State of California
AIR RESOURCES BOARD

Final Statement of Reasons for Rulemaking
Including Summary of Comments and Agency Responses

PUBLIC HEARING TO CONSIDER ADOPTION OF NEW CERTIFICATION TESTS AND STANDARDS TO CONTROL EMISSIONS FROM AGGRESSIVE DRIVING AND AIR-CONDITIONER USAGE FOR PASSENGER CARS, LIGHT-DUTY TRUCKS, AND MEDIUM-DUTY VEHICLES UNDER 8,501 POUNDS GROSS VEHICLE WEIGHT RATING

Public Hearing Date: July 24, 1997
Agenda Item No.: 97-6-1

I. GENERAL

In this rulemaking the Air Resources Board (ARB or Board) is amending its regulations to establish new certification tests and standards to control emissions from aggressive driving and air-conditioner usage for passenger cars, light-duty trucks, and medium-duty vehicles under 8,501 pounds gross vehicle weight rating. The certification tests are referred to as the Supplemental Federal Test Procedure, or SFTP. The rulemaking was initiated by the June 6, 1997 publication of a notice for a July 24, 1997 public hearing to consider the amendments. A Staff Report (Initial Statement of Reasons for Proposed Rulemaking) was also made available for public review and comment on June 6, 1997. The Staff Report, which is incorporated by reference herein, contained the text of the regulatory amendments as initially proposed by the staff, along with an extensive description of the rationale for the proposal.

The originally proposed action consisted of amendments to California Code of Regulations (CCR), title 13, sections 1960.1 and 2101, and the incorporated "California Exhaust Emission Standards and Test Procedures for 1988 and Subsequent Model Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles" (the LDV/MDV Standards and Test Procedures) and "California New Vehicle Compliance Test Procedures" (New Vehicle Test Procedures).

On July 24, 1997, the Board conducted the public hearing, at which it received written and oral comments. At the conclusion of the hearing, the Board approved regulatory amendments by adopting Resolution 97-34. As approved, the amendments included various modifications to the originally proposed text, reflecting suggestions made by the staff at the July 24, 1997 hearing. These modifications were limited in nature and were generally designed to clarify the intent of the original proposal. Attachment D to the resolution described the modifications suggested by the staff and approved by the Board. In accordance with section 11346.8 of the Government Code, the resolution directed the Executive Officer to incorporate into the approved amendments the

modifications described in Attachment D, with such other conforming modifications as may be appropriate, and to make the modified regulatory language available to the public for a supplemental 15-day comment period. 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.

The text of the Board-approved regulatory modifications was made available for a supplemental 15-day comment period by issuance of a "Notice of Public Availability of Modified Text" on September 15, 1997. The modified regulatory language made available included one additional conforming modification, not presented at the hearing, to a separate test procedure document. On page 17 of the Staff Report, staff indicated that it was not proposing an assembly-line testing component in the proposed regulations. In order to effectuate this limitation, the additional modification amends the "California Assembly-Line Test Procedures for 1998 and Subsequent Model-Year Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles" (the Assembly-Line Test Procedures) to provide that demonstration of compliance with the SFTP standards is exempt from assembly-line quality audit testing. The modification also amends CCR, title 13, section 2062, which incorporates the Assembly-Line Test Procedures by reference, to reflect the new "last amended" date for the Assembly-Line Test Procedures. No written comments were received during the supplemental 15-day comment period.

Following the close of the supplemental 15-day comment period, the Executive Officer issued Executive Order G-98-001, amending CCR, title 13, sections 1960.1, 2062 and 2101, and the incorporated LDV/MDV Standards and Test Procedures and Assembly-Line Test Procedures.

This Final Statement of Reasons updates the Staff Report by identifying and explaining the modifications made to the originally proposed regulatory texts. The Final Statement of Reasons also contains a summary of the comments the Board received on the proposed regulatory amendments during the formal rulemaking process and the ARB's responses to those comments.

Incorporation of Test Procedures and Federal Regulations. The amended test procedures documents are incorporated by reference in CCR, title 13, sections 1960.1 and 2062. The LDV/MDV Standards and Test Procedures in turn incorporate certification test procedures adopted by the U.S. Environmental Protection Agency (U.S. EPA) and contained in 40 Code of Federal Regulations (CFR) Part 86.

