate MTBE, this becomes more and more crucial. It is preferable to build in the cushion for commingling now by setting standards that will result in emissions equivalent to those from CaRFG2, rather than adopt standards that will have to be changed as soon as the waiver is granted. In the long run, our approach should provide the regulated industry with added certainty.

12. Comment: We oppose the staff's suggested modification that the originally proposed cap limits for T50 and T90 be lowered from 225°F and 335°F respectively back to the limits currently specified for CaRFG2. We believe increasing the cap limits for T50 and T90 by the originally proposed five degrees Fahrenheit provides additional flexibility that can allow California refiners to produce additional volume of fully complying CaRFG3 with no measurable impact on emission performance. Raising the cap limits does not represent environmental backsliding. (Ultramar, Diamond Shamrock Corporation).

Agency Response: Although raising the cap limits has no direct impact on emissions, it does affect the ARB's ability to effectively enforce the regulations. Also, the originally proposed increase in the T50 and T90 cap limits was a primary factor in the staff's proposal for an added DI specification. After the initial proposal, ARB staff continued to meet with individual refiners and WSPA on numerous occasions to understand the needs of the refining industry. The staff weighed refiners' desire to increase the cap limits for T50 and T90 against the additional constraints from the DI specification and impacts on the enforceability of the regulation throughout the distribution system. We believe that, on balance, the adopted approach is appropriate. It enhances enforcement and assures that the superior driveability of California gasolines is preserved without the need for a separate DI specification.

13. Comment: The auto manufacturers' proposal to cap sulfur at 5 ppm should be rejected because it is not needed and it may impede the refiner's ability to meet California gasoline demand. Reducing sulfur below the 20 ppm level right now is an enormous mistake. (WSPA)

Agency Response: The Board adopted the CaRFG3 sulfur limits proposed by staff.

*(2) Impact of the CaRFG3 Regulations on Gasoline Supplies in California*

14. Comment: We believe that the ARB staff has significantly underestimated the potential impacts of the production shortfall on the state. Without the application of the MTBE ban and CaRFG3 rules, demand would overtake supply gradually, if at all and allow gasoline suppliers to react in a measured way. Under the MTBE ban and CaRFG3, the state will go from self-sufficient to 10 to 20% short overnight. Further, the public will be aware that the change is due to government action. Significant public outcry may put the program and refiner's investments at risk. (WSPA.)

Under ARB's proposed formula to lower the sulfur content, supplies will become even tighter because it impacts the ability of refiners to produce normal volumes of gasoline. (California Chamber of Commerce)

Agency Response: Staff's estimates on the production shortfall are not substantially different from the commenter's. The Staff Report (p. xvii) indicated that the removal of MTBE and the originally proposed CaRFG3 regulations would result in a net reduction in gasoline production by California refiners of about 10 to 20 percent. In 1998, about 920,000 barrels per day (bpd) of gasoline were consumed in California; it is projected that consumption in the state will increase to about 970,000 barrels per day in 2003. California refineries are producing on average about 935,000 barrels of gasoline per day for California and have a maximum production capability on a short-term basis to produce about 1,000,000 bpd for the state's consumption. The increase in the state's gasoline consumption therefore means that California would need to import gasoline to meet demand as it exceeds California's refinery capacity in the next few years, even without the CaRFG3 regulations.

In addition to an increase in gasoline consumption requiring imports by 2003, the CEC staff stated at the December 9, 1999 public hearing, that MTBE has been imported at a rate of approximately 85,000 barrels per day in California, and that California will need replacements for the imported MTBE. CEC staff suggested that, in many cases, the replacements would be ethanol, which could be imported at rates ranging from 50,000 to 80,000 barrels per day. Further, if we consider the need for increased imports of alkylates, total imports could be as high as 275,000 barrels per day. CEC staff indicated that the imports are expected to come from such places as the Pacific Northwest, U.S. Gulf Coast, Europe, Virgin Islands and other locations.

As California increases its imports of finished gasoline and blendstocks, a steady import market will be created between California and outside sources. One of the many reasons given for California's recent price spikes has been that California has been a "gasoline island" with no really steady outside sources to make up temporary shortfalls in California due to refinery shutdowns or mechanical failures. With California creating reliable ongoing markets for imports, and other states complying with federal Phase 2 RFG requirements, refiners in other states and the Caribbean will be attracted to the market for CaRFG3 finished and blendstocks gasolines in California. With a reliable ongoing source of imports, California should be able to obtain additional gasoline when temporary supply disruptions occur in this state and potentially minimize future severe price spikes.

Nationwide, sulfur standards are set to go lower and that will lead to investments outside of California to make lower sulfur blending components which would be more compatible with California gasoline. California would have more potential suppliers for lower sulfur components.

Also, see the agency response to comment 16 and 17 on price and supply.

15. Comment: Burdening the complicated process (phasing out MTBE) by injecting stricter gasoline standards could very well increase the risk of marketplace disruptions.



(California Chamber of Commerce, California Manufacturers Association, and California Business Roundtable)

Agency Response: As a result of the modifications to the flat and averaging limits for T50, we believe that the adopted CaRFG3 standards are no more stringent than they need to be to maintain the air quality benefits of the CaRFG2 standards as required by S.B. 989. See Section IV.A of this FSOR and the response to comment 9.

16. Comment: It is incumbent upon ARB to pay close attention to issues of supply and price. California is already virtually an "island" for fuel because of our unique requirements. We have experienced severe price and supply fluctuations in the last few years. Any changes to ARB regulations on fuel formulation should seek to insure that any price increases are reasonable, and that the sensitivity to supply disruptions and radical price swings is minimized. (American Automobile Association)

Agency Response: As noted in the response to the previous question and elsewhere, we have tried to build in all the flexibility possible while meeting the S.B. 989 requirement that the emissions reductions and air quality benefits of CaRFG2 be at least maintained. On the question of the role of the ARB's fuels regulations on price spikes in the last few years, see the response to comment 18.

17. Comment: ARB has not provided facts to support its findings regarding the stability of the gasoline production system, nor to address the concerns of regulated parties regarding the availability of CaRFG3 gasoline from out-of-state. The removal of MTBE will result in a loss in gasoline production capacity for in-state refiners. In addition, the state may be vulnerable to supply disruptions, similar to the supply disruptions that have occurred under CaRFG2, resulting in price increases. The reasons for those price increases would remain under CaRFG3. Certain out-of-state supply characteristics that exist under CaRFG2 would appear to remain under CaRFG3. California uses almost all of the gasoline produced in the state. CaRFG2 is used very little outside of California. CaRFG2 is more expensive to produce than gasoline used elsewhere, and is not produced to any significant degree outside of California. Finally, bulk quantities of finished gasoline have to be brought into the state via marine tanker. (Trade and Commerce Agency)

The ARB has not demonstrated in the record that sufficient gasoline supplies exist outside the state to compensate for any decrease in refinery capacity. Without an adequate supply there is the possibility of supply disruptions. (Trade and Commerce Agency)

ARB has stated in its Staff Report that "as California becomes more a routine importer of gasoline, it is expected that there should be more stability in the marketplace because refineries outside of California will, on an ongoing basis, be producing product for importation into California. Thus, the overall gasoline production system...should be no more subject to supply disruptions than under the current rules..." ARB has not

supported this finding with information in the rulemaking record. (California Trade and Commerce Agency)

Agency Response: The Staff Report states, "It is important to note that even without the proposed CaRFG3 regulations, California is already becoming a net importer of gasoline. California has experienced, and will continue to experience, ongoing increases in demand for gasoline." (pp. 58-59) In addition, the CEC "estimates that by 2003, even without the proposed CaRFG3 regulations, California refineries will no longer be able to meet California demand and the importing of gasoline and gasoline blending components will become a routine occurrence, even when California refineries are operating at capacity." (*Id.*) Hence, California will soon become a regular importer of finished gasoline or blendstocks, due to California's annual increase in demand for gasoline, whether or not the CaRFG3 standards were implemented.

The CEC study, *Supply and Cost of Alternatives to MTBE in Gasoline*, conducted by MathPro Inc., presented the results of refinery modeling for California that demonstrated that there currently exists sufficient import resources and in-state capacity to meet California needs for fuel. This study was designed to look at the costs and supply issues relating to the phase-out of MTBE from California gasoline. This modeling exercise was completed prior to the approval of the CaRFG3 regulations, therefore it did not include the additional flexibility provided by the CaRFG3 regulations.

One of the ARB's objectives in the development of the CaRFG3 regulations has been to avoid supply shortfalls and disruptions to the greatest extent feasible. The flexibility included in the originally proposed CaRFG3 standards was designed to make it easier for refiners to produce gasoline than would have been possible under the CaRFG2 regulations, once MTBE is phased out. For example, the sulfur and benzene specifications were decreased so that the T50 and T90 specifications could be increased without increasing emissions. The higher limits on T50 and T90 give back some of the volume loss associated with the removal of MTBE and improve supply. And the increases to the originally proposed flat and averaging limits for T50 will help refiners regain some lost production capacity.

There may even be supply advantages created for California with more reliance on imports. A primary reason for California's recent price spikes was supply disruptions created by the occurrence of refinery maintenance or shutdowns while imports alternatives were not immediately available. Many commenters and concerned citizens have criticized California as being an "island" without outside sources of gasoline or blendstock supply. When California refiners become regular and reliable customers for out-of-state imports, a stable and steady of supply of CaRFG3 gasoline or its blendstocks will be created for this state. Thus California refiners can be expected to have a more stable outside source of gasoline supply and have the market flexibility to choose to produce the gasoline within state or import finished gasoline or blendstock from outside sources. This diversity in California's gasoline supply will be good for California refiners and the state's gasoline consumers.

Refiners in the Caribbean and Texas, as well as other sources around the world, have the production capacity to produce finished CaRFG3 or its blendstocks. The U.S. EPA's recently adopted "Tier 2" regulations should substantially expand the extent to which out-of-state refineries will be able to produce batches of low-sulfur gasoline that could meet California requirements. The Tier 2 regulations, promulgated on February 10, 2000, will significantly reduce average gasoline sulfur levels nationwide as early as 2000, fully phased in by 2006 (65 F.R. 6698). The refinery average sulfur limit for refiners and importers will be 30 ppm starting in 2005, and there will be a per gallon cap of 80 ppm starting in 2006. There will also be a corporate pool average limit of 120 ppm in 2004 and 90 ppm in 2005. (40 CFR § 80.195.) An average, banking and trading program will encourage sulfur reductions in earlier years.

With regard to the extent to which past supply disruptions were due in substantial part to factors other than California's fuels regulations, see the response to comment 18.

Finally, as to the concern that all finished gasoline will have to be brought into the state via marine tanker, much of the ethanol used in California would be brought in by railcar from the Midwest.

18. Comment: California's unique fuel requirements are directly responsible for our high fuel costs. Prices this year shot up to as high as \$2.00/gallon, almost double what they were in the beginning of the year. The main cause – a limited number of refineries making fuel that could be sold in California.

When new ARB diesel regulations went into effect in 1993, prices soared 40 cents in one week. We are currently experiencing supply-driven price increases for diesel fuel once again – the fourth supply-related price spike this year.

When the CaRFG2 gasoline regulations went into effect in 1996, prices jumped as high as \$1.65 per gallon and higher in some areas of the state. This year rivaled 1996 for the largest number of price spikes, the longest duration of price spikes, and the highest prices. Once again, the cause was insufficient amounts of gasoline that could be sold in California.

We cannot afford these conditions. Regulations that further limit the reliable supply of gasoline or diesel fuel should not be approved. The proposed CaRFG3 regulations have the potential to make problems encountered under the CaRFG2 regulations even worse. My business and California's economy depend on stable supplies of affordable fuel. Please make sure these regulations do not take that away. (Seven oil marketing companies, 16 other businesses, and about 50 citizens.)

Agency Response: California gasoline prices are higher than in most other parts of the United States. Some of this difference is due to increased costs for producing less polluting blends. Recent wholesale and retail gasoline prices, however, have far exceeded the actual cost of producing California reformulated gasoline. The reasons for this are complex. The contributing factors which affect the supply and demand cycle and

which are often cited by those associated with gasoline production and marketing include reduction in refinery production capacities; rapid growth in demand on West Coast markets; closure of many small independent California refineries; oil company mergers and acquisitions; lack of substantial reserve fuel inventories; and California's physical distance from out-of-state refineries.

The incremental cost to produce CaRFG2 is, on average, five to eight cents more per gallon than conventional gasoline in Los Angeles or the Bay Area. California refiners invested an estimated four billion dollars to make modifications to their facilities to enable them to produce California's reformulated gasoline. The refiners also experience somewhat higher operating costs when producing CaRFG2. The recovery of capital expenditures, coupled with higher operating costs, translates into an estimated average increase of ten cents per gallon. Wholesale fuel prices have tended to reflect a significant portion of these added costs.

CEC Commissioner Michael Moore – Presiding Member of the CEC's Fuels and Transportation Committee – testified that he does not believe the ARB's fuels regulations were the primary cause of the retail price spikes experienced last summer. The primary causes have been the geographic distance to the next available fuel supplies in the U.S. Gulf Coast and elsewhere, coupled with a level of market demand which in peak periods basically equals in-state production capacity. Geography is a problem for all of the West Coast, including the Northwest states that use conventional gasoline and diesel fuel. Last summer, refinery and pipeline problems in Washington and Oregon resulted in gasoline prices that were for a short period higher than California's. The severe refinery production outages experienced in California last summer would have resulted in greatly increased prices regardless of the fuel specifications used. The CEC is directing its staff to investigate potential mitigation strategies that may reduce the price volatility in the future. It is holding several workshops and a hearing in 2000 to look into the issue.

With regard to the price spike in the Spring of 1996 during introduction of CaRFG2, the new California standards were only one of the contributing factors. One of the primary factors was an April 1, 1996 fire at Shell's Martinez refinery, which resulted in a 100 percent shutdown of Shell's production for most of April, and subsequent delays in a return to full production. At that time, there was also a significant rise in crude oil prices globally and increases in seasonal demand.

See the discussions of costs and supply in the responses to comments 19 and 24. The CaRFG3 regulations do not prohibit the use of MTBE until December 31, 2002. The CEC has concluded that allowing three years to transition to an alternative oxygenate would be enough time for refiners and oxygenate producers to take the necessary actions to meet demand.

*(3) Cost Impacts of the Proposed CaRFG3 Regulations*

a) Comments That Cost Estimates Are Incorrect

19. Comment: Regulated parties have expressed concern that the proposed CaRFG3 regulations would actually result in a significant increase in costs associated with the phase-out of MTBE, because of additional emissions reductions requirements being proposed. ARB has not separated the MTBE phase-out costs from the additional emissions reductions costs. More specifically, ARB is proposing stringent requirements for sulfur and other gasoline components than those found in existing CaRFG2 regulations or comparable federal regulations. But ARB has not provided justification for the increased stringency of the proposed regulations compared to existing requirements. (Trade and Commerce Agency)

Agency Response: With the relaxations to the flat and averaging limits for T50 approved at the hearing, we believe the adopted CaRFG3 standards provide as much flexibility as possible while maintaining the air quality benefits achieved by the CaRFG2 standards as required by S.B. 989. The adopted CaRFG3 standards are not designed to obtain additional emissions reductions. The discussion of costs in Chapter VI of the Staff Report did separately discuss costs of removing MTBE (Section B.1-3), and the costs of the proposed changes to the CaRFG limits. The presentation of the CEC on projected costs similarly distinguished between the costs for MTBE removal and the costs of the CaRFG3 standards.

The ARB is justified in having motor vehicle fuel standards that are more stringent than the comparable federal standards because they are a necessary element in attaining the national and state ambient air quality standards for ozone and PM in major portions of the state. The federal Clean Air Act has recognized this by exempting California from the general preemption of state regulations of fuel properties that differ from federal regulations (CAA § 211(c)(4)(B)).

20. Comment: We believe CARB has seriously underestimated the economic impact of the CaRFG3 regulations. ARB staff has gone far beyond removing MTBE and providing greater flexibility for refiners under the CaRFG regulations. The proposed CaRFG3 regulations would reduce refiner capacity by 10-15 percent and could increase manufacturing costs by up to 7 cents per gallon. (Cal-Tax).

