

State of California  
AIR RESOURCES BOARD

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

PUBLIC HEARING TO CONSIDER AMENDMENTS TO THE SPECIFICATIONS FOR  
LIQUEFIED PETROLEUM GAS (LPG) USED IN MOTOR VEHICLES

Public Hearing Date: December 11, 1998  
Agenda Item No.: 98-15-4

**I. GENERAL**

This rulemaking was initiated on by the publication on October 23, 1998 of a notice for a December 10-11, 1998 public hearing to consider amendments to the regulation governing specifications for liquefied petroleum gas (LPG) sold commercially for use in motor vehicles. A Staff Report: Initial Statement of Reasons was also made available for public review and comment on October 23, 1998. The Staff Report, which is incorporated by reference herein, contained the text of the regulatory amendments as originally proposed by the staff, along with an extensive description of the rationale for the proposal. The hearing notice and Staff Report were also posted on the Internet site for the rulemaking, <http://www.arb.ca.gov/regact/lpgspecs/lpgspecs.htm>.

The proposed action consisted of amendments to the specifications for vehicular LPG in section 2292.6, title 13, California Code of Regulations. The Air Resources Board (ARB or Board) originally adopted the LPG specifications in 1992, to become applicable January 1, 1993. The original regulation included a maximum limit on propene content of 5.0 percent by volume (vol.%). However, due to concern that the supply of complying LPG might be unreliable, the Board established an interim propene content limit of 10 vol.%, with the 5 vol.% propene limit becoming applicable January 1, 1995. In 1994 and again in 1997, the Board adopted two-year delays of the 5 vol.% propene limit because of continuing supply concerns; the second delay ran until January 1, 1999. In this rulemaking, the staff initially proposed that: (1) the interim propene content limit of 10.0 vol.% be made permanent, (2) a new specification of 0.5 vol.% be established for the maximum content of "butenes, pentanes, and heavier," and (3) the optional specification of 2.5 vol.% for the maximum content of "butanes and heavier" be changed to 5.0 vol.% for the maximum content of "butanes, butenes and heavier."

The staff proposal was based in part on the available results of an LPG test program, which was coordinated by staff with an LPG Task Group established by the ARB to oversee the project. The test program is described in Chapter III of the Staff Report. It was designed to collect data regarding emissions, engine performance and engine durability associated with different formulations of LPG. By the time of the December 11, 1998 Board hearing, only the emissions tests were completed, and the performance and durability tests were still in progress.

At the December 11, 1998 hearing, the Board adopted Resolution 99-22, in which it approved the proposed amendments with four modifications described in the next Section. In accordance with section 11346.8 of the Government Code, the Resolution directed the Executive Officer to make the text of the modified amendments available to the public for a supplemental written comment period of 15 days. He was then directed either to adopt the regulations 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.

The modified text of section 2292.6 in the form approved by the Board was made available for a supplemental 15-day comment period by issuance of a Notice of Public Availability of Modified Text on January 14, 1999. Two written comments were received during the supplemental comment period. In light of one of the comments, a further modification was made available for another supplemental comment period by issuance of a Second Notice of Public Availability of Modified Text on June 29, 1999. After consideration of the four written comments submitted in response, on October 20, 1999 Executive Order G-99-072 was issued on behalf of the Executive Officer, adopting the modified amendments.

**Incorporation of Test Procedure.** The amendments to section 2292.6 incorporate by reference American Society of Testing and Materials (ASTM) Test Method D 2163-87, entitled “Standard Test Method for Analysis of Liquefied Petroleum (LP) Gases and Propene Concentrates by Gas Chromatography.” This document is readily available from the ARB upon request and was made available in the context of this rulemaking in the manner provided in Government Code section 11346.5(b). The document is also published by ASTM, a well-established and prominent standards-setting organization, and is therefore reasonably available to the affected public from a commonly-known source. The document was incorporated in the California Code of Regulations because it would be cumbersome, unduly expensive, and otherwise impractical to publish it in the Code. It has been a longstanding and accepted practice of the ARB to incorporate ASTM test methods into the Code by reference (see, e.g., sections 2263 and 2280-82, title 13, California Code of Regulations). As the interested public is small (most specifically those persons who actually conduct the tests), distribution to all recipients of the Code is unnecessary.