California Code of Regulations, title 13, sections 1956.8, 1960.1, 1965, 2062, 2101, and 2292.1 identify the incorporated ARB documents by title and date. The ARB documents are readily available from the ARB upon request and were made available in the context of this rulemaking in the manner specified in Government Code section 11346.5(b). The CFR is published by the Office of the Federal Register, National Archives and Records Administration, and is therefore reasonably available to the affected public from a commonly known source.

The test procedures are incorporated by reference because it would be impractical to print them in the CCR. Existing ARB administrative practice has been to have the test procedures incorporated by reference rather than printed in the CCR because these procedures are highly technical and complex. They include the "nuts and bolts" engineering protocols required for certification of motor vehicles and have a very limited audience. Because the ARB has never printed complete test procedures in the CCR, the affected public is accustomed to the incorporation format utilized therein. The ARB's test procedures as a whole are extensive and it would be both cumbersome and expensive to print these lengthy, technically complex procedures with a limited audience in the CCR. Printing portions of the ARB's test procedures that are incorporated by reference would be unnecessarily confusing to the affected public.

The test procedures incorporate portions of the CFR because the ARB requirements are substantially based on the federal regulations. Manufacturers typically certify vehicles and engines to a version of the federal emission standards and test procedures which has been modified by state requirements. Incorporation of the federal regulations by reference makes it easier for manufacturers to know when the two sets of requirements are identical and when they differ.

Fiscal Impacts. The Board 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 the result of extensive discussions and meetings involving staff and the affected motor vehicle manufacturers. Staff seriously considered all of the alternatives proposed by industry. The Board has determined that no 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 than the action taken by the Board.

II. MODIFICATIONS TO THE ORIGINAL PROPOSAL

As noted above, the modifications to the original proposal consisted of minor changes to better reflect the staff's intent in the original proposal.

The provisions on disallowed "lean-on-cruise" calibration strategies were modified to refine the requirements. These provisions are in CCR, title 13, section 1960.1(q) note (8) and section 1960.1(r) note (9); identical language is in section 3.*l*. note (8) and section 3.m. note (9) of the LDV/MDV Standards and Test Procedures. The regulations define "lean-on-cruise" calibration strategy as the use of an air-fuel ratio significantly greater than stoichiometry, during non-acceleration conditions at speeds above 40 miles an hour. While such a strategy can improve fuel economy, it can also significantly increase oxides of nitrogen (NOx) emissions. The original proposal prohibited the employment of "lean-on-cruise" calibration strategies during vehicle operation in normal driving conditions unless the strategies are also substantially employed during

SFTP, in order to assure that any increases in NOx emissions associated with the strategies are measured during the certification tests.

The modifications require the manufacturer to state in the certification application whether any "lean-on-cruise" strategies are incorporated into the vehicle design. If a "lean-on-cruise" calibration strategy is identified, the manufacturer must specify the circumstances in which it will be employed and the reasons it will be used. This will enable ARB certification staff to effectively evaluate compliance with the "lean-on-cruise" requirements. The modifications identify three circumstances where lean-on-cruise strategies will be permitted. The first is where the strategies are substantially employed in either the Federal Test Procedure (FTP) or SFTP. The second circumstance is where the strategies are demonstrated by the manufacturer not to significantly reduce vehicle non-methane hydrocarbon (NMHC) plus NOx emission control effectiveness, since in that case there is no emission increase. The third circumstance is where the strategy is demonstrated to be necessary to protect the vehicle, occupants, engine, or emission control hardware. Finally, all of the "lean-on-cruise" provisions are not applicable to vehicles powered by a diesel-cycle engine or by a "lean-burn" engine — an Otto-cycle engine designed to run at an air-fuel ratio significantly greater than stoichiometry during the large majority of its operation.