We encourage staff to revisit the assumption regarding annual operating cost or better yet, rely on the CEC modeling of the Phase 3 program. Details from the Staff Report strongly suggests that staff has made assumptions that underestimate the likely operating cost impact of the proposal. The CEC report used by the ARB underestimates the cost of bidding ethanol away from current users in other areas of the country, and the ARB staff assume that the use of ethanol will be about half that of MTBE. However, if refiners opt to use 10 volume percent ethanol, the cost savings cited by staff disappear. (Page 58 of Staff Report) (WSPA)

WSPA believes that the staff estimate of cost effectiveness is understated. We strongly recommend that staff recalculate the cost effectiveness once CEC has completed their analysis of the proposed CaRFG3 program. The ARB analysis underestimates the sulfur reduction costs by relying on EPA analyses not applicable to the California situation and, has not considered the net loss of flexibility incumbent in staff's proposal. The costs of lost flexibility will be borne by refiners and will be higher than the costs assumed by staff. (WSPA)

Staff states, on page 56 of the Staff Report, that they "conservatively estimated, based on figures calculated during the development of the CaRFG2 regulations, that annual operating and maintenance costs of approximately 40% of the capital expenditure would occur each year". Regarding this estimate we note that in the CaRFG2 rule, staff used an estimate of 50%, not 40% for the operating cost as a percent of capital cost, and subsequent work done by WSPA, using refining modeling, indicated that the actual operating cost was closer to 60% to 70%. If the operating cost range is actually 60 to 80% as suggested by independent analyses, the unit cost for the program would rise by 2 to 4 cents per gallon over the staff's estimate, assuming that the staff's \$1 billion capital cost is correct. (WSPA)

The ARB cost analysis is predicated on average costs and does not account for disruptions in supply. The ARB does not account for increased volatility; therefore, underestimating the cost of the regulation. These issues were covered by Math Pro in their previous studies and it is in the Energy Commission analysis as well. (WSPA)

Agency Response: The CEC and MathPro, Inc. findings were consistent with the ARB assessment for the capital and operating expenses identified in the ARB Staff Report and were presented at the CaRFG3 hearing. The CEC subcontracted with MathPro, Inc. to perform an analysis of the economic impacts of the proposed CaRFG3 regulations. The final MathPro report, *Analysis of California Phase 3 RFG Standards*, was submitted to the CEC on December 7, 1999, and the CEC summarized the findings at the ARB public hearing on December 9, 1999. The CEC and MathPro, Inc. findings were consistent with ARB Board findings for costs after approval of changes in the CaRFG3 proposals for T50 and T90. As a result, the production and operating costs could be significantly lower than the originally estimated 4 to 7 cents per gallon in the first year of implementation.

21. Comment: It is troubling to WSPA that the capital estimate was developed in a manner that eliminates the ability for the public to meaningfully comment on it. We note that the staff did not include any indication of the types or capacities of facilities that refiners are estimating will be installed. Nor did staff discuss what, if any adjustments were made to refiner's input. With this lack of detail, WSPA is unable to comment on the validity of staffs \$1 billion estimated capital investment. (WSPA)

Agency Response: As stated in the Staff Report, staff's capital cost estimates were developed based on both discussions with refiners and in consultation with the CEC. At the time, staff was uncertain of the specific refinery modifications and input adjustment that would be necessary to comply with the proposed specifications. Staff's discussions

yielded a conservative estimate of about \$1 billion to comply with the originally proposed CaRFG3 specifications. Further analysis by MathPro, Inc. performed prior to the Board Hearing verified that the staff's estimate captured the whole range of potential costs for staff's original proposal, which ranged from \$370 million to \$900 million. However, based on staff's modifications to the original proposal, these costs were reduced to about \$360 million to \$750 million, with likely costs ranging from \$360 million to \$480 million.

22. Comment: The staff estimate of 0.4 cents/gallon to reduce sulfur from the current average of 25 ppm to the presumed future average of 10 ppm (Staff Report, pp. 61-62) is questionable because it is based on the EPA analysis for United States refineries and that is not applicable to California. Moreover, staff estimates that the cost to reach a cap of 5 ppm is 3-7 cents/gallon; the Staff Report does not elucidate how staff found the "knee in the curve" that lead to the 15 ppm change (from 25 to 10 ppm) cited in the Staff Report being estimated at 0.4 cents/gallon. (WSPA)

Agency Response: Although there is some uncertainty on the cost of solely reducing sulfur, the overall capital costs were consistent with an independent cost analysis by the CEC and MathPro, Inc. It is very difficult to separate the cost of reducing sulfur from the costs of changing other gasoline parameters. Because of the uncertainty of refiners' future activities, the estimate for reducing sulfur could only be made from a general estimate based on the analysis by the U.S. EPA. Although the EPA analysis may not be directly applicable to the costs for reducing sulfur for California refineries, it was consistent with information provided during discussions with individual refiners and was the best information available.

Because more information is needed on the effects of reducing sulfur further, the Board directed that more analysis be done. In Resolution 99-39, the Board directed the ARB Executive Officer to work with the CEC staff to evaluate the sulfur levels of gasoline produced to comply with the CaRFG3 regulations, and the expected impacts of an ultra-low-sulfur flat or cap limit for California gasoline on California gasoline supplies, production and import volumes, production costs, and the ability of refiners to produce complying California gasoline on a consistent basis.

23. Comment: New sulfur removal technologies are reporting concerns with recombination of sulfur and hydrocarbons downstream of the sulfur removal reactors. Without the construction of some additional processing unit, ultra-low sulfur gasoline can not be produced. We assume that staff will consider the CEC work on CaRFG3 economics in their presentation to the Board at the December hearing. (WSPA)

Agency Response: The results of the CEC-commissioned MathPro report, *Analysis of California Phase 3 RFG Standards*, were presented at the December 9, 1999 hearing and provided part of the basis for the ARB's final cost analyses.

b) Comments that CaRFG3 Costs Will Adversely Impact California

24. Comment: The rulemaking record does not address the potential detrimental impacts of the proposed regulations on California competitiveness. The increased costs (4 to 7 cents per gallon) of production may have a detrimental impact on California's economic competitiveness relative to other states. California small businesses, in particular, may be adversely impacted by any shifts in spending. (California Trade and Commerce Agency, California Chamber of Commerce, WSPA)

Agency Response: The ARB contracted with Professor Peter E. Berck of U.C. Berkeley to conduct a preliminary assessment of the economic impacts of the CaRFG3 regulations on the California economy. Professor Berck developed a computable general equilibrium (CGE) model of the California economy for assessing the economic impacts of large-scale environmental regulations. E-DRAM is a modified version of the California Department of Finance's Dynamic Revenue Analysis Model (DRAM) and is tailor-made for California and extremely refined. E-DRAM consists of over 1,000 equations designed to describe the relationships between California's producers, consumers, governments and the rest of the world. E-DRAM also features an entirely new air pollution module.

Using E-DRAM, investigators at U.C. Berkeley conducted a preliminary assessment of the economic impacts of the CaRFG3 regulations on the California economy. Investigators ran three scenarios for production and operating costs. Based on these analyses, investigators found that the California consumer price index may rise and real personal income may fall, but the relative magnitude of these changes will be miniscule. Overall, the impacts of the CaRFG3 regulations on the California economy will be negligible.

25. Comment: Regulated parties have expressed concerns that some smaller businesses, such as unbranded suppliers, may be eliminated as a result of the proposed regulations. ARB has stated on Standard Form 399 that no businesses will be eliminated as a result of the proposed regulations. (California Trade and Commerce Agency)

Agency Response: As clarified in the prior response, the overall impacts of CaRFG3 regulations on the California economy will be negligible. Factors other than the California gasoline regulations are affecting the gasoline distribution market and unbranded suppliers. The CaRFG3 regulations simply change how all suppliers of California gasoline will comply with the regulations, but does not materially change their marketing practices.

26. Comment: We are opposed to the proposed CaRFG3 regulations. The ARB Staff Report concludes that, if adopted, the CaRFG3 regulations would decrease California refinery capacity by as much as 15% and increase the price of gasoline in California by as much as 7 cents per gallon. This would create a significant economic hardship to consumers throughout the state, especially small businesses who rely on a steady supply of reasonably priced fuel in order to remain competitive.



California's refining capacity is already stretched very thin, with outages just this year causing severe problems with price and availability of gasoline. Passing regulations which will cut capacity and raise prices simple makes no sense. (Orion Environmental, Inc., Environmental Resolutions, Inc., Weatherford U.S. Inc., W.E. Duke and Company, Cowan Rental Services, Han-Padron Associates, Spec Services, Eichleay Engineers, Inc.)

Agency Response: The Air Resource Board is required by Executive Order D-5-99 and S.B. 989 to adopt regulations to phase out the use of MTBE .

As stated in the Staff Report, we are sensitive to the loss in production volume. The CARFG3 specifications were developed to help refiners recover some the volume loss due to the removal of MTBE.

California is experiencing ongoing increases in demand for gasoline. As a result of demand getting closer and closer to production capacities, there have been increasing imports into California of finished gasoline and blendstocks. The CEC estimates that by 2003, California refineries will no longer be able to meet California demand and the importing of gasoline and gasoline blending components will be a routine occurrence, even when California refineries are operating at capacity.

The California Energy Commission (CEC) has had economic studies prepared on the alternatives to MTBE, including ethanol, in California gasoline. CEC estimated that after taking into account capital and operating costs, the price of gasoline with oxygenates alternatives could increase from 2 to 6 cents per gallon.

Removing MTBE will result in a reduction in volume. However, the CaRFG3 regulations were developed to increased the flexibility so as to recover as much of the lost volume as possible without compromising any emission benefits of the program.

27. Comment: The ARB has driven up the price of gas up dramatically in our state with no commensurate improvement in air quality. You have isolated consumers in this state from the worldwide gasoline supply causing shortages and pricing inflexibility. You have given us the additive from Hell, MTBE, that fouls our drinking water supply because you were too myopic to see the big picture and too ignorant to apply thorough research and sound science. And now you want us to endorse further mischief known as CARB 3? NO WAY!!!! (KaServ Engineering)

Agency Response: CaRFG2, when introduced in 1996, was estimated to produce a 15 percent overall reduction (300 tons per day) in ozone precursor emissions from motor vehicles. These emission reductions were equivalent to removing 3.5 million vehicles from California's roads. The CaRFG2 program is also a major component of the California SIP. In 1996, the CaRFG2 program accounted for 25 percent of the ozone precursor emission reductions in the SIP.

The CaRFG3 regulations were conducted in response to Governor Davis's March 25, 1999 issuance of Executive Order D-5-99, in which he found that, on balance, there is a significant risk to the environment from using MTBE in gasoline in California. He made this finding on the basis of a University of California report (the U.C. Report) that concluded there are significant risks and costs associated with water contamination due to the use of MTBE. MTBE is highly soluble in water and will transfer faster and travel farther and more easily than other gasoline constituents such as benzene when gasoline leaks from underground storage tanks or pipelines.

The Executive Order directed the California Energy Commission (CEC) to issue a timetable for the removal of MTBE from gasoline at the earliest possible date, but not later than December 31, 2002. The CEC subsequently determined that December 31, 2002 was in fact the earliest feasible time. The Executive Order also directed the ARB to adopt CaRFG3 regulations by December 1999, that will provide additional flexibility in lowering or removing the oxygen content requirement while maintaining current emissions and air quality benefits and ensuring compliance with the State Implementation Plan (SIP).

Subsequent legislation signed by the Governor October 10, 1999 (Stats. 1999 Ch. 812; S.B. 989, Sher) also required the CEC to develop a timetable for the removal of MTBE from gasoline at the earliest practicable date. New section 43013.1 of the Health and Safety Code further required the ARB to ensure that the CaRFG3 regulations adopted pursuant to the Governor's Executive Order maintain or improve upon emissions and air quality benefits achieved by CaRFG2 as of January 1, 1999, and also provide additional flexibility to reduce or remove oxygen from motor vehicle fuel.

The CaRFG3 regulations were developed to meet the mandates discussed above, peer reviewed by U.C. scientists, and then subjected to a multimedia environmental assessment completed by the California Environmental Policy Council (CEPC). The CEPC found that there will be not be a significant adverse environmental impact on public health or the environment, including any impact on air, water, or soil, that is likely to result from the change in gasoline that is expected to be implemented to meet the CaRFG3 regulations approved by the ARB.

Also, see other responses to comments 25 and 26 on costs and supply.

28. Comment: Our company supplies marine vessels with fuel, and most of these fuels must be imported to meet demand. We are concerned any proposals that would increase the need to import products. The proposed CARB regulations would increase costs and further cut refinery capacity. California refining capacity is already stretched and the infrastructure for increasing imports is limited. Therefore, prices must increase and make California less competitive on the Pacific Rim. Please protect our economy and vote no on the CaRFG3 proposal. (Chemoil)

Agency Response: Most of the MTBE used in California gasoline is currently imported; alternatives to MTBE will have to be imported at about the same volume when MTBE is

no longer used. Increases in imports will primarily occur because of increases in demand. The proposed CaRFG3 regulations increase refiners' flexibility to produce complying gasoline in comparison to producing gasoline without MTBE under the current regulations.

Although there may be some increased cost associated with the CaRFG3 regulations -- some refiners have stated there could be no change in cost. Also, see Section IV.A of this FSOR and the response to comment 15 and corresponding comment 9.

29. Comment: California state and local government agencies will be forced to pay more for gasoline and this means that \$15 million of taxpayers dollars will be diverted from other programs. (Cal-Tax)

Agency Response: See agency response to comment 26. In comment 26, it is underscored that ARB was required by the Governor's Executive Order D-5-99 and S.B. 989 to phaseout the use of MTBE in gasoline by December 31, 2002 and to maintain the air quality benefits derived from CaRFG2 as of December 31, 1998. Further, ARB has provided extensive flexibility through the use of the ARB Predictive Model for refiners to reduce their production costs, which in turn will have a positive effect on wholesale and retail gasoline prices. Further, the CEC has determined (see other agency responses) that capital costs will be significantly lower than the ARB staff's estimated costs.

The U.C. report on MTBE provided an estimate of \$340 million to \$1.5 billion dollars for the clean-up costs of the contamination of ground water. Should MTBE not be phased-out on the current ambitious schedule, cost to the residents of California could be even higher than the estimates provided by the U.C report on MTBE. This would overwhelm the other costs identified.

c) Comments on the Effect of the CaRFG3 Regulations on Prices

30. Comment: We are concerned with increased cost of gasoline or the possibility of price spikes when the CaRFG3 regulations are implemented. Any proposals for more stringent gasoline specifications should be justified based on an objective analysis of how such changes might impact gasoline prices, and should be completed before the ARB Board makes a final decision on the proposed CaRFG3 regulations. (Watts Learning Center, Nisei Farmers' League, Western Growers' Association, California Farm Bureau, several Central Valley Farm Bureau organizations, California Cotton Ginners' and Growers' Association, the Almond Haulers' Association, California Cattlemen, and Agricultural Council of California. California Chamber of Commerce, California Manufacturers Association, and California Business Roundtable, Automobile Club of Southern California).

Agency Response: As stated in the Staff Report, with respect to gasoline prices, it is very difficult to predict what will occur in the marketplace. Based on the modifications to the staff's original proposal, MathPro, Inc. has estimated the CaRFG3 production costs to range from 2 to 6 cents per gallon, with one refiner indicating at the Board Hearing that

they would incur no additional production costs to produce CaRFG3 if a waiver from the federal oxygen requirement was granted. It should be noted that supply/demand, crude oil prices, and competitive considerations heavily influence gasoline prices. However, it is reasonable to assume that over time, refiners will recover the increased costs of production in the marketplace. With this assumption, it is reasonable to conclude that this increase in production costs will, on average, be reflected in gasoline prices.

With respect to the stability of prices and the presence of price spikes in the marketplace, that too is very difficult to predict. Refinery incidents in California have historically caused significant short-term swings in gasoline prices. Prices statewide increased in the short-term until imports arrived from other markets or the refineries were repaired. The proposed regulations are designed to provide the flexibility to import complying gasoline. In fact, as California becomes more of a routine importer of gasoline, it is expected that there will be more stability in the marketplace because refineries outside of California will, on an ongoing basis, be producing product for importation by California. Thus, the overall gasoline production system – consisting of California refineries and imports – should be no more subject to supply disruptions than under current rules, and may be better able to readily adjust to any production disruptions that occur in the future.

31. Comment: The ARB Staff Report states that the Phase 3 compliance costs will be higher for refineries that will add ethanol production facilities than for those that do not add ethanol production facilities. The basis for this statement is not clear. (WSPA)

Agency Response: As stated in the Staff Report, staff expects that refiners will replace MTBE with ethanol to either provide octane enhancement, or to meet federal oxygen requirements. MathPro, Inc has estimated the costs to replace MTBE with 5.7 volume percent ethanol (equivalent to approximately 2.0 weight percent oxygen) to be about 5.8 cents per gallon. However, to the extent that refiners are able to produce gasoline without any oxygenates and can provide octane enhancement through alternative methods, MathPro, Inc has estimated these costs to about 4.3 cents per gallon. These costs demonstrate that the expected refinery equipment modifications, as well as operational and blendstock utilization changes, will be greater to produce oxygenated gasoline containing ethanol than to produce non-oxygenated gasoline.