**Fiscal impacts.** The ARB has determined that this regulatory action will neither create costs or savings to any State agency nor affect federal funding to the State. The ARB has also determined that the amendments will not create costs or impose a mandate upon any local agency or school district, whether or not it is reimbursable by the State pursuant to Part 7 (commencing with section 17500), Division 4, Title 2 of the Government Code; or affect other non-discretionary savings to local agencies.

**Consideration of alternatives.** The ARB has also determined that no alternative was presented or considered which would be more effective in carrying out the purpose for which the regulatory action was proposed, or which would be as effective and less burdensome to affected private persons, than the adopted amendments.

## II. MODIFICATIONS TO THE ORIGINAL PROPOSAL

The adopted amendments reflect four modifications to the original proposal. The first modification pertained to the maximum 5 vol.% limit for “butanes, butenes and heavier.” This was ultimately modified to apply to simply to “butanes,” since a separate 2.0 vol.% butene limit was being adopted as part of the second modification.

The second modification pertained to the new proposed new 0.5 vol.% limit on “butenes, pentanes, and heavier.” As finally adopted, the new 0.5 vol.% limit applies only to pentenes and heavier (thus excluding butenes from this category of regulated compounds), and a second new 2.0 vol.% limit applies to the maximum butene content. This reflects two basic revisions. First, the adopted language includes both pentenes and pentanes in the compounds subject to the new 0.5 vol.% limit, while the original proposal excluded pentenes (due to the fact that pentenes have a lighter molecular weight than pentanes). This effectuated the staff’s original intent to include pentenes. In addition, a higher butene content is allowed than under the original proposal, since up to 2.0 vol.% butenes are allowed under the final amendments instead of placing butenes among the compounds subject to the 0.5 vol.% limit.

During the first supplemental comment period, a comment was received from one current producer of HD-5 grade LPG (maximum 5 vol.% propene) which indicated that the producer may not be able to meet the amended specifications if butenes were included in a 0.5 percent by volume limit on “butenes and heavier, excluding butane.” Staff had intended that the amendments to the fuel specifications would maintain the quality of LPG sold for motor vehicle use without prohibiting the sale of HD-5 grade LPG formulations currently being sold in California. Staff accordingly reevaluated the need to impose a very stringent specification for butenes. A butene specification is nonetheless reasonable since butenes belong to the chemical family of olefin hydrocarbons, which have been found to increase the ozone forming potential of vehicle exhaust emissions. Olefin hydrocarbons also are known to increase evaporative and exhaust emissions and do warrant a limiting specification. These considerations led to exclusion of butenes from the compounds subject to the 0.5 vol.% limit, while limiting maximum butene content to 2.0 vol.%.

The third modification reduced the maximum permissible sulfur content in motor vehicle LPG from 120 parts per million by weight (ppmw) to 80 ppmw, in order to mitigate the potential loss of emission benefits from the amendment maintaining the maximum propene content level of 10 percent by volume.

The final modification adds a statement that in five years the ARB will review the California Code of Regulations chapter containing the motor vehicle LPG specifications to determine whether it should be retained, revised, or repealed. This modification provides for periodic sunset review of the regulations.

### III. SUMMARY OF COMMENTS AND AGENCY RESPONSES

Prior to or at the December 11, 1998 hearing, the Board received written comments on the proposal from the Advanced Technology International Corporation (ATIC), the Engine Manufacturers' Association (EMA), Ford Motor Company (Ford), Industrial Truck Association (ITA), ARCO Products Company (ARCO), the Western Propane Gas Association (WPGA), the Adept Group (Adept), and the California Trade and Commerce Agency (Trade and Commerce). Oral testimony was presented by EMA, Martinez Refining Company (MRC), the National Propane Gas Association (NPGA), Adept, and WPGA. During the first 15-day supplemental comment period, written comments were received from ARCO and WPGA. During the second 15-day supplemental comment period, written comments were received from Adept, WPGA, Campora Propane (Campora) and Cornerstone Propane (Cornerstone).

Set forth below is a summary of each objection or recommendation regarding the proposed amendments, or the procedures used by the ARB, together with an explanation of how the proposed action was changed to accommodate each objection or recommendation, or the reasons for making no change.