In other areas, a nonsubstantive clarification was made to the text of CCR, title 13, section 1960.1(q) note (7), to the identical second paragraph of CCR, title 13, section 1960.1(r) note 5, and to the identical portions of section 3.*l*. note (7) and section 3.m. note (5) of the LDV/MDV Standards and Test Procedures. Additionally, in the table in CCR, title 13, section 1960.1(r) note (10), "LDT1" was changed to "LDT." Since the opening paragraph of note (10) defines the passenger car (PC) and light-duty truck (LDT) fleet as including those LDTs from 0-5750 lbs. loaded vehicle weight (LVW), the term "LDT1" — commonly used to refer to the lighter LDTs in the 0-3750 lbs. LVW category — was inadvertently used to describe the LDT fleet from 0-5750 lbs. LVW. The identical modification was made to the table in section 3.m. note (10) of the LDV/MDV Standards and Test Procedures.

A modification was also made to section 4.b.2. of the LDV/MDV Standards and Test Procedure. This was added to ensure that if a manufacturer uses an "Alternative or Equivalent Phase-in Schedule" for the SFTP requirements, the schedule must be submitted before or during the first year implementation of the vehicle classes: 2001 calendar year for PCs and LDTs, and 2003 calendar year for MDVs.

Section 2101(b) of title 13, CCR was modified to show the new last amended date of the incorporated California New Vehicle Compliance Test Procedures. Finally, as noted above, the Assembly-Line Test Procedures were modified to provide that the assembly-line quality audit requirements do not apply to the SFTP standards. This modification reflects the characterization of the proposal on page 17 of the Staff Report.

III. SUMMARY OF PUBLIC COMMENTS AND AGENCY RESPONSES

During the 45-day public comment period, the Board received written comments from the American Automobile Manufacturers Association (AAMA) and the Association of International Automobile Manufacturers, Inc. (AIAM), Specialty Equipment Market Association (SEMA), and Volkswagen of America (VW). At the public hearing, oral comments were provided by AAMA and AIAM, Ford Motor Company (Ford), and SEMA. During the 15-day public comment period following the hearing, no written comments were received.

Oral comments from Ford consisted of commendations of the process in developing these regulations. These commendations and other statements of support from oral and written comments are not summarized below.

1. Comment: We strongly disagree with ARB's treatment of diesel and lean-burn gasoline technology. Proposing the same standards for these vehicles and for gasoline vehicles with three-way catalysts and stoichiometric engine control unfairly punishes diesel and lean-burn gasoline vehicles. If the proposed standards for diesel and lean-burn gasoline vehicles are adopted, this technology will effectively be eliminated from the market. (VW)

Postponement of SFTP standards for diesel and lean-burn gasoline engines is requested until a greater understanding of the environmental benefits of this technology is available. Some of the environmental benefits of diesel vehicles include lower cold start emissions, lower in-use deterioration, no evaporative and refueling emissions, and lower fuel transportation and refining emissions. For both diesel and lean-burn vehicles, the environmental benefits include better fuel economy (resulting in fewer refueling events, refueling emissions, and fuel transportation and refining emissions) and lower carbon dioxide emissions. However, ARB has not included these in-use driving patterns to assess environmental benefits of diesel vehicles in this proposal. (AAMA and AIAM, and VW)

Agency Response: Currently there are no diesel-fueled vehicles or lean burn gasoline vehicles certified to the LEV and ULEV emission standards. NOx emissions on current diesel-powered vehicles are too high to comply with the LEV NOx standard for the Federal Test Procedure (FTP). Lean-burn gasoline technology is still under research and development, and production vehicles have not been certified. Given the lack of availability in low-emitting diesel vehicles and lean-burn gasoline vehicles, the test programs used to develop the proposed LEV SFTP standards consisted only of gasoline-fueled vehicles.

To a great extent, the environmental benefits of diesel-powered vehicles are known. The lower cold start emissions and in-use deterioration of diesel-fueled vehicles would help these vehicles comply with the applicable FTP emission standards. Diesel-fueled vehicles are currently exempted from evaporative/refueling certification testing because they are believed to have very low, if any, emissions. Thus, the environmental benefits of diesel-powered vehicles are

recognized in the regulatory context. However, it is also known that certain exhaust emissions (e.g., NOx and particulate matter) from diesel vehicles are significantly higher than those of gasoline-fueled vehicles. In fact, as mentioned above, current technology diesel-powered vehicles cannot comply with the LEV NOx standard for the FTP, and advanced emission control strategies are needed on diesel-powered vehicles to comply with this NOx standard. These advancements would likely also result in a corresponding reduction in NOx emissions on the SFTP. Applying the same fuel neutral policy for gasoline and diesel as is the case in the LEV regulations, diesel-fueled vehicles and emerging technologies (e.g., a lean-burn gasoline concept) will be required to meet the same set of SFTP exhaust standards as gasoline-fueled vehicles.