#### *(4) Treatment of Small Refiners*

32. Comment: I support Kern Oil's request for permanent reformulated gasoline specification flexibility, and stress Kern Oil's importance to our state and the Southern San Joaquin Valley. (Assemblyman Dean Florez) Identifying opportunities for flexibility in meeting the CaRFG3 performance specifications is especially important to Kern Oil, and I appreciate the assistance provide in this respect. (Assemblyman Roy Ashburn) It is my understanding that the ARB is making progress in dealing with some of the problems encountered by small independents. It is my hope that as we face our important environmental and regulatory challenges, we find ways for such refiners throughout the state the opportunity to compete or for new enterprises to enter the market. (Assemblyman Charles Poochigian)

Agency Response: As indicated in Section IV.D., we have adopted small refiner provisions that will apply to Kern Oil.

33. Comment: The CEC received testimony in June 1999 from a small refiner which stated that small refiners operate under "less flexible process scenarios" than large refiners, and that the "difficulties in producing complying gasoline without the use of MTBE may be insurmountable". The potential impacts on these types of businesses have not been addressed by the ARB in the Staff Report on Standard Form 399. (California Trade and Commerce Agency)

Agency Response: The Staff Report stated on page 45 that staff was evaluating a request from Kern Refining for special consideration for small refiners. Kern had indicated that they could not economically meet the proposed CaRFG3 standards. As discussed in Section IV.D., the staff ultimately recommended modifications providing special treatment for small refiners to maintain their economic viability, and small refiner provisions have been added. Small refiners were not treated separately as small businesses on the STD. 399 form because refiners are excluded from the definition of "small business" (Gov. Code § 11342(h)(2)(H)).

34. Comment: The following conditions should be considered in providing a small refiner exemption. Net emissions should not increase, MTBE must be removed from small refiner gasoline at the same time as required of other refiners, small refiners should not gain a cost advantage, and small refiners should be held to the same cap limits as other refiners. (Equilon, Inc, WSPA).

To assure that the small refiners do not gain a cost advantage, provide for an independent review to evaluate the costs being borne by the small refiners. The exemption should only be granted if justified if the actual costs are indeed higher than those of competitors. (WSPA)

Agency Response: The adopted provisions for small refiners in the CaRFG3 regulations incorporate all of the suggestions in the comment. The small refiner provisions do not exempt small refiners from the requirement to remove MTBE by December 31, 2002. Any emissions increases resulting from gasoline produced under the small refiner provisions will have to be fully offset by cleaner diesel fuel produced by the refiner (section 2272(c)(5).) In addition, all small refiner gasoline will be subject to the basic CaRFG3 cap limits that will apply to all refiners.

Based on an independent analysis, small refiners will not gain a cost advantage over other California refiners. The small refiner provisions apply only to refiners that produced fully complying CaRFG2 in 1998 and 1999. As a result, the small refiner provisions will only apply to Kern Oil. The CEC's Fuels Resources Office (FRO) reviewed the technical analysis performed by an independent refinery expert (Robert Brown Associates) who assessed Kern Oil's submittal of data and analysis to support special treatment of small refiners. FRO staff concluded that the capital requirements for Kern Oil would be so

great to fully comply with the CaRFG3 regulations as to increase the average production costs by an amount far greater than the 3.4 to 6.4 cents per gallon range estimated by MathPro, Inc. for other refiners.

In addition, it is clear from the CEC study that the modifications made to produce the federal Phase 2 RFG gasoline and small refiner CaRFG3 gasoline – as well as the costs to produce cleaner diesel fuel to offset gasoline emissions – will ensure that Kern Oil does not receive a cost advantage over other refiners in California.

35. Comment: We oppose a small refiner exemption from all or part of the CaRFG3 standards because emissions will increase and enforcement of the CaRFG3 standards would be compromised. (Equilon, Inc.)

Agency Response: The small refiner provisions adopted by the Board will not result in a net emissions increase because any emissions increases resulting from gasoline produced under the small refiner provisions will have to be fully offset by cleaner diesel fuel. (§ 2272(c)(5).) Since all small refiner gasoline will be subject to the same cap limits that apply to all other CaRFG3, we do not believe the small refiner provisions will compromise enforcement of the CaRFG3 standards.

36. Comment: A small refiner exemption should not serve as an incentive for the operation of exempted refineries in California. Limit the production of gasoline under the exemption to historical volumes on a quarterly basis. Excess gasoline production would be subject to the rules faced by other refiners. Further, assure that any exemption apply only to refiners operating in 1999. (WSPA)

Agency Response: The small refiner provisions limit application of the small refiner standards to a “qualifying volume” which is based on historical criteria and is capped for Kern Oil at the equivalent of 8000 bpd (sections 2260(a)(29), 2272(c)(3)). Any excess California gasoline produced by the small refiner is subject to the regular CaRFG3 standards. In addition, the small refiner provisions apply only to refiners that produced fully complying CaRFG2 in 1998 and 1999.

37. Comment: If CARB proposes a small refiner exemption, it should be similar to the small refiner exemption in the Phase 2 RFG rule. That exemption resulted in eventual compliance by the exempted refiners, rather than ongoing application of less stringent requirements resulting in higher emissions. In addition, all applicable provisions of Section 2272 (Gasoline Produced by Small Refiners) should be required. (WSPA)

Agency Response: The small refiner exemption does not allow net emissions from small refiners to be higher than for large refiners; hence, the small refiner provisions for CaRFG3 is considered to be more stringent than the exemption provided for CaRFG2. Because air quality benefits will be preserved, it is not necessary to sunset the exemption. In any event, the CaRFG3 small refiner provisions have been added as amendments to the CaRFG2 small refiner provisions, and they share some of the same elements.

Only one California small refiner upgraded its refinery to be able to produce CaRFG2 in 1998 and 1999. The additional capital expenditures and other costs to comply with the proposed CaRFG3 standards would be substantially greater for Kern Oil on a per-gallon basis than the costs for large California refiners. Kern Oil has demonstrated that it would not be economically feasible for Kern Oil to produce gasoline meeting the CaRFG3 standards. Without an exemption, Kern Oil would also be unfairly prevented from recouping its investment to make CaRFG2. Given these disparate costs, and preexisting investments made to comply with the CaRFG2 standards, it is appropriate to include special treatment for small refiners that have been producing CaRFG2.

38. Comment: We note that the ARB is proposing to require compliance plans be submitted by gasoline producers to allow the State to monitor progress toward compliance. We believe that if ARB grants an exemption for small refiners, the exemption should be contingent on the small refiner meeting a previously outlined compliance plan. Failure to meet increments of progress should result in loss of the exemption. (WSPA)

Agency Response: A small refiner that qualifies for the small refiner provisions will be subject to the same compliance plan requirements in section 2269 that apply to all other refiners. If the small refiner is not able to comply with the small refiner CaRFG3 standards by December 31, 2002 because it has not implemented its compliance plan, it will not be permitted to produce California gasoline until it is able to comply with the small refiner standards. The small refiner compliance plan provisions in the CaRFG2 regulations were much more important because meeting the increments of progress toward final compliance was a prerequisite to the temporary exemption from some of the standards. The CaRFG3 standards do not require final compliance with the large refiner standards because compliance with the small refiner standards requires emissions offsets and therefore does not increase emissions.

39. Comment: CENCO requests relief from the December 31, 2002 compliance deadline for CaRFG3 regulations because it will be at an economic disadvantage compared to other refiners. We would like to be subject to a similar small refiner rule as for Kern. Whereas the CENCO refinery was not in operation in 1998 or 1999, it exists and it is fully permitted with AQMD operating permits to operate, so we are an existing piece of machinery down there, and we think it is unfair, particularly given the supply problems that California faces, to exclude us on the basis that it was not running. (CENCO)

Agency Response: We believe it is appropriate to limit the current small refiner provision to those refiners who have already made the substantial investment to comply with the CaRFG2 standards and have been producing CaRFG2. The current owners of the CENCO refinery acquired it with the knowledge that it had not produced CaRFG2 and would need substantial modifications to do so. However, the ARB staff will work with CENCO to determine whether some sort of small refiner treatment is justified.

*(5) Concerns Associated With the Use of Ethanol in California Gasoline*

a) *Evaporative Emissions Impacts From Commingling Gasoline With and Without Ethanol*

40. Comment: Commingling a gasoline containing ethanol and a gasoline without ethanol will increase RVP and could result in increased emissions. (Alliance of Automobile Manufacturers, American Lung Association, Coalition for Clean Air, Dennis Lamb-Independent Consultant, National Resources Defense Council, Oxygenated Fuel Association, Planning and Conservation Union of Concerned Scientists, Sierra Club, Sierra Research, Union of Concerned Scientists, WSPA)

Even a commingling effect of .02 psi could result in significant increases in evaporative emissions in an area especially in light of the near doubling of the contribution of mobile source evaporative emissions recognized in the new EMFAC2000. (American Lung Association)

The commingling issue has been discussed. I just want to highlight that the staff proposal itself suggests that a wide variation of possible impacts for commingling, it is very uncertain. It could be as little as one-tenth of a pound per square inch RVP, or it could be as large as 0.4 psi. I think that it is important to keep in mind that the ARB really cannot control commingling, and so that is why we are urging trying to protect against it. (National Resources Defense Council)

Additional efforts also are needed to further manage the evaporative emission from commingling as a lot of people were talking about today. So, here we strongly recommend your Board to reexamine these important issues by requiring your staff to report back to you on the progress of Phase 3 gasoline implementation no later than the end of 2001. (South Coast Air Quality Management District)

Agency Response: The Board recognizes that estimating the effect of mixing ethanol and non-ethanol gasoline is a very complex task due to the dependency on many variables, such as brand loyalty, ethanol gasoline market share and distribution, the outcome of ARB's request for an oxygenate waiver from the EPA, consumer refilling patterns, etc. The current ARB estimate of the commingling effect indicates that the average gasoline pool RVP could increase by about 0.1 psi., and the potential increase in evaporative emissions was taken into account when developing the CaRFG3 standards. However, because of the unknown variables, the Board directed the ARB staff to fully evaluate the commingling issue and to report back to the Board by December 2001. At that time, the ARB staff will propose amendments to the CaRFG3 regulatory requirements if appropriate.

41. Comment: We looked at two cases for commingling in the South Coast. Our analysis is only about the act of a motorist with non-ethanol fuel pulling up to the gas station and putting in an ethanol-containing fuel, nothing upstream of that. Case one has ethanol with MTBE, 6.7 psi RVP initially on both fuels, and that is a scenario that could occur as



early as next summer. Case two is 6.9 psi RVP ethanol containing fuels with the 6.5 psi RVP non- oxygenated fuel as outlined in the staff report, and that is a future situation that we have evaluated in 2005. The impact of commingling varies depending on brand, loyalty, how full the tank is when people refill it.

For the South Coast and the year 2000, you can get somewhere as high as almost a 12 percent increase in evaporative emissions. For the second case, in 2005, the RVP effects are even greater, as much as four-tenths of a psi, with emissions increases potentially as high as 20 percent.

Converting from percentage increase to tons per day, these numbers for the year 2000, computed in with the model, what you see is again, depending on ethanol market share, that our average results would suggest as much as a 6 ton per day increase with a maximum case over 12. The lower part of the bar in our chart shows the minimum impacts so that there would be an impact in all cases except at 90 percent market share, something like 2 tons per day if ethanol containing gasolines are not 100 percent in the market place, or if they are not completely eliminated from the market place. In the second case for 2005, and because of the RVP effects were greater, the tons per day is higher. (Sierra Research)

Agency Response: See the response to comment 40. The commenter indicates that emission increases could occur this summer as a result of mixing ethanol gasoline with non-ethanol gasoline. The commenter then provides an unrealistic one-time worst case scenario to show that potential emission impacts could be significant. We do not agree with the commenter's projections of future commingling.

We believe that determination of any evaporative emission increase by this summer cannot be fully quantified as suggested by the commenter because insufficient data exists to determine to what extent ethanol would be used in commercial gasoline. However, a recent timetable study by the CEC suggested that ethanol use will not increase substantially until the proper ethanol distribution infrastructure can be developed. The CEC indicated in the report that this will take about two years. Based on the CEC's projections, we do not anticipate much commercial use of ethanol in the near term and consequently we expect only minimum commingling impacts during the summer of 2000 or 2001. Nevertheless, the Board does plan to monitor the situation to determine if any action is required.

The analysis prepared by Sierra Research for 2000 and 2005 presents a worst case commingling effects scenario. Some studies of the commingling effect on emissions have suggested that the overall RVP increase in the gasoline pool due to the commingling effect of ethanol in the marketplace is dependent on a great many variables, including the percent of ethanol in the marketplace, the outcome of ARB's oxygenate waiver request, brand loyalty, refueling tank level, etc. Sierra Research based its estimate on a single first-time commingling case and assumes that all other commingling events have the same RVP effect on the gasoline pool. Sierra Research's estimate is based on the assumption that all the variables in their analysis would simultaneously reach their

respective worst case values. This is not the case since the overall increase in the gasoline pool RVP will actually be the combined effect of all individual commingling events where the individual variables would span their range of probable values.

The EPA commingling model considered the independent individual effect of many variables, while the ARB evaluation of commingling impacts was based on discrete assumptions to depict a reasonable "average" commingling scenario. The result of these analyses indicate that the impact of commingling on the gasoline pool should be lower than that calculated by Sierra Research. The issue of commingling is complicated and will be fully evaluated once more data is available to determine the extent to which ethanol will be available to motorists.

42. Comment: The ARB's report suggests that total pollutants may increase by 20.5 tons per day. A switch to ethanol from MTBE can potentially increase VOC by as much as 50 tons per day and also increase toxics by 4 percent through commingling of gasoline purchases assuming the oxygenate standards are retained. (Oxygenated Fuel Association)

Agency Response: The ARB Staff Report does not state that emissions are expected to increase with implementation of the CaRFG3 regulation. As required by S.B. 989, the CaRFG3 regulations were set to preserve the air quality benefits of the CaRFG2 program while phasing out the use of MTBE as quickly as possible and providing additional flexibility to reduce or remove oxygen from CaRFG3. See the responses to the preceding two comments.

43. Comment: The ARB can prevent commingling and the resulting RVP increase by requiring a minimum oxygen content of 1.0 wt.% oxygen, which is similar to the federal RFG per gallon minimum requirement of 1.5 wt.% weight percent per gallon. (Oxygenated Fuels Association, American Lung Association)

Agency Response: See response to comment 40. The CaRFG2 and CaRFG3 regulations do not specify a minimum oxygen content. Adding such a specification would make the regulations more stringent with no corresponding air quality benefit.

44. Comment: There should be a clearly demonstrated and compelling reason to add stringency in the CaRFG3 regulations to account for commingling, without further study. (WSPA)

Agency Response: See the response to comment 40, 41, 42, and 45. We recognize there are several uncertainties regarding the commingling effects in the future. At the same time, we do not consider it appropriate to ignore the commingling effect. ARB staff has spoken to individual refiners about their future plans, and ethanol will be used in some gasoline because of its favorable octane, regardless of the federal minimum oxygen specification. The ARB estimate is reasonable and will provide more regulatory certainty to refiners in that the specifications will not need to change much, if at all, once future commingling effects are better quantified.