#### A. Comments Made Prior to or at the Hearing

1. Comment: The proposed regulation text on the 5 vol.% limit for "butanes, butenes, and heavier, and the 0.5 vol.% limit for butenes, pentanes, and heavier" are unclear given staff's expressed intent, and needs to be changed. This clarity issue can be resolved by rewording the specifications as follows:

<u>butenes, butanes and heavier</u>	<u>2.5 5.0 vol.% (max.)</u>
<u>butenes and heavier, excluding butanes</u>	<u>0.5 vol.% (max.)</u>

(Trade and Commerce)

Agency Response: We agree. The modified text made available in connection with the first Notice of Availability of Modified Text reflected the commenter's recommended changes. However, further changes to the specifications were made in response to comments provided during the supplemental comment period.

2. Comment: Ford recommends that the Board include a lower, more realistic sulfur specification for LPG in this proposal. The current specification of 120 ppmw is unnecessarily high and should be reduced to no more than 80 ppmw, a value appropriate for bi-fuel LPG vehicles, which also operate on California Phase 2 gasoline. (Ford)

Agency Response: The Board has modified the proposed amendments to incorporate the lower 80 ppmw sulfur specification recommended by Ford. Staff agrees that the lower sulfur content of LPG becomes increasingly important for future LPG vehicles, which are certified with catalytic converters.

Staff also recognized that a lower sulfur specification may limit a producers' ability to make California motor vehicle LPG. Therefore, California LPG producers were surveyed to determine their typical range of sulfur content in LPG before and after being additized with odorant. Staff found that typically LPG will not exceed the 80 ppmw sulfur level, except for the rare instances when LPG is intentionally over-odorized.

Staff also evaluated data from a Phillips Petroleum Co. study suggesting that the copper corrosion specification in HD-5 LPG practically limits the LPG sulfur content to under 80 ppmw. The data by Phillips shows that an LPG blend prior to additization would fail the copper corrosion test required by the HD-5 specification if the maximum sulfur level ever exceeded 30 ppmw. At 1.5 times the required odorant dosage, the amount of sulfur added is expected to be about 25 to 35 ppmw. Hence, the only practical way an HD-5 LPG mixture (including out-of-state imports) could exceed the 80 ppmw sulfur limit is if it were intentionally over-additized.

3. Comment: The new Large Spark Ignited Emissions regulations – approved by the Board October 22, 1998 – are as stringent as on-highway vehicle regulations. They directly affect the spark-ignited engines used in forklift trucks, where LPG fuel use is in the range of 70% to 80%. Poor LPG quality has been a problem for many years, affecting both durability and performance. As equipment manufacturers and possible holders of engine emissions certification, it is felt that increasing the allowable propene content to 10 vol.% for in-use application is unacceptable because engines or vehicles are currently certified on HD-5. (ITA)

Agency Response: The data from the ARB's LPG test program indicate that there will not be performance issues resulting from the use of 10 vol.% propene, 5 vol.% butane LPG. The study also showed no statistically significant difference in criteria pollutant emissions between a 5 and 10 vol.% propene LPG fuel blend. Ford did not oppose staff's recommendation to change the standard to 10 vol.% propene even though the company is directly affected by this amendment as well.

4. Comment: By increasing the propene content of the fuel to 10 vol.%, the octane reading of that fuel will be lowered, and this in turn will jeopardize the performance and durability of diesel-cycle LPG engines. (EMA)

Agency Response: As indicated by staff at the December hearing, the proposal to raise the propene level to 10 vol.% will result in a one octane number reduction. This small a change is not expected to adversely affect engine performance.

5. Comment: If the current specifications are maintained, or the less stringent ones are accepted, the addition of CGX-4® by LPG dealers or refiners should be considered in order to assure the public of fuel that would not increase maintenance cost on the carburetion system or increase exhaust emissions. (ATI)

Agency Response: At this time, there are no restrictions placed on the use of LPG additives. We recognize that it is common practice within industry to use LPG additives that reduce fuel system deposits. However, this suggestion is beyond the scope of this rulemaking, and we do not have enough data on the CGX-4® additive to justify including it in the LPG motor vehicle specifications.