2. Comment: There are currently no test data available to accurately assess the state of lean burn concepts and the cost and viability of future lean-burn technology. Staff has proposed an extremely difficult LEV, ULEV, and super-ultra low emission vehicle (SULEV) standard for lean-burn engines with no known technique available to meet these standards. (AAMA and AIAM, and VW)

Agency Response: As stated by the commentor, no test data are currently available on lean burn gasoline vehicles to assess their SFTP emission performance. Thus, it was impossible for staff to determine the technological feasibility of lean burn vehicles to comply with the SFTP emission standards. If lean burn gasoline vehicles are produced in the future, as is the case with any other new automotive technology, these vehicles must comply with all applicable emission standards. (See also Agency Response to Comment 1.)

3. Comment: Lean-burn technology inherently has higher NOx emissions compared to the stoichiometric vehicles used to set the proposed standards. The proposed standards represent such a severe reduction in NOx levels for lean-burn vehicles that manufacturers may abandon development efforts in this field. It is recommended that ARB postpone setting standards for lean-burn vehicles or consider a phase-in of NOx control over a longer period of time. A less stringent, interim step for lean-burn vehicles at the LEV level instead of the proposed standards may be a viable way to accomplish this. (AAMA and AIAM, and VW)

Agency Response: Vehicles with lean-burn technologies are not currently in production due to their inability to comply with the current emission standards. It is difficult to assess the technological feasibility of these vehicles to comply with the proposed SFTP standards given this lack of information. As with any other automotive technology under development, compliance with the applicable emission standards is required as part of vehicle certification for sale in California. (See also Agency Response to Comment 1.)

4. Comment: The proposed regulatory text for improved dynamometer requirements suggests that the improved single roll electric dynamometer be equivalent to the obsolete twin-roll

hydrokinetic dynamometer. The single roll dynamometer is superior to the twin-roll dynamometer in simulating vehicle road forces. A requirement to provide equivalency to the twin-roll dynamometer would seem to hamper any attempts to make the best use of the capabilities of the single roll dynamometer. ARB should revise this requirement to eliminate the equivalency to the twin-roll dynamometer. (AAMA and AIAM)

Agency Response: The commentors misinterpret the provisions requiring the use of a single roll electric dynamometer. Either a single roll electric dynamometer meeting the federal specifications, or another type of dynamometer that produces results equivalent to those with the specified single roll electric dynamometer, must be used. A demonstration of equivalency to a twin-roll hydrokinetic dynamometer is neither required nor permitted.

The pertinent title 13 requirements are in CCR, title 13, section 1960.1(q) note (10), and (r) note (11). These provisions require the use of a single-roll electric dynamometer or a dynamometer which produces equivalent results, as set forth in the incorporated LDV/MDV Standards and Test Procedures. Parallel requirements are in the LDV/MDV Standards and Test Procedures, section 3.(*l*) note 10 and 3.(m) note 11, which require the use of "a single-roll electric dynamometer or a dynamometer which produces equivalent results, as set forth in 40 C.F.R. §86.108.00." The referenced federal provision sets forth specifications for a single roll electric dynamometer (§86.108.00(b)(2)), and provides that such a single roll dynamometer, or one approved as equivalent, must be used for SFTP testing (§86.108.00(d)). Accordingly, the California SFTP provisions unambiguously require the use of a single roll electric dynamometer that meets the specifications in 40 C.F.R. §86.108.00(b)(2), or another dynamometer configuration shown in accordance with 40 C.F.R. §86.108.00(c) to be equivalent..