45. Comment: The limited work that has been done on the commingling effect has been based largely on scenarios where the ethanol content of the gasoline ethanol blends is 10 volume percent. However in California, most if not all, blends would be at 5.7 vol.%. Also, assumptions used for refueling patterns can dramatically impact the outcome of any commingling model or calculation. But, perhaps one of the most important factors to consider when determining the degree of any commingling that occurs is customer loyalty. (Downstream Alternatives)

Agency Response: We recognize that these variables are relevant. The projected 0.1 psi increase in RVP from commingling represents staff's best current estimate based on consideration of all relevant factors. Prior to its December 2001 report to the Board on commingling, staff will evaluate these issues in greater depth.

b) Concerns With the Increases in Permeation Emissions from Gasoline Containing Ethanol

46. Comment: Real-time permeation emissions increase with ethanol, because ethanol is a small molecule. It migrates quickly and passes through permeable materials. The Board would be at fault if they made a decision to go to an ethanol-containing fuel without first having attempted to quantify the effects of putting in ethanol on the evaporative emissions. A workshop on this in the near future would be appropriate. There are data that exist, it's just one of those things we haven't talked about. (Harold Haskew, automotive consultant)

Agency Response: In light of data on ethanol submitted by Dupont representatives and testimony at the hearing, Resolution 99-39 directs the Executive Officer to update the Board on potential increases in hydrocarbon emissions from materials permeability associated with the use of ethanol in gasoline. ARB staff is working with industry and contractors to perform literature reviews and to provide best available data on permeation emissions associated with the use of ethanol in gasoline compared to non-oxygenated fuels. Permeation issues have been discussed at staff workshops conducted since the December 1999 hearing. The Board also directed staff to report to the Board on the results of permeability testing by December, 2001. If necessary, the ARB staff will recommend amendments to the CaRFG3 regulations to address any potential emissions shortfalls.

47. Comment: We heard about the permeation issue less than 24 hours before the hearing. The Board should ask the staff to conduct a workshop so the evidence and calculations can be discussed openly. (Parallel Products, Gary Whitten).

The technical studies provide very little information regarding potential permeation emission increases from gasoline containing ethanol. In particular, there is nothing on 5.7 vol.% ethanol blends. Permeation rates can vary dramatically between elastomer types. Quantification of permeation emissions impacts is sufficiently complex to warrant some type of a workshop or hearing or at least a formal comment period so that these data gaps can be identified and test programs that address such gaps could be developed.

At a minimum, any decision should be based on all of the information that is available, not just a few papers. (Downstream Alternatives)

Agency Response: See the response to comment 46. In the Resolution, the Board directed staff to provide an update on October, 2000 on the potential increases in hydrocarbon emissions from materials permeability associated with the use of ethanol in gasoline, and to report to the Board on the results of permeability testing by December 2001. The Board also directed the staff to provide semiannual updates on the progress and implementation of this work. During the 15-day comment period, the public was provided with an opportunity to comment on the materials on permeation emissions transmitted by the Dupont representative.

c) Emissions and Other Environmental Impacts From Increased Transport of Ethanol by Diesel Trucks

48. Comment: We are concerned that the effort to come up with a new formula for California's gasoline may mean that our communities will be suffering the impact of more, not less, toxic emissions in the years to come. We understand that the ARB is currently considering ethanol as the new fuel oxygenate to help California's fuel burn cleaner. But CEC studies suggest that transporting ethanol to the terminal site for blending into gasoline would require more diesel trucks to drive through some of the already most polluted areas of our state. How many more trucks will be traveling through our community? How many more tons of pollution will these trucks produce? What will be the impact on our overall air quality? Have you studied exhaustively the safety risks? Putting more diesel trucks on the road, combined with the less effective ability of ethanol to clean the air, seems to be a formula for hurting the air quality gains California has tried so hard to make in recent years. (Jovenes, Inc., El Centro Del Pueblo, Watts/Century Latino Organization, Project Info, Soledad Enrichment Action, Inc., Multicultural Area Health Education Center (MAHEC), Los Angeles Conservation Corps, Central American Resource Center (CARECEN), Asian Youth Center, Clinica Msr. Oscar A. Romero, Clinica Para Las Americas, Health Education Council, Plaza Community Center, Mexican-American Growers Association, and 28 community activists and citizens.)

The use of ethanol results in increased hazard exposure from splash blending and increased gasoline tanker truck traffic on the highways. (Thomas A. Ring, Consulting Chemical Engineer)

Agency Response: We recognize that increased use of ethanol in California gasoline will result in increased transportation (i.e., trucks, railroads, ships, etc.) to transport ethanol to be splash-blended at gasoline refineries, terminals and distributions centers. This issue is discussed on page 70 of the Staff Report.

The number of trucks delivering ethanol to the pipeline terminals would be equal to five to ten percent of the trucks loading gasoline at the terminals. If ethanol is blended at about 5.7 vol % (2.0 wt. % oxygen), then for every hundred tanker trucks delivering fuel

from a terminal there must be about 6 tankers bringing ethanol to the terminal. The CEC has estimated that if all gasoline were ethanol-blended, the increased truck activity would add 21,000 miles of driving in the state per day. That would be an increase of about 0.06 percent of heavy-duty truck vehicle miles traveled in 2003, per MVE17G. The associated increases in emission of particulate matter, CO, and NOx would be less than 0.25 ton per day in the state. The increased traffic and the associated increase in emissions would be subject to conditions in permit amendments needed for authority to modify the equipment and operations at the distribution terminals.

In Resolution 99-39, the Board directed the Executive Officer to work with local air quality management districts and local communities to address potential impacts from increased use of cargo tank trucks to transport ethanol to gasoline refineries, terminals and bulk plants. Refiners and gasoline distribution facilities, as part of modifying their facilities to comply with the CaRFG3 regulations, will have to estimate the local environmental impacts, including the emissions impacts due to the transportation and splash-blending of ethanol in gasoline. If there are significant local emissions impacts due to ethanol transportation, storage, and blending, then under the permit and CEQA processes the project applicants must apply all feasible mitigation measures.

It is important to recognize that the objective of this rulemaking is to reduce the environmental risks to communities from ground and surface water contamination from MTBE after it has leaked from underground storage tanks or gasoline distribution equipment.

49. Comment: We are extremely concerned that a majority of the projected extra tanker truck trips will occur in areas already suffering from excessively dense traffic, such as Los Angeles and the San Francisco Bay Area, and the motorists who travel in these areas do not need the greatly increased danger of sharing the roads with 70,000 additional rolling time bombs each year. We suggest that more time be taken to study this critical public safety issue. (Citizens for Reliable and Safe Highways)

Agency Response: As indicated in the response to the previous comment, CEC estimated there would be about an 0.06 percent increase of heavy-duty truck vehicle miles traveled (VMT) in 2003, per MVE17G. ARB staff expects that ethanol will also be shipped by rail and marine vessel. However, the increase in heavy-duty truck VMT and trips will be less than 1/10 of 1 percent statewide. This modest increase will result in small increases in risks from an accident, even in localized areas.

d) Other Environmental Impacts From the Use of Ethanol

50. Comment: I urge you not to go ahead with the new formulation of gas. I'm not in favor of ethanol. It has its own problems. (Jodi Waters, Robert Bruce Bullard)

California should ensure that production and use of ethanol be done in an environmentally sustainable manner. The staff proposal must not weaken RVP or other specifications, fully evaluate toxic emissions of ethanol, and thoroughly evaluate water

quality impacts from use of ethanol. We support the use of ethanol in gasoline if these conditions can be met. (Union of Concerned Scientists, Natural Resources Defense Council, Planning and Conservation League, Coalition for Clean Air).

Agency Response: As discussed in Section III, ARB and SWRCB have conducted the ethanol fate and transport analyses directed by the Governor's Executive Order D-5-99, and OEHHA has conducted the analysis of health risks of ethanol in gasoline. These analyses were peer reviewed and ultimately approved by the Environmental Policy Council, which made the finding set forth in Section III.B.4. On the issue of RVP impacts from commingling, see the responses to comment 40.

51. Comment: It is this writer's opinion that California should not be considering the use of ethanol (or any other oxygenate) as a gasoline component for a variety of reasons. Oxygenated gasoline yields essentially no benefit to emissions reductions from today's or the future, vehicle fleet. The ultimate fate of large quantities of ethanol in the California environment is untested and unknown. (Thomas A. Ring, Consulting Chemical Engineer)

Agency Response: The CaRFG regulations establish specifications and emission levels that gasoline formulations must meet in order to be sold in California. California leaves the choice of oxygenates used in the production of gasoline to its California refiners. Currently, only ethanol has been reviewed and approved for use in the production of gasoline in this state by the California Environmental Policy Council. However, refiners may have the option to use other oxygenates (e.g., ETBE, TAME, DIPE) if the CEPC approves of its use in California gasoline, or no oxygenate if U.S. EPA grants California a waiver from the oxygenate requirement for Federal RFG. Most importantly, refiners could choose, based on economics, which oxygenate to use (or no oxygenates) and at what levels in California gasoline. Refiners will determine in the free-market whether it is less expensive to use additional hydrocarbons or ethanol in the production of California gasoline.

52. Comment: The Cal/EPA report indicates that current models do not enable us to closely match the predicted and observed levels of acetaldehyde and PAN from ethanol use. We recommend that very careful monitoring of these atmospheric products should be initiated before increasing the use of ethanol in gasoline. We must insure that the CaRFG3 regulation does not inadvertently create additional air pollution and public health problems from emissions of these pollutants. (Sierra Club, Coalition for Clean Air, and Union of Concerned Scientists, American Lung Association, and NRDC)

Agency Response: In ARB Resolution 99-39, the Board directed the Executive Officer, upon implementation of the CaRFG3 regulations in 2003, to evaluate whether the regulations actually maintain or improve upon air quality benefits achieved by CaRFG2 – including emissions reductions for potency-weighted air toxics – and to report to the Board by 2004 on the results of the evaluation along with any appropriate recommendations. Staff will work with the ARB and local air districts monitoring network to ensure that both acetaldehyde and PAN are carefully monitored and that acetaldehyde and PAN levels do not increase statewide with the increased use of ethanol

in California gasoline. Should any air toxics increases occur, staff will report back to the Board with appropriate recommendations to mitigate those air toxics increases. Also see the discussion in Section III.

e) The Cost of Ethanol

53. Comment: Ethanol cannot be produced at a price competitive with that of hydrocarbon-based gasoline. Its use in fuel is made possible only by a 60 cents per gallon government (taxpayer) subsidy to ethanol manufacturers. (Thomas A. Ring, Consulting Chemical Engineer)

Agency Response: Refiners that use ethanol at certain volume levels in the production of gasoline do receive a federal subsidy. California has no authority to determine whether a federal tax subsidy is appropriate for ethanol. However, the decision on whether it is economically advantageous to use ethanol or other gasoline alternatives rests with each individual refiner.

(6) Other Technical Issues

a) Carbon Monoxide Credit and Debit Issues with the Predictive Model

54. Comment: The staff has done a very good job proposing that we credit CO from two percent oxygen and above, but from two percent and below there is an absolute and definitive loss of carbon monoxide benefits. And based on staff's own numbers on calculating the credit it's 577 tons per day of CO benefits that will be lost with the use of non-oxygenated fuels. It had been in the Staff Report that a CO debit would be part of the proposal and it is not. How is the Board proposing to handle that? (Parallel Products)

Agency Response: Under a CO debit approach, gasoline containing zero rather than 2.0 wt.% oxygen would be charged with a hydrocarbon increase corresponding to the ozone-forming potential of the increased CO emissions. The statement on page 26 of the Staff Report that the Predictive Model included a CO debit along with the CO credit for oxygen contents exceeding 2.0 wt.% oxygen was due to an editing error.

The CO debit that would result from the reduction in oxygen is discussed in Appendix G of the Staff Report (pp. G-4 – G-7). The potential debit would be far less than the 577 tpd cited by the commenter. Appendix G indicates that reducing gasoline oxygen content from 2.0 wt.% to 0 wt.% results in an increase in CO emissions of about of 4.6 percent (228 tpd) due solely to the oxygen effect. However, the CaRFG3 Predictive Model would show an increase in HC emissions resulting from removing the oxygen, and to pass the Predictive Model criteria, the refiner would have to reduce HC emissions by changing other properties. The refiner would most likely reduce the sulfur content and T50 to achieve the necessary HC reductions. Reducing sulfur and T50 will also reduce CO emissions, partially offsetting the CO emissions increase from removing the oxygen. After accounting for the sulfur and T50 effects, we believe that the increases in CO

emissions associated with reducing the oxygen content of gasoline from 2.0 wt.% to zero wt.% would be about 142 tpd.

Moreover, a gasoline with zero oxygen will have lower rates of permeation emissions than fuels with ethanol or MTBE. The lower permeation emissions from gasoline with no oxygen appear to more than offset the increase in ozone-forming potential from the higher CO emissions. Thus it is not necessary to include a CO debit mechanism in the final regulations. As indicated in the response to comment 46, the staff is conducting further investigations of the extent of permeation emissions.

55. Comment: CO emissions are dominated by the high emitters and CO emissions from the high emitters – and from off-road and off-cycle emitters – may respond only to oxygen. Therefore the CO debit is going to be every bit as much as the CO credit, and the mechanisms should be the same. (Gary Whitten)

Agency Response: First, the Auto/Oil study on high emitters concluded that if the fluctuations in the air/fuel ratio are eliminated during the testing of high emitters, all of the fuel effects are representative of what is expected from normal emitters. Second, there has never been a comprehensive study of the effects of fuel properties on off-road vehicles, and there simply is not enough data to develop a predictive model for off-road vehicles. The limited data that exists for off-road vehicles varies widely and no significant fuel property effects can be extracted from that data. Third, the effects from off-cycle emissions were included in the CO credit when increasing oxygen from 2.0 to 3.5 wt. percent, but there was no significant difference between 0 and 2 wt percent oxygen; thus, it was not included at lower levels of oxygen. Also, the lower permeation emissions from non-oxygenated gasoline is expected to offset any CO increase associated with removing the oxygen.

56. Comment: The Caldecott Tunnel data of 1994 shows where there was a 20 percent reduction in CO emissions when oxygen went from zero to 2 wt.% with no RFG changes other than oxygen. So it's not unreasonable to believe that the carbon monoxide debit is going to be every bit as much as the carbon monoxide credit, if not more so. (Gary Whitten)

Agency Response: We do not disagree that the addition of oxygen to gasoline results in some CO decrease; however, not all of the 20 percent reduction in CO emissions between the summer of 1994 and the winter of 1994 in the Caldecott Tunnel study can be attributed to the change in oxygen content. The Caldecott Tunnel study also shows that from year-to-year CO emissions have decreased because of fleet turnover rates and the oxygen content of the fuel. Further, the Caldecott study showed a 15 percent reduction in CO emissions between the summer of 1995 and the summer of 1994 when oxygenates were not being used. These results are consistent with the 10 percent CO reduction projected for the on-road fleet in the early 1990's when oxygen was required in wintertime gasoline.



57. Comment: The U.S. EPA has quantified emissions from off-road vehicles and have made recommendations and the oxygen effect on off-road vehicles is actually higher than the credit that ARB is giving for on-road vehicles. And the ARB does have an off-road total emissions inventory for off-road sources. (Gary Whitten)

Agency Response: While there may be a CO reduction in off-road vehicles, there is an increase in emissions of NO<sub>x</sub>. The NO<sub>x</sub> emissions contribute to both ozone and particulate matter. We agree that it would be ideal to quantify the effects of oxygen on CO and NO<sub>x</sub> emissions from off-road vehicles, but that cannot be done in sufficient time to implement the CaRFG3 regulations. The ARB is conducting studies to obtain more information on off-road vehicles and is seeking participation from industry for resources and methods to obtain more data. Also, see the response to comment 55.

58. Comment: The CO credit, as it is even now, could be higher as was mentioned in some of the peer reviews this morning, in that the airshed modeling indicates that the chemistry of CO is perhaps more important to urban atmospheres than the MIR factor, which is used in the credit, so that the credit would be proportional to that MIR adjustment. (Gary Whitten)

Agency Response: The MIR factors are the best available factors at this time and have been developed to represent the ozone forming potential for a wide range of cities and conditions. Results of airshed models would have to go through the same process. The peer reviewers concur that in this case we have to use the MIR factors, but should continue to improve the methodologies for estimating ozone forming potential.

b) Other Predictive Model Issues

59. Comment: It is inappropriate to compare the Phase 2 model predictions to the Phase 3 model predictions. (WSPA)

Agency Response: The model comparisons were performed so that the staff would be able to understand the differences in the model predictions and to demonstrate that the models, directionally, predict the same change in emissions. Furthermore, the model comparison demonstrates that the S.B. 989 requirement of preservation of emissions benefits is met regardless of which model is used.

60. Comment: The predicted percent change in total potency-weighted toxics emissions shown in Table V-2 of the October 19, 1999 Staff Report does not match with the Predictive Model predictions. (WSPA)

Agency Response: WSPA is correct. There is an error in the Staff Report, which has been corrected in subsequent staff analyses.