6. Comment: Language should be added to the regulation to reflect that the results of the performance and durability testing were not available when the amendments were adopted and any adverse findings would be considered by the ARB, thus indicating the interim nature of these changes. (WPGA)

Agency Response: At the December 11, 1998, hearing, the Board directed staff to report back once the ARB LPG test program was complete. The regulatory language recommended by the commenter is unnecessary and would not have a regulatory effect.

7. Comment: The quickest way that we can kill the California use of propane as an alternative fuel is to require segregated propane as a motor vehicle fuel. We encourage you to delay this rulemaking for a few months until the LPG Task Group has completed its work, or to adopt the staff's proposal temporarily until the information is fully available from the LPG Task Group. After which, staff should come before the Board again to reconsider the LPG specifications. (NPGA)

Agency Response: For the reasons set forth in this Final Statement of Reasons, we do not believe that the adopted amendments will result in segregation of LPG intended for use in motor vehicles. Staff's proposals were based on available results from the LPG test program. Even though the performance and durability studies were still under way, the preliminary results indicated that staff's proposals are reasonable. Given the January 1, 1999 trigger date in the regulation, it is appropriate for the Board to act at the December hearing. Furthermore, staff plans to provide the Board an update of the LPG test program and to propose new modifications to the LPG specifications if warranted.

8. Comment: Current California producers make LPG generally meeting the motor vehicle specifications, but they will not certify the product as such. They argue that since motor vehicle LPG is a small part of the market (about 8,000 barrels per day), it is not in their interest to certify LPG as motor vehicle grade. Therefore, we are requesting that the Board direct staff to develop new uniform LPG specifications which are representative of both commercial and motor vehicle fuel properties. This would simplify compliance efforts, and allow for accountability from producers and marketers. (WPGA)

Agency Response: The Board does not have the authority to establish specifications for nonvehicular commercial LPG. Modifying the specifications for motor vehicle LPG to be the same as commercial LPG will not assure adequate vehicle or emissions performance from LPG vehicles.

9. Comment: We recommend that the Board adopt staff's proposals with four modifications:

1. Make the approval conditional upon review of the performance and combustion and the durability tests within 6 months and require re-evaluation of the LPG specifications within three years,
2. Insure that the agreed upon test program is complete,
3. Allow for alternative LPG formulations based on a formulated protocol, or an LPG emissions predictive model,
4. Delete the line that pertains to "butenes, pentanes, and heavier" compounds that may be found in LPG fuel blends because these specifications were not addressed in the LPG test program. (Adept)

Agency Response: The adopted amendments to the LPG specifications balance the need for production flexibility with the need for LPG with adequate emissions and vehicle performance. Staff based its proposal on the results of the Adept Group LPG test program, in consultation with engine manufacturers, the oil industry, and other affected stakeholders. Even though the results of the performance and combustion test phases were not complete at the time of the December hearing, the available data indicated that there would be any significant adverse impacts from the 10 percent propene and 5 percent butane LPG specifications proposed to the Board. However, as suggested by the commenter, the Board also adopted an amendment that provides that the LPG regulation is to be reviewed in the future to determine if the regulation should be maintained, revised or rescinded. The Board also directed staff to present the results of the LPG test program once complete.

Because the ultimately adopted amendments to the LPG specifications afford the needed production flexibility, producers will be able to provide sufficient motor vehicle grade LPG to meet the LPG vehicle demand. We therefore believe there is no need at this time to allow for alternative formulations. Development of a technically sound LPG predictive model would require extensive resources and additional data.

With regard to the suggestion to remove the specification for "Butenes, pentanes, and heavier," the originally proposed approach has been revised, and modified language was made available for supplemental comment. Also see the response to Comment 18.

10. Comment: We recommend that the Board adopt a unified specification for both commercial and motor vehicle grade propane. (WPGA)

Agency Response: The Board does not have the authority to establish specifications for commercial LPG. Also, modifying the specifications for motor vehicle LPG to be the same as commercial LPG will not assure adequate vehicle or emissions performance from LPG vehicles.

11. Comment: Typically, odorants are added to LPG to comply with the odorant specification. Therefore, to lower the maximum allowable sulfur content to 80 ppmw actually is a health and safety concern. (WPGA)

Agency Response: We believe that there will be no safety issues raised by lowering the sulfur content to 80 ppmw. As indicated by the commenter, sulfur compounds are typically added to LPG to meet the odorant specification associated with the ARB motor vehicle specifications and federal requirements. The ARB specification requires that enough odorant be added to “provide a detectable odor down to one-fifth the lower flammability limit of LPG”. Staff found that this specification is generally met through the addition of up to 1.5 pounds of ethyl mercaptan per 10,000 gallons of LPG. At this treatment rate, the overall sulfur content of LPG is well below the proposed 80 ppmw sulfur limit.