5. Comment: AAMA and AIAM do not support the addition of the lean-on-cruise requirement, because it singles out lean-on-cruise calibration strategies for special treatment under ARB's defeat device criteria. We believe that it is already addressed sufficiently in ARB's existing regulations that prohibit defeat devices. No showing has been made that the existing regulations are inadequate to address any problems that may be presented by lean-on-cruise calibrations. Therefore, AAMA and AIAM recommend that ARB not adopt this specific regulatory language. If additional guidance is needed relative to lean-on-cruise strategies, a letter to the manufacturers that incorporates the language recently discussed by industry representatives and the ARB staff would suffice. (AAMA and AIAM)

Agency Response: Lean-on-cruise is an enleanment calibration strategy used to improve fuel economy during extended high-speed cruises or for other purposes. As stated on pages 27-28 of the Staff Report, recent test data on two current production vehicles showed that during steady-state, high-speed cruising conditions, using lean-on-cruise strategies resulted in extremely high tailpipe NOx emissions, as high as six grams per mile (as compared to the LEV 50,000-mile NOx emission standards for these vehicles of 0.6 grams per mile for the FTP and 1.2 grams per mile for the Highway Fuel Economy Test.) The original off-cycle test schedules, each over 20

minutes in length, were created by the U.S. EPA and the ARB to represent high-speed, high-load driving conditions and contained considerable high-speed cruising events. However, to accommodate the manufacturers' request, the US06 cycle, which is relatively shorter in length at 10 minutes, was ultimated adopted by the U.S. EPA and proposed by ARB. Although in general longer test cycles contain better representation and coverage of driving conditions for regulatory control, the shorter US06 cycle was chosen because of lower testing costs due to reduced testing time. The shorter US06 cycle contains only limited high-speed type cruises.

To account for the limited high-speed cruising conditions in the US06, and because of the large emission increases associated with lean-on-cruise strategies, it is necessary for the regulations to clearly identify when lean-on-cruise strategies will be allowed. The modifications to the originally proposed lean-on-cruise regulatory language are described in Section II above. They identify additional limited circumstances in which lean-on-cruise strategies may be employed, and clarify the manner in which lean-on-cruise strategies are to be identified and addressed in the certification process. The modified text was informally made available to industry representatives well before the hearing so that any additional concerns could be addressed. Including the modified language in the regulatory text so that the parameters are clearly defined is preferable to providing nonregulatory guidance at a later time.

6. Comment: Composite NMHC plus NOx standards for the SFTP should be adopted to add flexibility while maintaining air quality benefits. The U.S. EPA has already recognized the usefulness of this concept by adopting SFTP standards based on a composite of the FTP, US06 test, and the SC03 test. (AAMA and AIAM)

Agency Response: While additional flexibility is afforded with composite SFTP emission standards, it does not result in the same air quality benefits as with stand-alone standards (i.e., separate US06 and SC03 standards). This is because the averaging of emission values to comply with a composite standard would yield a lower compliance risk than with stand-alone standards. The compliance risk is the fundamental determinant of how far below a given standard manufacturers elect to certify their vehicles. The composite approach as suggested by industry would allow manufacturers to certify at higher emission values and thus closer to the standards at the same compliance risk. Thus, the air quality benefits for stand-alone SFTP standards would be compromised with the composite approach. In addition, the U.S. EPA was able to composite the standards of the FTP, US06, and SC03 tests easily because the standards were set at the same useful life durability (50,000 and 100,000 miles). However, different durability bases exist for the California FTP and SFTP (US06 and SC03) LEV standards. The FTP standards are at useful life and the SFTP standards are at low mileage (4,000 miles). Thus, California FTP, US06, and SC03 standards cannot easily or accurately be composited together as in the Federal case. Given the aforementioned disadvantages of using the composite SFTP standard approach, the Board is adopting stand-alone standards for California LEVs and ULEVs.