61. Comment: The ARB Predictive Model predictions for toxics emissions are more sensitive to a change in oxygenate (for a given oxygen level) than the EPA model's toxics

predictions. The ARB should use the modeling approach used by EPA to more accurately model toxics emissions. (OFA)

Agency Response: The toxics model predictions from the ARB model are more sensitive to a change in oxygenate because the ARB model makes a potency-weighted toxics emissions prediction while the EPA model makes a total toxics prediction. A change in oxygenate (for a given oxygen level) affects only the predicted formaldehyde and acetaldehyde emissions, and not the benzene and 1,3-butadiene emissions. Because the aldehydes have a very low potency relative to benzene and 1,3-butadiene, a change in aldehydes has little effect on the change in potency-weighted toxics emissions. We believe that the potency-weighted approach is the appropriate approach for modeling toxics emissions because it better reflects the relative potential harm from exposures.

62. Comment: We believe the Predictive Model database does not properly reflect how the California fleet may respond to changes in fuel composition. Therefore, we recommend that the Board not approve the model as proposed. Instead, we suggest that ARB staff re-estimate the Predictive Model so that it is internally consistent to the greatest extent possible with the EMFAC 2000 inventory model, motor vehicle manufacturer sales data for California, and emissions distribution data derived from California's surveillance and remote sensing programs. (National Corn Growers' Association, Mike Graboski, Environ Corporation).

Agency Response: We developed the Predictive Model as a consensus item in 1994 after a three-year cooperative process with the full involvement of the fuels industry, auto industry, and other interested parties. We originally tried to segregate the test data by model year, emission class, and manufacturer as suggested in the comment. However, we found that the data – which took ten years and well over \$40 million to collect – simply does not have enough vehicles or the appropriate vehicle distribution to do a detailed subdivision. Ultimately, vehicles were grouped based on differences in emissions control technology and this resulted in a robust model. It is simply not feasible to segregate the model as suggested in the comment in the next several years.

63. Comment: We believe the ARB should quantify the effects of high emitters in the Predictive Model. (Mike Grabowski)

Agency Response: The ARB Predictive Model includes the effects of high-emitting vehicles and has significantly more high-emitting vehicles than the U.S. EPA complex model. There is insufficient data from high emitters to develop an independent model. To properly model the effects of high emitters separately requires significantly more data than for normal emitting vehicles because of the extremely high variability associated with high emitters. Also, the Auto/Oil Air Quality Improvement Research Program study on high emitters shows that the effects of fuel property changes on high emitters is consistent with normal emitters, once the high test variability is accounted for.

c) Methodology for Estimating Emissions Impacts

64. Comment: In modeling the properties of gasoline that will be used to comply with the CaRFG3 standards, the ARB staff did not account for the fact that, in complying with the CaRFG2 regulations, the alternative regulatory limits selected by the refiners using the Phase 2 Predictive Model resulted in emissions reductions relative to the basic CaRFG2 limits. As a result, the staff underestimated the emissions reductions that will result from the CaRFG3 standards. (WSPA)

Agency Response: The assumptions used by the staff to estimate the properties of fuels that will be produced to comply with the CaRFG3 standards are conservative - the staff accounted for historical margins the refiners used to ensure compliance with an alternative set of specifications. The staff made its projections for the average in-use fuel that will be produced to the CaRFG3 standards on the basis of the CEC's data for the average fuel that was in use in 1998 and the CEC's estimates of the refiners' production compliance margins. The ARB staff is not able to project the degree, if any, to which a refiner will, based on the economics of their own refinery operations, choose through the use of the CaRFG3 Predictive Model to over-comply with the CaRFG3 standards. The emission reductions estimated by the staff are consistent with those that would result from a fuel produced to the basic flat limit standards. We acknowledge that it may be in the economic interest of some refiners to over comply with some part of the standards, but this is insufficient reason to relax the specifications.

65. Comment: In estimating the RVP of future gasolines the ARB should have assumed that RVPs of gasoline containing 2.7 wt. % and 3.5 wt. % oxygen were the same (7.0 psi) as the RVPs of gasoline with zero wt. % and 2 wt. % oxygen. (WSPA)

Agency Response: We believe that it is appropriate to make an assumption regarding the possibility of different RVPs for future fuels. Because of the CO credit for oxygen contents greater than 2 wt. % and the blend effects of ethanol, it is reasonable to assume that the RVP of gasoline containing 2.7 wt. % and 3.5 wt. % oxygen could be higher than gasoline containing zero wt. % to 2 wt. % oxygen. However, the CaRFG3 regulations only allow the RVP of a gasoline to be varied when the predictive model is used. The RVP limits and the evaporative element of the CaRFG3 Predictive Model allow a refiner using ethanol to produce a complying gasoline with an RVP of up to 7.2 psi provided that the increase in evaporative emissions is offset by reductions in exhaust emissions. The CaRFG3 regulations will also allow refiners to produce a low RVP gasoline and use the reduction in evaporative emissions to provide more flexibility in setting other fuel parameters.

66. Comment: Staff estimates the future in-use sulfur level will be 10 ppm. In Chapter V, staff estimates the *in-use* level will be 15 ppm (table V-3). We question this discrepancy. (WSPA)

Agency Response: In Chapter V of the Staff Report, staff estimated sulfur levels at 15 ppm for a representative CaRFG3 fuel that would simply comply with the 20 ppm flat limits and reflect a compliance margin of 5 ppm. The staff's estimate that CaRFG3 in-use fuel sulfur levels may be 10 ppm is based on experience with CaRFG2 sulfur levels,

where refiners have reduced sulfur significantly to obtain the benefits the Predictive Model provides for low sulfur. Staff believes that there is a high probability that refiners will continue to rely on lower sulfur levels under the Predictive Model to offset other gasoline specifications that may be above their respective flat limits, particularly because the NOx and hydrocarbon curves as sulfur is decreased are steeper under the CaRFG3 Predictive Model than under the CaRFG2 model.

*(7) Comments Urging Other Specific Changes to the Regulations*

a) Driveability Index (DI)

67. Comment: A DI specification is not appropriate. DI is a performance specification, not an emission specification. (Equiva, WSPA)

The oxygen offset (20 \* weight percent oxygen) proposed by the ARB for calculating DI would unfairly penalize ethanol blends because it is not supported by available data and is much too large for California ambient temperatures and fuels. (WSPA)

Agency Response: For the reasons described in Section IV.B., the Board eliminated the proposed DI standard.

The Board also directed the Executive Officer to transmit to the U.S. EPA Administrator the Board's recommendation that U.S. EPA adopt a nationwide gasoline DI standard to assure the adequate emissions performance of existing and advanced vehicle technology motor vehicles.

68. Comment: The gasoline formula taken as a whole including the lower RVP limits could lead to the DI exceeding 1200 much more frequently, even with the T50 and T90 caps being maintained at prior levels. (Alliance of Automobile Manufacturers)

Agency Response: To address concerns about potential changes in the DI, the Resolution directs the Executive Officer to evaluate the DI of in-use CaRFG3, and to report back to the Board by 2004 with the results of the evaluation and any appropriate recommendations. If all other properties were to be held constant, increasing T50 and T90 would increase the emissions of both NOx and hydrocarbons; however, the CaRFG3 Predictive Model makes it very difficult to significantly increase T50 and T90 without severely modifying the other parameters. Further, with the CaRFG3 cap specifications for T50 and T90 not increased, it is virtually impossible to practically produce a complying fuel with a DI exceeding 1200.

b) Early Use of the CaRFG3 Predictive Model

69. Comment: ARB should consider provisions for early use of the CaRFG3 Predictive Model and a set of transition gasoline standards for the early phase-out of MTBE. (Tosco, Renewable Fuels Association)

Agency Response: As discussed in Section IV.C., the Board has modified the original proposal to allow refiners and importers to opt to meet the CaRFG3 standards prior to December 31, 2002. Where a refiner designates particular blends as subject to the CaRFG3 standards, the CaRFG3 Predictive Model will apply to those blends. Under early opt-in, the CaRFG3 standards include the requirement that no MTBE be intentionally added to the gasoline. The primary rationale for the early opt-in provisions is that the CaRFG3 standards will provide additional flexibility for any refiner or importer wishing to produce gasoline without MTBE before December 31, 2002.

c) Residual Levels of MTBE

70. Comment: We support staff's proposed prohibition of the intentional addition of MTBE to gasoline, but we have concerns that the de minimis levels that are specified are too low and could prohibit importing gasoline from areas of the country where MTBE is still used in refineries. Staff has indicated that they will make a review of the ultimate level of MTBE in the year 2002. We strongly recommend that the staff open up this review to all levels, not just the ultimate levels, and that they begin that review and try to complete it coincident with the CARBOB review in 2000. (Equilon Enterprises, Equiva)

Agency Response: In Resolution 99-39 the Board directed the Executive Officer to further evaluate the practicality of the allowable MTBE residual limits for CaRFG3, including conducting one or more workshops if appropriate, and to report back to the Board by July 2002 with a recommendation on whether the limit should be revised. The review will not be limited to the final allowable MTBE level of 0.05 vol.% that applies starting December 31, 2004. If new information indicates that the review should be completed earlier, the staff can bring the matter to the Board prior to July 2002.

71. Comment: We strongly recommend that the initial level of MTBE allowed in non--MTBE gasoline be set at the same level at which it is now set for labeling, i.e., 0.6 vol.% at the refinery, and that this level be maintained for six months. If this is not done, refiners will be forced to begin their MTBE phaseout several months prior to December 31, 2002. (WSPA, Tosco)

Agency Response: The section 2273 cut-point for gasoline labeled as not containing MTBE prior to 2003 was set at 0.6 vol.% largely because substantial quantities of MTBE gasoline are expected to remain in the state through 2002. Once the MTBE ban becomes applicable December 31, 2002, there will be no more MTBE gasoline entering the gasoline distribution system in California. With refiners transitioning to non-MTBE gasoline by November–December 2002 and the 45-day phase-in periods for midstream and downstream facilities, we believe the 0.3 vol.% residual limit for the first year is feasible. However, as noted in the response to the previous comment, the staff will reevaluate the appropriateness of the residual MTBE limits and report back to the Board by July 2002 with any recommendations for changes.

72. Comment: With regard to the MTBE de minimis levels, we believe that the 45-day phase-in periods will help assure a smooth transition. Staff should consider additional

time for the initial phase-in in 2003 to assure that refiners have the maximum time to complete refinery modifications. (WSPA)

Agency Response: We expect that refiners will be transitioning to non-MTBE gasoline starting a reasonable time before December 31, 2002. This is particularly the case in the greater South Coast area, where refiners will be transitioning to ethanol gasoline to meet the wintertime oxygenates requirements in section 2262.5(a). In any event, 45 days should provide an adequate time for gasoline at terminals to meet the residual MTBE limits. If future information indicates otherwise, the initial MTBE phase-out provisions can be revisited.

d) Conditional Prohibition of Oxygenates Other Than Ethanol and MTBE

73. Comment: The Staff Report proposed to subject non-MTBE ethers and alcohols other than ethanol to a multimedia analysis before they could be used in California gasoline. However, the proposed Section 2262.6 omitted the provision related to alcohols other than ethanol. WSPA requests that this apparent oversight be corrected and alcohols other than ethanol be included in the requirements which non-MTBE ethers are subject. (WSPA)

Agency Response: The omission was in error and has been corrected. See Section IV.F. of this Final Statement of Reasons.

74. Comment: I urge you to conduct a review of the research data on the subject of ETBE prior to adoption of the staff recommendation to exclude other ethers. Indicting ETBE or other oxygenates based on concerns about MTBE appears misguided when available research supports a further examination of these alternatives. (Todd C. Sneller, Administrator, Nebraska Ethanol Board)

Agency Response: ARB staff does not support or oppose the use of ETBE in gasoline in California. ARB's position has been to support CaRFG emission standards and to allow refiners to choose which oxygenate they use to comply with the federal oxygenate requirements.

S.B. 521 (1998) required the University of California to prepare a study on the public health and environmental risks from using oxygenates in gasoline. One of the findings from this effort was the recommendation "to learn from our experience with MTBE and to *carefully assess the environmental impacts of other oxygenates* such as ethanol before committing to its widespread use in California's gasoline supply."

Further, U.S. EPA's Blue Ribbon Panel on Oxygenates in Gasoline found that,

“ . . . other ethers (e.g., ETBE, TAME, and DIPE) have been widely used and less widely studied than MTBE. To the extent that they have been studied, they appear to have similar, but not identical, chemical and hydrogeologic characteristics. The Panel recommends accelerated study of

the health effects and groundwater characteristics of these compounds before they are allowed to be placed in widespread use. (*U.S. EPA - the Blue Ribbon Panel on Oxygenates in Gasoline, Executive Summary and Recommendations, Final, July 27, 1999 (page 9).*)”

Since other ethers have characteristics similar to MTBE and could pose similar risks to the environment if used in significant volume, and since ethanol has been the only alcohol to have been subject to a full environmental assessment as a potential gasoline oxygenate, we believe it is appropriate to conditionally prohibit – as of December 31, 2002 – the use of any gasoline oxygenate other than ethanol. This conditional prohibition is automatically inapplicable as soon as a multimedia assessment is conducted for the oxygenate and the Environmental Policy Council determines that use of the oxygenate will not cause a significant adverse impact on the public health or the environment.

e) Maximum Oxygen Specification

75. Comment: One other regulatory issue that has come about in staff's recommendation to change at this point is to lift the oxygen cap from 3.5 to 3.7 percent by weight. The U.S. EPA has a weight of four percent currently in practice, and we believe staff should move to that level as well. One of the reasons that we say that is an option for an ethanol producer to meet new sulfur standards on denatured fuel ethanol would be to use less of a denaturant, and right now we're able to use five parts per hundred and as little as two parts per hundred, but if we decide to use lower levels, that would increase the oxygen content of the ethanol itself. So we believe that staff should take a look at that and consider a change. (Renewable Fuels Association)

Agency Response: The most effective way to assure that the denaturant does not contribute to a sulfur exceedance is to use a low-sulfur denaturant such as CaRFG3. The Board deferred action on specifications for denatured ethanol until October 2000, and this issue can be revisited at that time if appropriate.

f) Denatured Ethanol Specifications

76. Comment: The proposed ethanol quality standards of 1 ppmw sulfur, 1 vol.% aromatics, 0.1 vol.% benzene and 0.1 vol.% olefin may overly constrain supply and deserve further review by the ARB, ethanol suppliers, and gasoline producers. WSPA recommends that this issue be reviewed in early 2000. (WSPA)

We suggest a delay in adopting the denatured ethanol specifications. We believe that as we move forward on these regulations, the CARBOB amendments will provide better predictability for refiners and we want to work cooperatively in that effort. (Renewable Fuels Association).

If ARB believes that ASTM D 4806 in its present form does not sufficiently control the properties of denatured ethanol for fuel usage, we would like to work with ARB to

develop an appropriate specification. (American Society for Testing and Materials (ASTM) - Committee DO2 on Petroleum Products and Lubricants)

Agency Response: We appreciate this useful offer. As indicated in Section IV.F. of this FSOR, the Board concluded that it was premature to adopt the proposed specifications for denatured ethanol, and proposed section 2262.9 was accordingly deleted. Resolution 99-39 directs the Executive Officer to propose to the Board, for consideration by October 2000, appropriate further amendments to the CaRFG3 regulations to assure the practical implementation of specifications for denatured ethanol for use in motor vehicles. Further work is needed in the development of denatured ethanol specifications and this work will be conducted in cooperation with the American Society for Testing and Materials and other key stakeholders.

g) The CARBOB Provisions

77. Comment: WSPA has had discussions with ARB and others on additional improvements to the CARBOB regulations to reduce production costs and preserve production flexibility. These include a CARBOB Predictive Model for certifying final blends of CARBOB, modified CARBOB segregation requirements, and provisions for oxy/non-oxy transitions. It was agreed that there was insufficient time to complete the needed analysis by the December 9, 1999 Board hearing. We recommend that these issues be discussed and considered by ARB staff, WSPA and other interested stakeholders in early 2000. Based on this review, we then request that the Board consider additional improvements, and that this requirement be included in the resolution adopted by the Board on December 9-10, 1999. (WSPA)

We suggest that the ARB accelerate the CARBOB revisions and complete work by the third quarter of 2000. Further, we request that ARB do all it can to preserve fungibility, add flexibility and avoid additional blending stringency in the process. (Equilon)

Agency Response: Resolution 99-39 directs the Executive Officer to propose appropriate amendments to the CaRFG3 regulations to assure the practical and effective implementation of the provisions on CARBOB and imported gasoline no later than October 2000. The ARB will continue to work with interested parties over the next several months to address CARBOB issues affecting fungibility, flexibility, and supply.

h) Compliance Plans

78. Comment: California refiners should be required to state in their compliance plans they send to the CEC the sources, volumes, and types of fuel or fuel components they will be importing to comply with these regulations. (Seven oil marketing companies, 16 other businesses, and about 50 citizens.)