12. Comment: We believe that it would be to the benefit of California if the ARB presented the proposed LPG motor vehicle fuel recommendation as an interim specification versus a final recommendation. By keeping the door open to continue to develop a broader motor fuel specification, we are more assured of fuel availability and continued development of clean alternative fuels and vehicles. We at ARCO are interested in continuing and supporting this dynamic program. (ARCO)

Agency Response: We believe there is sufficient data supporting the ultimately adopted amendments that they should not be identified as “interim” specifications. However, as indicated elsewhere a modification to the regulation states that it is to be reviewed in five years. Staff plans to monitor implementation and further developments, and will recommend appropriate revisions if appropriate before the end of the five year period.

#### **B. Comments Received During the First 15-Day Supplemental Comment Period**

13. Comment: We are concerned with the 0.5 vol.% limit on “butenes.” We are building a polypropylene recovery unit at our Los Angeles refinery which is scheduled to come on line in 1999. Due to the process changes, we will not be able to meet the 0.5 vol.% butene requirement. This is a new addition to the specification as the past HD-5 specification did not have this restriction on butenes. There are two reasons the 0.5 vol.% limit on butenes causes difficulty. First, since butenes are lighter than butanes, and therefore are released first, the 0.5 vol.% butene limit would also significantly limit the amount of butanes in the LPG product. Secondly, the design values for the propylene unit are higher than 0.5 vol.%; limiting butenes to 0.5% would impact the propylene recovery and thus impact the economics of our new plant.

Since early 1997, we have been making exclusively HD-5 grade LPG to support ARB’s efforts for a cleaner LPG motor vehicle specification; the HD-5 specification allowed for higher levels of butenes. Therefore, we are proposing either of the following changes to the specifications:



1. Butenes, butanes and heavier to not exceed 5.0 percent by volume with butenes and heavier excluding butanes not to exceed half (2.5 percent) of this volume.
2. Increase butenes and heavier excluding butanes from 0.5 percent by volume to 2.5 percent by volume. (ARCO)

Agency Response: Given this situation, we agree that there is a need to adjust the butene specification. It was not the intent of the proposal to prohibit HD-5 grade LPG formulations currently being sold in California. Accordingly, the modifications made available in the second 15-day comment period identify a maximum 2.0 vol.% limit for butenes, and a 5.0 vol.% limit on butanes.

14. Comment: In our view, the folks that make propane in California have not had enough time or desire to identify whether or not the sulfur or butene limits pose a problem to them. We fear that enforcement may adversely affect propane supply in the short term at a time when we need all the propane we can get for residential heating uses. WPGA therefore requests additional time for study and comment on these limitations prior to adopting and implementing the proposed amendments.” (WPGA)

Agency Response: Staff believes that most LPG producers will continue to produce LPG for the California motor vehicle market. The amendments being proposed have been shared with all LPG producers in California during the formal rulemaking process. Staff has also met with several individual producers to discuss specific concerns related to the proposed specifications. Furthermore, changes were made to the butene limits because of concerns raised during the first 15-day comment period, which will further provide production flexibility.

### **C. Comments Received During the Second 15-Day Supplemental Comment Period**

15. Comment: This is to register our concerns regarding the proposed LPG engine fuel specifications, specifically the specification for sulfur content as it applies to LPG with a propene level of 5.0 vol.% or less. Large volumes of propane are imported into California usually during the winter months, meeting the specifications for “Special Duty/HD-5” propane. The HD-5 specification allows sulfur content to be 123 ppmw maximum. However, the proposed ARB requirement is at 80 ppmw. Normally we would not expect the sulfur content of imported HD-5 propane to approach even the more severe 80 ppmw allowed by the ARB, but it is legal to do so nonetheless. Our industry could therefore receive import propane, which does not meet the CARB sulfur specification during a great portion of the year, when supplies are restricted due to high heating load demand. This is not only unfair to marketers, but could lead to major supply disruptions when Californians need propane the most. (WPGA)