7. Comment: The ARB should adopt SFTP standards for Tier 1 vehicles and transitional low-emission vehicles (TLEVs) that are only applicable at 4,000 miles, consistent with the mileage basis for the proposed LEV SFTP standards. The difference in the mileage basis for the Tier 1/TLEV and the LEV SFTP standards unnecessarily complicate the development process with no corresponding benefit to air quality. (AAMA and AIAM)

Agency Response: The Federal SFTP useful life (i.e., 50,000 and 100,000 miles) standards for Tier 1 vehicles were based upon data generated in an extensive research program. The U.S. EPA adopted the SFTP standards after careful analysis of the test data and determined the technological feasibility of the standards for Tier 1 vehicles. Thus, due to the strong technical foundation of the Federal SFTP standards for Tier 1 vehicles, staff proposed the same Federal SFTP useful life standards for California Tier 1 vehicles and the similar but slightly cleaner TLEVs. In the California test programs conducted to determine the appropriate 4,000 mile SFTP standards, only vehicles that were LEVs or were potentially similar to future LEVs were tested. No data were generated to set 4,000 mile SFTP standards for Tier 1 or TLEVs. Thus, appropriate 4,000 mile SFTP standards for Tier 1 and TLEVs could not be accurately determined. In addition, the limited number of Tier 1 vehicles and TLEVs delivered and produced for sale in California would likely also be available on a national basis, requiring Federal certification. Thus, aligning with the Federal Tier 1 SFTP requirements for California Tier 1 and TLEVs is appropriate.

8. Comment: AAMA and AIAM are concerned that the benefits estimated by ARB for the proposed SFTP regulation are understated, particularly for NMHC and carbon monoxide (CO) emissions. In general, the benefits should be determined based on the difference between in-use emissions from pre-SFTP vehicles and in-use emissions that would result from vehicles designed to meet the SFTP standards with adequate headroom. This approach does not presume only one control strategy. For the federal rule, the U.S. EPA followed this approach and had hydrocarbon (HC) and CO benefit levels directionally opposite those of the ARB. The benefits from the SFTP rulemaking need to be properly accounted for so that future mobile source policy decisions are based on the most accurate information possible. (AAMA and AIAM)

Agency Response: The ARB methodology used to perform the SFTP emission benefit calculations was indeed based on the difference between in-use emissions from uncontrolled vehicles and the in-use emissions expected on vehicles certified to the SFTP standards (effective starting the 2001 model year). In order to estimate the in-use emissions from vehicles certified to the SFTP standards, staff used test program data and engineering analysis to determine the potential technologies that would be used to comply with the proposed standards. Using this approach, rich-bias calibration was noted as one of the least expensive strategies for manufacturers to comply with the SFTP NMHC plus NOx standards. In extensive test programs conducted by both staff and industry using this emission control strategy, impressive emission reductions were observed on the majority of vehicles. Although other software control strategies may be used by manufacturers, only the effectiveness of the rich-bias calibration was assessed

extensively. Thus, staff used the rich-bias strategy as one of the key modifications to evaluate the technological feasibility and emission benefits of the SFTP regulation. While the rich-bias calibration was successful in reducing SFTP emissions on most vehicles, staff acknowledges that other software modifications may also be used. In the Staff Report, it was estimated that 70 percent of vehicles could comply with software modifications (rich-bias calibration) and the remaining 30 percent would required some type of hardware modification.

Although the difference between in-use emissions from uncontrolled vehicles and controlled vehicles was used for both the California and Federal emission benefit calculations, directionally different HC and CO emission benefits were attributed to the Federal regulations. This is primarily due to the significantly higher levels of off-cycle CO emissions (as a result of commanded fuel enrichment) observed in Federal vehicles as compared to California vehicles. In order to comply with the US06 CO standard adopted by the U.S. EPA, significant reductions in commanded fuel enrichment would be required, resulting in large CO and HC emission benefits. However, California vehicles on average emitted considerably lower CO emissions during off-cycle driving and thus, only a relatively small amount of CO emission benefits would be expected, if any. In addition, the relative stringencies of the California and Federal SFTP emission standards are different, especially for the ULEV emission class. The proposed California standards emphasize SFTP reductions in NOx emissions over HC and CO emissions (as reflected in the emission benefits that showed substantial NOx emission reductions for the implementation of the SFTP regulation.) The U.S. EPA, however, emphasized modest reductions in all three pollutants.