Agency Response: California refiners are required to provide a variety of information to the CEC under the Petroleum Industry Information Reporting Act (PIIRA), sections 25352 et seq. of the Public Resources Code, and CEC regulations adopted Pursuant to



that statute. It would be inappropriate for the ARB to specify what information must be submitted to the CEC. However, both the ARB and CEC staffs are in communication on this and other issues. The CaRFG3 regulations do include requirements that refiners submit periodic compliance plans to the ARB Executive Officer (section 2269).

*(8) Comments Urging That Adoption of the Amendments Be Delayed*

79. Comment: Please delay the adoption of CaRFG3 regulations until a full assessment of how these regulations will affect gasoline and diesel supplies and pricing can be conducted. It is critical that these regulations be fully evaluated for their effect on consumer prices and fuel supplies before they are put into place.

We expect government to fully and objectively analyze the potential effects of regulations and to do its best to minimize their impacts. To date, CARB has not examined the true price and supply impacts that are likely to result from the Phase III gasoline regulations, or attempted to reduce these problems. It appears neither CEC nor your staff will complete a real economic analysis before the proposed regulations are presented to the CARB Board for approval. (Seven oil marketing companies, 16 other businesses, and about 80 citizens.)

Agency Response: Governor Davis issued Executive Order D-5-99 directing state agencies to take the necessary steps to phase-out the use of MTBE in California gasoline. As part of Executive Order D-5-99, the Governor directed the California Energy Commission (CEC), in consultation with the California Air Resources Board (ARB), to develop a timetable by July 1, 1999, for the removal of MTBE from gasoline at the earliest possible date, but not later than December 31, 2002. On July 1, 1999, the CEC approved a report entitled "Timetable for the Phase Out of MTBE from California's Gasoline Supply," regarding the MTBE phase-out schedule. The CEC estimates that planning, permitting, construction, and testing of facilities required to produce non-MTBE gasoline will take three years to complete. The CEC MTBE phase-out study concludes that, to ensure an adequate supply and availability of gasoline, refiners will need until December 31, 2002 to complete refinery upgrades. The CEC report also concluded that requiring MTBE to be phased-out on an accelerated schedule could lead to disruptions in the supply and availability of gasoline. Also, the February, 1999, CEC report entitled, "*Supply and Cost of Alternatives to MTBE in Gasoline*," states, "Allowing three years to transition to an alternative oxygenate (ethanol) would be enough time for refiners and oxygenate producers to take the necessary actions to meet demand."

In response to comment 24, we reported the result of a preliminary assessment of the economic impacts of the CaRFG3 regulations on the California economy conducted by Professor Peter E. Berck of U.C. Berkeley using the E-DRAM economic impact model. Based on analyses of three scenarios for production and operating costs, investigators found that the California consumer price index may rise, and real personal income may fall, but the relative magnitude of these changes will be miniscule. Overall, the impacts of the CaRFG3 regulations on the California economy will be negligible.

The California Energy Commission (CEC) has had economic studies prepared on the alternatives to MTBE, including ethanol, in California gasoline. The CEC estimated that, with capital and operating costs taken into account, the price of gasoline with oxygenate alternatives could increase from 2 to 6 cents per gallon.

The recently enacted Sher Bill (S.B. 989) has supported the MTBE phase out deadline, with the S.B. 989 legislation providing the ARB with the necessary authority to adopt California's Phase 3 Reformulated Gasoline (CaRFG3) regulations

In response to Executive Order D-5-9, and to the applicable Senate Bills, the CaRFG3 Staff Report was independently peer reviewed by scientists from both the University of California and California State University systems. The peer review concluded that, "The document provides both a comprehensive rationale as well as specific information on the proposed changes."

The California Environmental Policy Council (CEPC) held its meeting regarding the CaRFG3 regulations on January 18, 2000, as you noted in your letter. Pursuant to S.B. 989 (Sher) and S.B. 529 (Bowen), both chaptered on October 10, 1999, the CEPC reviewed the expected multimedia environmental (i.e., air, water, toxics) impacts of the CaRFG3 regulations. Based on scientific studies and public testimony presented, the CEPC made the finding that the CaRFG3 regulations would not result in any significant adverse environmental impacts on public health or the environment, including any impact on air, water, or soil, that is likely to result from the change in gasoline that is expected to be implemented to meet the CaRFG3 regulations approved by the ARB.

80. Comment: A number of late submittals of key information were made available after the preparation of the Staff Report and other rulemaking documents. We recommend that the ARB consider all the relevant information, before implementing the proposed regulations. (California Trade and Commerce Agency Automobile Club of Southern California, Bluewater Network/Californians Against Waste, Watts Learning Center).

We are disappointed that ARB staff has decided to incorporate CEC reporting data to reconfigure the baseline in the emissions analysis and justify further flexibility just a few days before this hearing. The entire issue of equivalency hinges upon the analysis, and changing the inputs prevents us from conducting a proper review of the data. We hope that this regulation will not be passed until we give it proper time, and that does not include passing it today and giving us 15 days to analyze this data. We do not feel like that is enough time. (Bluewater Network/Californians Against Waste)

The ARB should postpone taking any action on the ethanol issue at the December 9<sup>th</sup> Board meeting. Three weeks review is not enough time to consider a new kind of gasoline that has never been fully tested, manufactured or sold anywhere. Please give this issue the time and study it deserves. (Alex P. Evans, Vice-Mayor, City of Richmond)

The CEC is studying the supply and pricing issues, but its report has not been completed yet. We believe that it would be inappropriate to approve new fuel regulations until all

the facts can be properly studied by the ARB, the Automobile Club, and all the other affected parties. Thus we recommend that this portion of the rulemaking be continued until all parties have had an adequate time to review and comment on the CEC study as well as additional time to review the new ARB proposal. (Automobile Club of Southern California)

Agency Response: As noted in the response to the previous comment, there have been several studies on potential costs and supply issues that the Board has been able to consider. The Math Pro report *Analysis of California Phase 3 RFG Standards* was made available for supplemental comment. Given the need to move ahead with the CEC's timetable for removing MTBE from California gasoline, we believe there is sufficient information for the Board to move ahead and adopt the CaRFG3 regulations.

We acknowledge that there are a number of issues that we will need to continue to monitor in order to address them fully; however, there is no need to delay the approval of the CaRFG3 regulations. To the extent that members of the public have concerns regarding the modifications to the original proposal, those parties have had an opportunity to raise the concerns during the supplemental 15-day comment process.

81. Comment: Questions remain unanswered, including concerns about future availability of ethanol, long-term status of the federal oxygenate mandate in California, potential increases in gasoline imports, and engine and exhaust catalyst performance under various fuel formulations. The Board should reevaluate the CaRFG3 regulations as better information becomes available. (California Manufacturers Association)

Agency Response: As discussed in Section IV.H, the Board directed the Executive Officer to take a number of steps to monitor future developments connected with implementation of the CaRFG3 regulations. In addition to the specific directions, the staff can bring new matters to the Board's attention if warranted.

82. Comment: The ARB's current target date of December 10 for adopting ethanol as the state's new fuel oxygenate does not allow sufficient time for addressing the unstudied risks associated with this fuel alternative. We are therefore requesting that the ARB postpone this crucial decision until the issue of ethanol transport and its risks to our neighborhoods and our community are adequately addressed. (Jovenes, Inc., El Centro Del Pueblo, Watts/Century Latino Organization, Project Info, Soledad Enrichment Action, Inc., Multicultural Area Health Education Center (MAHEC), Los Angeles Conservation Corps, Central American Resource Center (CARECEN), Asian Youth Center, Clinica Msr. Oscar A. Romero, Clinica Para Las Americas, Health Education Council, Plaza Community Center, Mexican-American Growers Association, and 28 community activists and citizens.)

Agency Response: See responses to comments 47, 48 and 49 regarding the issues related to the environmental impacts of ethanol in gasoline. As directed by the Governor's Executive Order D-5-99, studies were conducted by the ARB, SWRCB, and OEHHA. The reports, after peer review by selected U.C scientists, were then submitted to the

California Environmental Policy Council. Based on these studies, the CEPC determined that there will not be a significant adverse environmental impact on public health or the environment, including any impact on air, water, or soil, that is likely to result from the change in gasoline that is expected to be implemented to meet the CaRFG3 regulations approved by the ARB.

The Board directed the Executive Officer, upon implementation of the CaRFG3 regulations in 2003, to evaluate whether the CaRFG3 regulations actually maintain or improve upon emissions and air quality benefits achieved by CaRFG2 as of January 1, 1999 and to report to the Board by 2004 on the results of the evaluation along with any appropriate recommendations. The evaluation of emissions and air quality benefits must also include emissions reductions for all pollutants, including precursors, identified in the California SIP for ozone, and emission reduction in potency-weighted air toxics.

83. Comment: The CEC is studying the supply and pricing issues, but has not been completed yet. We believe that it would be inappropriate to approve new fuel regulations until all the facts can be properly studied by the ARB, the Automobile Club, and all the other affected parties. Thus we recommend that this portion of the rulemaking be continued until all parties have had an adequate time to review and comment on the CEC study as well as additional time to review the new ARB proposal. (Automobile Club of Southern California).

Agency Response: The CEC report, prepared by MathPro, Inc., on the economic impact of CaRFG3 does not conflict with the assessment prepared by ARB staff. Therefore, there is no reason to relax the CaRFG3 regulations.

*(9) Miscellaneous*

84. Comment: We appreciate the commitments that ARB staff have made to assist refiners in the permitting process. However, we suggest that ARB prepare resource documents that address concerns that would be common to all permit applicants. We also support the concept of compliance plan submittals to allow monitoring of progress towards compliance. We request that ARB and the CEC agree to a joint mechanism for such reporting and that compliance plans be simplified to the extent possible. (Equiva)

Agency Response: In Resolution 99-39, the Board directed the Executive Officer to monitor refiner progress towards compliance with the CaRFG3 regulations and to report to the Board semiannually on this progress and on implementation of the directives in this resolution. Both the ARB and CEC staff have already agreed to coordinate their support regarding this issue. In addition, at the December 9, 1999 hearing, the ARB Stationary Source Division Chief, Peter Venturini, made a commitment to the Board and WSPA to provide a similar level of support for the CaRFG3 permitting process as the ARB provided for the CaRFG2 permitting process. The ARB facilitated the permitting and CEQA process for CaRFG2 refinery modifications by coordinating and informing federal, state, and local governments agencies about the CaRFG2 refinery modifications.

The ARB also provided technical assistance to local air pollution control districts and government agencies, and presented information on the CaRFG2 regulations at various public hearings.

In addition, the staff plans to prepare a Resource Document for CaRFG3 refinery and gasoline distribution modifications which will include (but not be limited to) statewide and regional information on the CaRFG3 air quality benefits and an assessment of the statewide and regional impacts of transportation emissions associated with the transportation of ethanol for use in California gasoline. We believe this type of information will be of benefit to all CaRFG3 permit and CEQA applicants and will be useful for CaRFG3 applications to local and state permit agencies.

85. Comment: The ARB should also commit the resources to perform rigorous testing and evaluation to properly characterize the effects of commingled gasoline blends and to adopt a strong in-use compliance mechanism to ensure that future fuel formulations do not violate CaRFG3 limits. (Sierra Club, Coalition for Clean Air, and Union of Concerned Scientists)

The ARB should continuously monitor the effects of the flexibility built into the CaRFG3 standards and take swift action to correct any unanticipated degradation that may result. (Sacramento Metropolitan Air Quality Management District)

Agency Response: To implement the Board's directions, the staff plans to conduct a rigorous examination of the extent of commingling gasoline with and without ethanol – including conducting new studies as necessary on factors such as refueling patterns and customer brand and grade loyalty. The Executive Officer will report his findings with any appropriate recommendations by December 2001.

In addition to the commingling analysis and an investigation of permeation emissions associated with ethanol, the staff has been directed upon implementation of the CaRFG3 program in 2003 to evaluate whether the regulations actually maintain or improve upon the emissions benefits from the CaRFG2 program. If it turns out there is a danger of emissions increases, we are committed to take corrective action.

86. Comment: Before the end of 2001, the ARB should consider a gradual reduction in sulfur levels to 5 ppm, a sunset date on the proposed modifications to T50 and T90 limits; enhanced downstream blending enforcement, and careful review of in-vehicle fuel commingling. (South Coast Air Quality Management District)

Agency Response: The Board has directed staff to report back to the Board by July 2002 on the feasibility of a lower sulfur standard. We do not plan a near-term review of the modifications to the T50 and T90 limits; if they were returned to the CaRFG2 levels, the lower CaRFG3 sulfur and benzene standards would mean that the CaRFG3 standards were considerably more stringent than the CaRFG2 standards while refiners were facing the need to remove MTBE. However, the staff will be examining whether the CaRFG3 standards do maintain the emissions benefits of the CaRFG2 standards, and will

recommend any action necessary to assure that is the case. We will be considering CARBOB amendments at an October hearing. On the issue of commingling, see the response to the previous comment.

87. Comment: The ARB should commit today to revisit the CaRFG3 program if U.S. EPA grants the oxygen waiver petition. There is no question that given the uncertainties of air quality benefits from CaRFG3, the substantial benefit in granting the waiver should be captured on behalf of air quality. (American Lung Association)

Agency Response: The NOx benefits from elimination of the federal RFG oxygen requirement, upon which the waiver request is based, will occur without the need to lock them in by a change to the regulations. The challenges presented by the need to eliminate MTBE – even if the waiver is granted – are substantial enough that it would not be appropriate to build in greater stringency within the next few months, by which time the waiver request should be acted upon.

88. Comment: California should support the development of a biomass to ethanol industry in California. We believe biomass cellulosic ethanol is environmentally preferable to corn-based ethanol. Biomass ethanol solves significant local environmental problems such as rice straw burning and other agricultural waste disposal issues. Biomass ethanol can also significantly decrease emissions of CO. (Union of Concerned Scientists, Natural Resources Defense Council, Planning and Conservation League, Coalition for Clean Air)

Agency Response: The Governor's Executive Order D-5-99 has indicated this state's interest in developing a biomass-to-ethanol industry in California. Directive 11 directed the CEC to evaluate by December 31, 1999 and report to the Governor and the Secretary for Environmental Protection the potential for development of a California waste-based or other biomass ethanol industry. CEC was also directed to evaluate what steps, if any, would be appropriate to foster waste-based or other biomass ethanol development in California, should ethanol be found to be an acceptable substitute for MTBE.

89. Comment: And as you know, we've been pushing for a ban on MTBE from the beginning and now we're at the point where you all are implementing a phase-out, which we're very happy to see that you're going to start enforcing. If the oil companies aren't able to meet the standards by the end of the year 2002, what kind of enforcement measures are set up? Are you going to push it to the year 2005? I wanted to find out like what has to happen for it to reach five parts per million on the sulfur levels? Also I'm concerned about the ongoing contamination of MTBE to the year 2002, and who is responsible for paying for the cleanup during that time? (Communities for a Better Environment)

Agency Response: The MTBE phase-out and the CaRFG3 standards will be enforceable under the fuels penalty provisions of Health and Safety Code sections 43025, assuming those provisions are extended by the legislature. The Board has directed the Executive Officer in Resolution 99-39 to report back by July, 2002, with an evaluation and recommendations for lowering the sulfur levels in the CaRFG3 regulations. As to MTBE

water contamination and cleanup, S.B. 989 has specific provisions to address these issues, which are under the general purview of the SWRCB rather than the ARB.

90. Comment: No significant water benefits will likely be realized from this regulation in the sense that California's underground storage regulations appear to be successful in eliminating the long and lingering gasoline tank leaks typical of the past that contribute to gross water contamination problems, such as Santa Monica, South Lake Tahoe and Glennville. In addition, recent passed legislation has targeted specific improvements that will further strengthen the regulation in preventing or minimizing the risk of future water contamination from leaking gasoline tanks. (Oxygenated Fuel Association)

Agency Response: The University of California report *Health and Environmental Assessment of Methyl Tertiary Butyl Ether (MTBE)* found that MTBE presented a risk to the environment. The report found the risk to be primarily from MTBE contamination of groundwater and drinking water resulting from leaking underground fuel storage tanks but also from leaking pipelines and from the use of personal watercraft on lakes and reservoirs. While the leaking underground tank programs are reducing the prevalence of leaks, they are not eliminating them. This is why the U.C. report recommended that MTBE be phased out of the state's gasoline.