Furthermore, it is stated in the staff report that “it is not staff’s intent for the amendments to prohibit HD-5 grade LPG formulations currently being sold in California. However, if HD-5 has sulfur content greater than 80 ppmw, then it will be precluded for sale in California and that statement becomes fallacious. (WPGA)

CARB needs to add a paragraph “e” to the specifications allowing ASTM D-1835 “Special-Duty Propane” and / or GPA “HD-5” as alternatives for use in motor vehicles. (WPGA, Cornerstone)

Sulfur Content should not be changed to 80 ppm from 120 ppm. This was not properly discussed nor was it part of the Task Group approved protocol. Also the lower sulfur content condition is not likely to be met by HD-5 LPG legally imported in California during the winter months. (Adept)

Agency Response: The ARB’s specifications are set to assure adequate fuel quality in terms of vehicle performance and emissions. The limits on sulfur, butenes, and the heavier components are specifically chosen for these reasons, and are not part of the HD-5 or special-duty propane specifications. Further, in practice, HD-5 will meet the ARB specifications, but the ARB specifications provide more assurance to vehicle owners and vehicle manufacturers by specifying a fuel that will be more controlled in terms of its composition and will result in a more consistent quality.

To further evaluate the potential impact of the 80 ppmw sulfur specification, staff conducted a survey of out-of-state suppliers and California marketers who import LPG to determine typical sulfur contents. In general, staff found that imported LPG will contain sulfur content below the proposed 80 ppmw. Also, as discussed in the response to Comment 2, the copper strip corrosion specification contained in the HD-5 specifications will also serve to keep LPG sulfur content below 80 ppmw. Therefore, staff expects that imported HD-5 will meet the amended ARB motor vehicle LPG specifications.

16. Comment: The sulfur content of LPG engine fuel was reduced to 80 ppmw “in order to mitigate the potential loss of emission benefits from the amendment maintaining the maximum propene content level of 10.0 vol.%.” Does this mean that if the propene content of the LPG were 5.0 vol.% or lower, that the sulfur content could be raised to 123 ppmw? (WPGA)

Agency Response: No. The 80 ppmw sulfur standard represents a maximum limit and staff expects that California motor vehicle LPG will have a sulfur content less than 80 ppmw (see response to Comment 2). The statements made by staff regarding lowering the sulfur content simply meant that lower sulfur in LPG directionally lowers emissions from LPG used in motor vehicles with catalysts. Thus, the lower sulfur standard may help offset any potential increases in emissions that might occur with the use of higher propene LPG fuels.

17. Comment: The Second Notice of Public Availability of Modified Text indicates it is not staff’s intent to prohibit HD-5 grade formulations currently sold in California. But if “California Spec” and “HD-5 Spec” loads are mixed together in the same tank, I could have two loads of non-spec fuel because the sulfur content could exceed 80 ppmw. Thus reconsideration needs to be given to the sulfur value. This is even more critical due to the type of odorant used. (Campora Propane)

Agency Response: The adopted amendments do not automatically allow HD-5 Grade LPG if the sulfur content exceeds 80 ppmw. However, for the reasons set forth in the Responses to Comments 2 and 15, we do not believe that HD-5 with a sulfur content exceeding 80 ppmw will be coming into California.

18. Comment: The suggested change in the butene maximum volume percentage is difficult to justify at this late date. It was not discussed by the Task Group, nor was it part of the protocol agreed upon by the Task Group. The issue requires further review and discussion within the Task Group. This item should not be part of a 5 year longstanding regulation. The suggested change may be an interim solution while proper review and action are taken. (Adept)

Agency Response: The initial proposed amendment to the LPG specifications included a maximum butene content limit of 0.5 vol.%. This level was proposed by staff to provide more specificity in the LPG specifications to ensure the quality of the fuel, since butene had not been separately regulated. However, in response to staff's proposal, a comment was received from an LPG producer indicating that it would not be able not meet the proposed 0.5 vol.% butene limit. The result would likely be a reduction in the supply of motor vehicle grade LPG. The modification expanding the butene limit to 2 vol.% maximum was developed to ensure adequate supply of LPG.