91. Comment: By relying on the industry's voluntary decisions to continue their practice of building "compliance margins" into their products to achieve air quality benefits that are equivalent or better than CaRFG2, the proposed regulations unlawfully delegate to the regulated industry the Board's authority and responsibility to "ensure" that the CaRFG3 regulations "maintain or improve upon emissions and air quality benefits achieved by California Phase 2 Reformulated Gasoline in California as of January 1, 1999." See, e.g. *Bayside Timber Co. v. Board of Supervisors* (1971) 20 Cal.App.3d 1, 8. (Bluewater Network)

Agency Response: The CaRFG3 regulations are clearly not the product of an unlawful delegation to the regulated industry. It is the ARB, not industry, that is setting the CaRFG3 standards. In doing so, the Board is simply taking into account existing behaviors of refiners, and is exercising its own judgment to anticipate future behaviors of regulated parties. In the case cited by the commenter, the court invalidated portions of the Forest Practice Act under which forest practice rules could not be promulgated by district forest practice committees and the State Board of Forestry unless two-thirds of the private timber ownership voting in the district approved them. That is the crux of an unconstitutional delegation – the administrative body actually cedes decision-making authority to the non-governmental entities. In contrast, the ARB has not ceded decision-making authority to the regulated industry.

92. Comment: The proposed CaRFG3 regulations are invalid because delegating to the regulated industry the Board's authority and responsibility to "ensure" that the CaRFG3 regulations "maintain or improve" CaRFG2 benefits exceeds the scope of authority conferred on the agency by the state Legislature. (Bluewater Network)

Agency Response: The CaRFG3 regulations do not constitute an improper delegation of authority for the reasons in the response to the previous comment. The ARB is granted broad authority by sections 43013 and 43018 of the Health and Safety Code to regulate motor vehicle fuels to reduce vehicular emissions. Adoption of the CaRFG3 regulations is clearly within the authority granted in those sections and section 43013.1.

93. Comment: A similar “unlawful delegation” and “exceeding statutory authority” analysis applies to the proposed regulation’s treatment of CO. Since CO is an ozone “precursor,” CaRFG2 emissions reduction benefits must be maintained or improved under section 26 of S.B. 989. Instead, however, the proposed regulations allow reductions in the percentage, by weight, of the oxygen content of fuel from the CaRFG2 minimum of 2% to the CaRFG3 minimum of zero %. This will cause direct, measurable increases in CO emissions under the proposed CaRFG3 regulations as compared to the CaRFG2 levels, in direct violation of section 26 of S.B. 989. Again, the proposed regulations fail to ensure that CaRFG2 benefits are maintained or improved because the proposed regulations rely on voluntary behavior to achieve that goal, which is unlawful for the reasons set forth in the previous two comments. (Bluewater Network).

Agency Response: First, S.B. 989 expressly does not require maintenance of CO benefits, for the reasons in the agency response to comment 3. Second, the CaRFG3 regulations do *not* allow a reduction in the minimum oxygen content compared to CaRFG2 – under both programs refiners are permitted to use the Predictive Model to reduce or eliminate oxygen except when it is required as a CO wintertime control measure. Third, see the responses to the previous two comments.

#### B. COMMENTS RECEIVED DURING THE 15-DAY COMMENT PERIOD

94. Comment: In California Code of Regulations, title 13, section 2262, we recommend that the row titled “Methyl tertiary-butyl ether (MTBE) and other oxygenates” be retitled “MTBE and oxygenates other than ethanol”. As written, the description is potentially misleading. We also suggest that the terms “none” and “not applicable” be changed for clarity. A potential change to increase clarity would be to enter “no intentional addition” in the flat and average limits for CaRFG3. (WSPA)

Agency Response: The recommended change to the name of the row has been made. We have changed “None” to “Not Applicable” to make the term consistent with the entries in other rows of the table. The entries for the flat and cap CaRFG3 limits in the MTBE row have been changed to read, “Prohibited as provided in § 2262.6.” These clarifying modifications are nonsubstantial.

95. Comment: The 15-day package contains a new section 2262.6(c). We are concerned that the language in subsection (c) conflicts with and may supercede the MTBE phase-out schedule in sections (a) and (b). We recommend that ARB modify subsection (c) to make clear that the schedule laid out in subsections (a) and (b) still applies. (WSPA)



Agency Response: In the Resolution, the Board approved the proposed CaRFG3 amendments with the modifications suggested by the staff which are contained in Attachment B to the Resolution. Item 6 of the attachment is expands the conditional prohibition in section 2262.6(c) so that it covers any oxygenate other than MTBE or ethanol. In the text made available with the 15-day Notice, “or MTBE” was inadvertently omitted. The ARB’s clear intent has been that the use of MTBE in gasoline starting December 31, 2002 will be subject to the staggered provisions in section 2262.6(a) and (b) rather than the immediate but conditional prohibition in section 2262.6(c). Therefore we have made the requested change and have added “or MTBE” to the finally-adopted text. This is a clarifying, nonsubstantial change because under the 15-day Notice language, the more specific terms regarding MTBE in section 2262.6(a) and (b) would have been interpreted as taking precedence over the treatment of MTBE under section 2262.6(c).

96. Comment: Section 2272 regarding small refiners contains a subsection (d) that states that qualifying small refiners “shall comply” with the federal RFG program. However, there is no indication of how ARB will demonstrate to U.S. EPA's satisfaction that such compliance is achieved. The U.S. EPA approved the enforcement exemption based on a demonstration that no formulations of California gasoline will be certified that do not meet the requirements of the federal RFG program. We believe that ARB will have to develop a means of addressing EPA's need for certainty of compliance either via a demonstration similar to that discussed above, or by other means. (WSPA)

Agency Response: It is expected that, like other refiners, a small refiner will produce its California gasoline using the CaRFG3 Predictive Model. The small refiner will accordingly have to report to ARB the alternative formulation specifications that apply to each final blend of gasoline. These reports, along with volume reports under section 2272(e), could be used to detect possible violations of the federal RFG requirements. The staff is committed to work with U.S. EPA to assure the continued viability of the California enforcement exemption. In any event, the small refiner standards should have no impact on applicability of the California enforcement exemption to other refiners, since all of the small refiners’ gasoline that enters the distribution system is subject to the same cap limits that apply to the other refiners.

97. Comment: Modified section 2272(d) states that qualifying small refiners shall comply with the federal RFG program as outlined in 40 CFR commencing with section 80.40. We further note that, in the commentary, ARB states “[t]he California Enforcement Exemption would still apply to the small refiner . . .” However, many of the sections “commencing with” 80.40 contain the enforcement requirements from which California refiners are exempt. We believe ARB should be more specific as to the CFR sections that apply to small refiners to avoid any implication the exemption does not apply to these refiners. (WSPA)

Agency Response: Section 2272(d) requires a small refiner subject to the section to “comply with all *applicable* requirements” of the federal RFG regulations commencing with 40 CFR § 80.40. (emphasis added). Since the small refiner does fall within the

ambit of the California Enforcement Exemption in 40 CFR § 80.81, the “applicable” requirements are those federal RFG requirements that apply to such refiners in any federal RFG area nationwide, *except* for those requirements exempted by the § 80.81 California enforcement exemption. We believe no further clarification is necessary.

98. Comment: WSPA believes the reference fuel in the Phase 3 Predictive Model should contain ethanol, not MTBE. With the Phase 3 model, a refiner cannot certify the flat limits against themselves (or the averages against themselves) when the oxygenate is assumed to be ethanol. This is because the Phase 3 model predicts slightly higher potency-weighted toxic emissions from ethanol blends. This does not justify using MTBE in the reference fuel for purposes of “preserving benefits” because the Phase 3 reductions in the flat and averaging limits for benzene offset this small increase in potency-weighted toxic emissions many-fold. (WSPA)

Agency Response: The use of MTBE as the reference fuel in the Predictive Model has been part of the staff’s CaRFG3 proposal since the proposal was first made. Therefore, this comment does not pertain to a regulatory change subject to the 15-day comment period. In any event, using MTBE as the reference fuel in the CaRFG3 Predictive Model makes very little difference in the relative emissions performance of a candidate Predictive Model gasoline. The potency-weighted toxics emissions for a 2.0 percent oxygen fuel with ethanol are only 0.19 percent higher than the potency-weighted toxics emissions from a 2.0 percent oxygen fuel with MTBE. This increase can be offset by decreasing the benzene content of a candidate predictive model gasoline from 0.80 percent to 0.79 percent. Therefore, very little flexibility is lost by using an MTBE-based reference fuel in the CaRFG3 Predictive Model.

99. Comment: Using MTBE in the Beta3 reference fuel also leads to some questionable model responses. Using ethanol in the reference fuel would eliminate this problem. (WSPA)

Agency Response: The commenter is mistaken; the questionable responses do not in fact occur. Therefore, this is not a reason to use ethanol in the reference fuel.

100. Comment: Staff claimed that the latest changes made to T50 were based on “new” information, yet no new data or analyses were provided for the hearing, nor since.

The T50 data had been discussed at length in monthly workshops held by ARB staff. Two sources of data were central to the discussions: ARB Compliance Division records, and the CEC survey of refiners. Both were available to staff prior to publication of the 45 day hearing notice. Neither is new.

CaRFG Statistics for 1998 from Compliance Division's files show the mean measurement for T50 was 198°F with a "Compliance margin of 6°F. In other words, refiners had determined not to exceed 204°F, and elected to generate additional credits by selecting a Designated Alternative Limit (DAL) to offset increases from other parameters.

Actual production for 1998 was a full 12°F below the flat limit, according to the Compliance Division numbers. A later representation of the data showed the same measured value (198°F) but estimated a higher compliance margin -- 8°F, or a target limit of 206°F.

In September 1999, an ARB staff handout at a workshop showed the average T50 in use for "all fuels" was 195°F, and the average for "average limit" fuel was 189°F, both even further below the 198°F for flat limit gasoline.

In mid-1999 the CEC surveyed California refiners to determine what average specifications they would report. CEC statistics on T50 indicated 1998 in use fuel averaged 200.84°F and a compliance margin of 4°F. This indicates that the refiners' target was not to exceed 205°F.

It would be a misinterpretation to call this "new" data, and then to use it to propose a 2°F increase in specifications. Compliance Divisions measurements must be considered within test method "reproducibility." The refinery survey uses the refiners' own measurements and must be considered within a "repeatability" range. Statistically, the averages (198°F and 200°F) are the same. The data do not support an increase in specifications of 2°F.

Staff has not provided any new data, nor indicated what data might suggest a modification, just two days before the hearing. Despite the staff claim of new information, no data indicates that the specifications should be relaxed. (Unocal)

Agency Response: The CEC refinery survey data were not available prior to the publications of the staff report because it had not undergone the data quality review that we require. It would have been inappropriate to base a recommendation on preliminary data. The original ARB compliance data used in the staff report were the best available at the time even though it was from a limited number of samples.

Once the CEC survey results were finalized they were used because they provided a significantly more robust assessment of the 1998 average in-use gasoline. The CEC data were more appropriate to use because they represent an industry average gasoline; whereas, the ARB compliance data were not necessarily representative of the industry average. The two data sets are not directly comparable.

The removal of MTBE from gasoline seriously limits the refiners' ability to produce gasoline that meets all of the current CaRFG2 requirements. Removing MTBE reduces gasoline volume by about 11 percent and raises the T50 by about 10 °F. Given the CO credit, the evaporative hydrocarbon model, and the impact on refinery production volumes and distillation temperatures associated with the removal of MTBE, there is every reason to assume that the future average in-use fuel properties will be significantly different than they were in 1998. The increases in T50 and T90 were to provide flexibility for refiners to remove MTBE and recover some of the lost volume associated with MTBE's phase-out from California gasoline.

101. Comment: Refiners attempting to meet the original T50 flat limit of 210°F produced fuel that averaged either 198°F (Compliance Division) or 200°F (CEC refinery survey) data. Targeted limits were 204°F-208°F depending on which compliance margin estimate one accepts (staff seems to have accepted a 4°F margin). The issue of compliance margins is critical.

In 1991 the CaRFG2 T50 specifications for averaging were set 10°F below the 210°F flat limit. CARB assumed that refiners would need a 10°F compliance margin to preserve the benefits if averaging was allowed. The averaging specification was set at 200°F, and ARB expected that figure to be the top limit for in-use gasoline. This approach is well founded in the Clean Air Act Amendments of 1990, but it appears that most benefits were not preserved.

Average production may have been in the 200°F range, but compliance margins have been only about 4°F, so refiners could use the other 6°F of T50 as credit, within the predictive model, to offset higher emissions from other parameters. This narrowing compliance margin is a direct result of refinery statistical control programs. Unocal warned the Board during the 1991 Phase 2 hearings that refiners would “beat” the compliance margin gap between the flat and averaging limits, designate an alternative limit (DAL), and use the Predictive Model to offset other emission increases. They have. It has worked.

Staff proposed, in its report for the December 9 hearing, to increase the flat limit for T50 from 200°F to 201°F, and the average limit from 210°F to 211°F. But refiners had narrowed the compliance margin by about half (to about 4°F). Thus the staff was pushing in exactly the wrong direction, because the environmental benefits were not being preserved. Then and more inappropriately, staff proposed at the last minute to increase the limits even more, to 203°F and 213°F for T50 averaging and flat limits respectfully.

If the Board wishes to preserve the environmental benefits attained to date, a minimal step would be to return the flat and average limits to the original 200° and 210° F. To retain the environmental benefits as intended and claimed, the flat limit should be set at 204°F and the averaging limit at 200°F.

The staff proposal to increase the flat limit while claiming benefits based on an invalid averaging limit violates the approach directed in Section 211(k)(7) of the Clean Air Act Amendments of 1990. Refiners can elect an alternative flat limit, use the model to offset other emission increases, and the environment loses about half the T50 benefit originally assumed.

The Board should delay any consideration of these modifications until the staff has provided the information and analysis to the Public. (Unocal)

Agency Response: The emissions benefits estimated for the CaRFG2 program were based strictly on the flat limit specifications and no benefits were assumed for over

compliance (i.e the compliance margins were assumed to be zero); therefore, there is no way the emissions benefits of the CaRFG2 could not be preserved. Also, the averaging limits for CaRFG2 were derived from the flat limits and were selected so that refiners could not increase emissions relative to the flat limits. In setting the averaging limits, the ARB selected standards that would assure the benefits from the flat limits would be preserved. For T50, the average limit was conservatively set 10°F lower than the flat limit. In the staff report, the compliance margin for T50 was estimated to be 8°F not 4°F as stated in the comment. Since the actual compliance margin for T50 was smaller than the 10°F used to set the average limit, then gasoline produced to the average limit provided more benefits than flat limit gasoline, not less.

Any emissions increase from increasing T50 is offset by lowering the limits for benzene and sulfur. The 1998 average in-use gasoline, because of over-compliance, is “cleaner” than the CaRFG2 specifications. These additional benefits are captured, as required by Senate Bill 989, in the CaRFG3 regulations. Please refer to the response to comment 1 and Section IV.A. of this Final Statement of Reasons.

102. Comment: Staff calculates that CaRFG3 reduces HC reductions a mere 0.01. -- a figure within any possible margin of error, so it is just as likely that HC will increase. Thus the staff proposed change, if utilized by any refiner, would destroy any benefit from the CaRFG regulations.

There is such uncertainty surrounding issues such as ethanol commingling and permeation that the Board directed staff to do further work and report back. Thus the Board is willing to change CaRFG specifications -- if change is justified by that work and if change is necessary to preserve benefits.

But early use of the CaRFG specifications would allow increases for evaporative emissions and for distillation temperatures. These increases would add to the commingling and permeation problems that are substantial but still not fully defined. A recent Sierra Research study that has been presented to staff suggests that commingling would eclipse CaRFG3 benefits.

The reduction of RVP from 7.0 to 6.9 psi does not provide an offsetting cushion as staff claims. In fact, the 0.1 psi reduction has been double-counted in the staff report. In one instance it is counted as preserving current benefits, suggesting that actual production is 6.9 psi. In fact it was 6.8 psi.

Another discussion states that the 0.1 psi would offset the increased emissions from ethanol commingling. The same report admits that the commingling impacts are not fully understood.

Further, the impacts of EMFAC 2000 are not understood, although the new model will be adopted. Evaporative emissions calculations may change dramatically, or other considerations could make the staffs present preservation estimate far off the mark. These uncertainties must be resolved. Allowing early use of the specifications or model can

only broaden to the error band around the close call on HC. This provision must be delayed until all the major issues are understood well enough to calculate emissions impacts.

Agency Response: See response to comments 1, 40, 41, and 108.