We believe that it is advisable to maintain a limit on maximum butene content and that the 2 vol.% butene limit is reasonable given the information provided by commenters. It is ultimately the ARB's responsibility to determine the specifications for LPG intended for use in motor vehicles. No information has been provided indicating that the 2 vol.% butene limit will have a significant effect on vehicle emissions or performance. The modified butene limit was reviewed by the auto and engine manufacturers during the supplemental comment process, and we have not received any comments indicating an adverse impact on vehicle performance or durability.

Staff intends to monitor the implementation of the butene specification and will recommend appropriate recommendations to the Board if necessary prior to the mandatory five year review.

19. Comment: Although we clearly support a limit on "pentanes and heavier" in LPG for internal combustion use, it is not clear how the 0.5 vol.% max. cap is right. Why not 1 vol.%? Or 3 vol.%? The issue was not properly discussed not was it covered in the Task Group agreed-upon protocol. The proposed modification should not be part of a 5 year longstanding regulation. The suggested change may be an interim solution while proper review and action are taken. (Adept)

Agency Response: The adopted 0.5 vol.% limit applies to "pentenes and heavier" (which includes pentanes), rather than "pentanes and heavier" as characterized by the commenter. The original staff proposal would have imposed an 0.5 vol.% maximum limit on "butenes, pentanes and heavier." This necessarily meant that pentane (and

pentene) contents above 0.5 vol.% were not allowed regardless of the butene content. Excluding butenes from the constituents subject to the 0.5 vol.% limit makes the limit less stringent than originally proposed.

The rationale for the original 0.5 vol.% limit was to prevent the extra butane-and-heavier (permitted by the increase from 2.5 to 5.0 vol.% maximum) from being substantially non-butane. The second 15-day changes made the 5.0 vol.% limit applicable to butanes only, eliminating that element's restriction on constituents heavier than butanes. This reinforces the need to separately limit pentenes, and the original 0.5 vol.% cap is reasonable. One reason for the limit is that compressor oils and other contaminants have been known to cause vehicle performance problems associated with fuel injector deposits. The specification was provided to LPG producers during the supplemental comment process, and no comments were received from LPG producers indicating that there would be a problem in meeting the specification.

Staff intends to monitor the implementation of the pentene and heavier specification and will recommend appropriate recommendations to the Board if necessary prior to the mandatory five year review.

20. Comment: The LPG regulation should not be entrenched for 5 years. Worst case, these specifications should be reviewed within three (3) years to address the issues in comments 17 and 18, and to allow for consideration of new engine technology. (Adept)

Agency Response: One of the modifications to the originally-proposed regulatory text was addition of a statement to the effect that the ARB will review the LPG specifications within five years. If, based on new information, the staff determines it is appropriate to recommend further changes to the LPG regulation prior to the five year review, then staff will do so. However, it would not be the most effective use of Board and staff resources to mandate a formal review in less than five years.

21. Comment: I question the date of the test method designated for butenes and pentenes. You reference an outdated test method in 2163-87. There is a more current revision. Also, unless it is your intent to use "obsolete" test methods in the future, I suggest that you reference the test method without the year of revision. The test method on question would be ASTM D 2163. It would only be necessary to note that the test methods listed are the most current revision. (Cornerstone)

Agency Response: The test method referenced in the LPG regulation is for ARB compliance testing purposes. The LPG suppliers and producers may use any test method they choose as part of their quality assurance programs. However, the ARB will use ASTM D 2163-87 to verify compliance with the specifications. The amendments are not adding a new test method. Rather they are continuing to identify the previously referenced test method for determining the constituents of LPG. This issue was not raised until the second 15-day comment period, and the commenter has not identified any substantive reason why it is necessary at this time to identify a later version of the ASTM test method.

The ARB is not authorized to designate ASTM test methods without specifying the year of revision. Section 20(c)(4), title 1, California Code of Regulations provides that when a regulation incorporates a document by reference, the regulation must identify the document by title and date of publication or issuance. The only exception is “where an authorizing California statute or other applicable law requires the adoption or enforcement of the incorporated provisions of the document as well as any subsequent amendments thereto.” The ARB’s authorizing statutes do not contain such a provision. There are also sound policy considerations for these restrictions. Since subsequent revisions to a test method may affect the stringency of the regulation, it is inappropriate for such a revision to go into effect without action by the agency decision-makers.