103. Comment: The early use of the CaRFG3 standards and model also create an unusual opportunity for downstream cheating. Since all downstream specs would be triggered by one refiner's substantial use of the provision, an opportunity for downstream blending will exist. Historically, this kind of cheating has been limited to certain blendstocks and transmix often introduced at the service station level. RVP has been one of the impacted parameters.

Increasing the downstream limit on RVP from 7.0 to 7.2 will present an unusual opportunity with huge amounts of gasoline. The large cost differential between CaRFG and other gasolines gives rise to astounding opportunities for financial gains through illegal blending downstream. This opportunity for financial gain from illegal operations is reminiscent of the U.S. experience with Prohibition. (Unocal)

Agency Response: A comparison of a 0.2 psi increase in the RVP standard to Prohibition stretches credulity to new limits. The commenter provides no basis for the assumption that a 0.2 psi increase will make the difference for a person deciding whether to blend conventional gasoline into CaRFG downstream from the refinery. If the RVP of the illegal gasoline is considerably higher than the CaRFG3, it would push the resulting blend over the 7.2 psi cap limit for RVP. Moreover, the CaRFG regulations contain elements that can be used to proceed against illegal blenders without having to prove that the blended gasoline exceeds the RVP or other cap limits. Section 2266.5(h) prohibits persons from blending any non-oxygenate blendstock into downstream CaRFG unless the blender can demonstrate that the material being added independently meets the CaRFG refinery limits. And new section 2266.5(i) prohibits persons from blending CaRFG that contains ethanol with CaRFG that does not contain ethanol during the RVP season unless the blender can affirmatively demonstrate either that the gasoline blend meets the cap limit for RVP or that the blender has taken necessary precautions to assure the gasoline blend will be sold only when the RVP standard does not apply.

104. Comment: The small refiner provisions are both incomplete and excessive. The rules by which emissions must be mitigated have not yet been proposed. The public is therefore unable to assess the net effect on the environment. Lack of the full mitigation program to review deprives the public of the detail necessary to evaluate the entire environmental impact of this proposal. (Unocal)

Agency Response: Section 2272(c)(5) was drafted so that the small refiner will not be able to produce gasoline subject to the small refiner standards unless the excess emissions are offset pursuant to section 2282. The small refiner provisions accordingly cannot be used until the offset mechanism is adopted in section 2282 and becomes applicable. Thus

the public will have a full opportunity to comment on the offset mechanism and assess its effect on the environment prior to implementation.

105. Comment: The small refiner provisions will allow small refiners to sell non-complying gasoline in volumes impossible under normal operations. The most liberal calculation approaches are used, and yield calculated volume caps higher than any refiner, large or small, could sustain. The diesel problems of the early 1990s should remind the Board and staff that such loopholes lead to unusual economic gains, environmental damage, and political upheaval. (Unocal)

Agency Response: The small refiner exemption volume is limited and is based on historic production data provided by the CEC. The volume will not allow any growth in small refiner gasoline capacity at the small refineries that qualify for the exemption.

106. Comment: The small refiner provision in itself creates enforcement problems and increases the opportunities for additional downstream cheating. There is no restriction how or where this gasoline can be sold. It can become another dumping ground for non-complying blendstocks or off-grade blends that don't exceed the small refiner standards. Such illegal practices often occur between the terminal and service station distribution system in tanker loads where enforcement is the most difficult. (Unocal)

Agency Response: The two primary mechanisms in the CaRFG3 regulations to prevent illegal downstream blending are the cap limits and the downstream blender prohibitions described in the response to comment 103. We carefully designed the small refiner limits so that small refiner gasoline is subject to the *same cap limits* that apply to all other gasoline subject to the CaRFG3 standards. Maintenance of the cap limits and the downstream blender prohibitions mean that the small refiner provisions should result in no increase of downstream cheating.

107. Comment: The CaRFG3 program will probably fall short of its air quality goal because of commingling ethanol-blended and non-ethanol blended gasolines. (AIAM)

Agency Response: See the responses to comments 40, 44 and 45.

108. Comment: Until the ARB approves the revised EMFAC2000, questions will remain about whether CaRFG3 will allow backsliding on ambient ozone, particulate matter, CO, and toxics. (AIAM)

Agency Response: The use of EMFAC2000 instead of EMFAC7G would have very little effect on the estimated emissions benefits from the CaRFG3 regulations. The use of EMFAC2000 would primarily affect the tradeoff between evaporative and exhaust emissions for gasolines complying under the CaRFG3 Predictive Model. As discussed in Section V.G., there was insufficient time to be able to incorporate EMFAC 2000 into the CaRFG3 Predictive Model while keeping to the multimedia review mechanism in Health and Safety Code section 43830.8(h), enacted in 1999 by S.B. 529.

109. Comment: Increased ethanol use presents serious questions about increased emissions due to permeation, commingling, and lower engine performance. (AIAM)

Agency Response: See the response to comment 7, 40, and 46.

110. Comment: The small refiner flexibility in the CaRFG3 regulations is conditioned on a mechanism which requires mitigation through diesel changes and is yet undefined. Therefore, if the yet-to-be determined diesel mitigation requirements become too onerous or infeasible, Kern asks CARB to consider a mechanism which would allow certain specification amendments to the small refiner CaRFG3 flexibility. (Kern Oil)

Agency Response: The rulemaking this fall is the most appropriate forum for this request.



## Attachment A

### **NONSUBSTANTIAL MODIFICATIONS TO THE REGULATIONS MADE AFTER THE 15-DAY COMMENT PERIOD**

#### **Final Regulation Order, title 13, California Code of Regulations**

Page 1, section 2260(a)(1), corrected the direction of the quotation mark prior to the word Alternative

Page 12, section 2262, The California Reformulated Gasoline Phase 2 and Phase 3 Standards Table was modified as described in section IV. F. of the Final Statement of Reasons

Page 13, section 2262.3(b), (1) was removed

Page 16, section 2262.4(c) added a period after the title Applicability

Page 24, section 2262.6(b)(3), the capitalization was corrected in the heading, and section 2262.6(c) added the word MTBE in both the title and description

Page 25, section 2263(b)(1), Table 1 legend a, changed the word Does to Do

Pages 27 and 47, sections 2263.7, 2267, and 2268, corrected the Authority and Reference citations respectively by replacing the underlined text with *italicized*

Page 29, section 2264(b)(2) changed the word then to than

Page 38, section 2266(b)(2) corrected section ~~2262.6(d) and (e)~~ to ~~(e) or (f)~~ and changed the words and to or

Page 39, section 2266.5(a)(2) removed the ~~strikeout~~ from (A)

Page 48, section 2269, the Reference citation added section 39010

Page 51, section 2271, added a period after the heading Variances

Pages 51-57, sections 2271(a), (b)(1), (b)(2), (c), (d), (e), (f), (g), (g)(2), (h), (i), and (j) corrected the capitalization in each of the headings

Page 56, added the Authority citation section 43013.2 and the Reference citation for sections 40000 and 43013.2

Page 57, section 2272(a), corrected capitalization

Page 59, section 2272(c)(3), the s at the end of the word period in the first sentence was removed.

In the Test Methods table in section 2263(b)(1), the proposed addition of a T10 specification was eliminated. T10 was only relevant as part of the formula for calculating the Driveability Index; elimination of the Driveability Index meant that it was no longer necessary to specify a test method for T10.

## Attachment B

### CaRFG3 Scientific Peer Review "Specific Concerns and Agency Responses"

#### **RVP changes and Evaporative Emissions Impacts Issues**

Comment: The U.C. peer reviewers encouraged ARB staff to properly evaluate the changes in emissions with the changes in RVP. The peer reviewers support the staff's subsequent changes and recommendation for evaluating the impacts of commingling.

Agency Response: Concerns were expressed by peer reviewers about the effects of permeation emissions due to increased use of ethanol in California gasoline. It has been argued that the substitution of ethanol for MTBE (in 2003) in gasoline will increase evaporative emissions of the current fleet, mainly due to the effects of permeation and commingling.

Specifically related to the permeation of ethanol, Dupont has raised the issue of older vehicles with fuel system elastomers that may increase permeation evaporative emission rates due to the effects of ethanol in gasoline. Future vehicles will feature materials that have very low permeation rates. However, there are still concerns with permeation effects from most existing vehicles. The Board directed the ARB Executive Officer to provide the Board in October, 2000, with an update on potential increases in hydrocarbon emissions from materials permeability with the use of ethanol in gasoline, and to report to the Board on the results of permeability testing by December, 2001.

With regard to commingling, the Board found that because as little as 2 vol.% ethanol in gasoline will raise the RVP by about 1 psi, commingling ethanol blends with non-ethanol containing gasoline in a motor vehicle fuel tank will raise the RVP of the hydrocarbons that had not previously been blended with ethanol, resulting in increases in evaporative emissions;

The extent of commingling and its effect on evaporative emissions depends on several factors, including whether the federal RFG year-round 2 wt% oxygen requirement will continue to apply in California, refiner choices regarding the mix of gasolines in a given area, and customer choices regarding brand and grade loyalty.

The ARB staff estimates that commingling in California could increase average RVP by between 0.03 psi and 0.2 psi, with a best estimate of about 0.1 psi; the 6.9 psi RVP limit when the evaporative model is used and the approved T50 and T90 specifications offset these emission increases associated with commingling while maintaining real-world benefits.

In Resolution 99-39, the Board directed the Executive Officer, upon implementation of the CaRFG3 regulations in 2003, to evaluate whether the regulations actually maintain or improve upon emissions and air quality benefits achieved by CaRFG2 as of January 1, 1999 and to report to the Board by 2004 on the results of the evaluation, including effects for commingling, along with any appropriate recommendations.

## **ARB Predictive Model Issues**

Comment: The peer reviewers noted that the ARB CaRFG3 Predictive Model has been used to calculate the benefits of the proposed CaRFG3 regulations. ARB staff notes that most of the gasoline produced in California is based on the ARB Predictive Model. It would be useful to have more information on the statistical properties of the models so that any uncertainty can be judged. The staff proposes to add a new technology group, and there appears to be justification for this addition, although the difficult question of high emitting vehicles requires ongoing research efforts.

Agency Response: The updates reflected in the proposed CaRFG3 Predictive Model will more accurately reflect changes in the vehicle fleet, account for changes in new vehicles' response to changes in fuel properties, and increase the robustness of the data set that is used to create the model.

An assessment of the uncertainty, while very difficult to calculate, has been provided to the peer reviews based on the review of the CaRFG3 Predictive Model by a qualified statistician.

## **CO Credit Issues**

Comment: The peer reviewers indicated that ARB staff is proposing that CO be accounted for in the overall ozone formation process and appropriate addition given the relatively new information on its importance. This is an appropriate and important addition, as CO is a precursor to ozone. It is important, however, in doing so that ARB maintain a consistent approach from modeling behavior of all ozone forming compounds. The value of examining issues such as these should not be underestimated, and the continued input from outside experts should be encouraged.

Agency Response: Allowing a hydrocarbon credit for gasoline that provides CO emissions reductions associated with an oxygen content greater than 2.0 wt. %; the credit is based on the relative reactivity of CO emissions compared to the reactivity of the various hydrocarbon species. ARB staff used the Carter maximum incremental reactivity (MIR) factors (California Non-Methane Organic Test Procedures, Amended June 24, 1996, Monitoring and Laboratory Division, California Air Resources Board). Further, ARB staff will update the ARB models to reflect recent vehicle emissions test data and changes in the current and future vehicle fleet.

The proposed amendment allowing a CO credit for gasoline having an oxygen content greater than 2.0 wt. % appropriately recognizes the ozone-forming potential of CO and the impact of CO emissions reductions that result from increasing oxygen content on ozone formation; this amendment will provide additional incentives to use ethanol as a blending component.

## **Driveability Index (DI) Issues**

Comment: The peer reviewers had concerns about the DI because they believe the DI is a property that is a subjective measure obtained from trained drivers. Further, that the DI does not have a direct connection to the emissions as the other regulated properties do. The peer

reviewers believe that the ARB Predictive Model should capture the effects of changing the parameters responsible for the DI. Further, the peer reviewers suggested that a DI of 1225 is not justified, and it appears to be between the values promoted by the automobile manufacturers and the oil companies. Based on what was said at the December 9, 1999 public hearing on the CaRFG3 regulations, the peer reviewers supported the ARB staff's proposed changes (see in agency response).

Agency Response: ARB staff removed the recommendation in the proposed CaRFG3 regulations for a Driveability Index (DI) specification.

Also, the Board directed the ARB Executive Officer to evaluate the DI of in-use CaRFG3 to determine whether the in-use DI levels are adequate to minimize any adverse impacts of the DI levels on the in-use emissions performance of motor vehicles and to report back to the Board by 2004 with the results and any appropriate recommendations. Further, the Board directed the ARB Executive Officer to transmit to the U.S. EPA Administrator the Board's recommendation that the U.S. EPA adopt a nationwide gasoline DI standard to assure the adequate emissions performance of existing and advanced technology motor vehicles.

### **CARBOB Issues**

Comment: The peer reviewers expressed concern that there are many unresolved issues regarding CARBOB provisions, such as fungibility, sampling and testing, and certification to the proposed standards. The reviewers stated that they knew that ARB staff is aware of these issues and that ARB staff was unable to address many of them because of time and resource constraints. The peer reviewers indicated that while these issues do not have a direct impact on expected emissions, the forthcoming studies need be examined to ensure there are no significant negative impacts on the implementation of the regulations.

Agency Response: The Board directed, in ARB Resolution 99-39, the ARB Executive Officer to propose to the Board, for consideration by October, 2000, appropriate further amendments to the CaRFG3 regulations to assure the practical and effective implementation of the provisions on CARBOB and imported gasoline.

While the proposed amendments eliminating the CARBOB quality audit requirements appropriately provide additional flexibility, additional CARBOB issues still need to be addressed to assure a smooth transition to an increased use of ethanol in California gasoline.

### **Provisions for Adjustments**

Comment: The peer reviewers recommended that the Board may wish to consider adopting the proposed recommendations but with provisions for adjustments to the regulations based on revisions of draft documents such as EMFAC99.

Agency Response: Provisions were included in the ARB Board's Resolution 99-39 for the weighting of evaporative, exhaust, and CO emissions, and the balancing of the Tech Group

weights of the CaRFG3 Predictive Model to be updated as necessary to reflect the EMFAC 2000 mobile source emissions inventory model once those elements of the inventory are approved.

### **Continue to Seek Federal Oxygenate Waiver**

Comment: The peer reviewers strongly recommended that the State persist in its efforts to obtain waivers for the (federal) oxygenate provisions.

Agency Response: On December 24, 1999, and February 7, 2000, the staff submitted additional materials in support of the Governor Davis' request of the U.S. EPA for a waiver from the federal oxygen requirement. On February 14, 2000, U.S. EPA Assistant Administrator, Robert Perciasepe confirmed receipt of California's completed application for a waiver from the reformulated gasoline program's oxygen requirement in the Clean Air Act. California continues to work closely with U.S. EPA and Congress to obtain a federal oxygenate waiver for California.

### **Provide More Text on CaRFG3 NO<sub>x</sub> Emission Reductions**

Comment: The peer reviewers recommended that ARB staff devote more text to the advantages in California of reduced NO<sub>x</sub> emissions for both ozone control and secondary aerosol formation, and the benefits that might be accrued in reducing NO<sub>x</sub> if the oxygenate requirement is eliminated.

Agency Response: ARB staff devoted significantly more time and effort in preparing the additional submittal materials to the U.S. EPA. This receipt of this material has been confirmed by the U.S. EPA. A significant portion of the materials submitted was in support of the position that relief from the federal oxygen requirement would lead to further reductions in emissions of NO<sub>x</sub>.

### **Support Reduction in Sulfur Content**

Comment: The peer reviewers recommended that the reduction in CaRFG3 sulfur content be supported. One of the key tensions in developing these amendments is the need to provide flexibility to refiners while still developing predictable fuel specifications for which the auto manufacturers can reliably design. Reducing sulfur reduces hydrocarbon, oxides of nitrogen, and toxics emissions.

Agency Response: The Board directed the Executive Officer to work with the CEC staff to evaluate the sulfur levels of gasoline produced to comply with the CaRFG3 regulations, and the expected impacts of an ultra-low-sulfur flat or cap limit for California gasoline on California gasoline supplies, production and import volumes, production costs, and the ability of refiners to produce complying California gasoline on a consistent basis, and to report back to the Board by July 2002, with recommendations, if appropriate on lowering future sulfur levels in California gasoline.