9. Comment: ARB's emission benefits overemphasized HC and CO emission increases that result from rich-bias calibrations, while masking or excluding benefits which result from the use of stoichiometric calibration and hardware modifications. AAMA's and AIAM's position is that vehicle hardware modifications will be required to comply with the SFTP standards, and hardware modifications such as catalyst improvements will improve emissions for HC, CO, and NOx emissions over all warmed-up driving, not just during the US06. (AAMA and AIAM)

Agency Response: The Technical Support Document contains a detailed methodology of the emission inventory analysis. Using ARB test program data on over 30 vehicles, staff projected that 70 percent of the vehicles could comply with software calibrations, primarily the rich-bias calibration, while the remaining 30 percent would require minor hardware modifications. Of this 30 percent, half of the hardware modifications consist of increased rhodium loading, which would primarily increase the catalyst conversion efficiency in reducing NOx emissions. The remaining half (15 percent of the fleet) would require an estimated 20 percent increase in catalyst volume, which would increase the catalyst conversion efficiency of HC, CO, and NOx emissions. Staff agrees that the fleet projected to require increased rhodium loading and catalyst volume would likely experience improved emission performance over all warmed-up driving. However, this emission benefit is difficult to ascertain over warmed-up, FTP-type driving. In addition, the highest contributor to the overall FTP emissions occurs during engine operation after start-up, whereas the contribution of warmed-up emissions to the FTP is near zero. Thus, only small

emission benefits for warmed-up FTP may be realized. Since the objective of the hardware modification is to reduce SFTP emissions to comply with the proposed SFTP emission standards, the carry-over effect to warmed-up FTP driving may range from negligible to small benefits. Given this large uncertainty and the possibility of negligible effects, staff chose not to claim any potential emission benefit.

10. Comment: While ARB contends that HC and CO emission increases over FTP-like driving can be avoided by calibrating such that rich-bias strategies would only be used over US06-type driving (selective biasing), this selective biasing was not used for the emission benefit calculations. (AAMA and AIAM)

Agency Response: During the regulatory development process, staff emphasized the reductions in NOx emissions over non-FTP driving conditions. In order to allow adequate flexibility for manufacturers to design their vehicles, the proposed CO standards were designed to serve as capping standards rather than be technology-forcing. While the proposed standards would likely still require reductions in the amount and extent of fuel enrichment during high-speed and high-load driving, limited CO emission benefits would be realized with these standards. In the ARB test programs, all of the test vehicles already performed below the SFTP CO standard without any modifications. Because the SFTP CO standard is not technology-forcing, a manufacturer may choose to not use the selective bias technique and still be able to comply with SFTP CO standard. Given this possibility, staff chose not to use selective biasing in adjusting the CO and HC emissions of the emission benefit calculations.

11. Comment: In the air-conditioning emission benefit calculations, the controlled NOx emission levels were adjusted upward because optimized air-conditioner-on test results were found to be lower than air-conditioner-off levels. HC and CO results, however, were not adjusted accordingly with this NOx level modification. Adjusting NOx levels upward while assuming no change in HC and CO emissions is not technically appropriate and again overstates the HC and CO disbenefit which results from rich biasing. (AAMA and AIAM)

Agency Response: Data from the ARB test program were used in the emission inventory calculation. As discussed in the Technical Support Document, the ARB test program on air-conditioner operation over the SC03 test cycle showed an average reduction of 70 percent in air-conditioner-on NOx emissions using the rich-bias calibration. On the ARB test vehicles, this level of reduction with the use of the rich-bias calibration was equivalent to reducing air-conditioner-on NMHC plus NOx emission levels on average by 45 percent *below* air-conditioner off levels. Since the majority of the data was generated from vehicles certified to either the Tier 1 and TLEV emission standards, ARB staff does not believe that it is likely that air-conditioner-on NOx emission will be reduced by this percentage on LEVs. Thus, as a conservative estimate, staff assumed that the proposed standards would reduce LEV air-conditioner-on NOx emissions only to that with the air-conditioner off.

While this adjustment was made to the NOx emission levels, it is true that the same type of adjustment was not made to the NMHC and the CO emissions. There were no data to show what the NMHC and CO emission levels would be at the bias setting in which air-conditioner-on NOx emissions would equal that of the air-conditioner-off NOx emissions (since the test program consisted primarily of testing to determine baseline air-conditioner-on emission levels and the optimized air-conditioner-on emission levels with the rich-bias calibration.) Thus, appropriate adjustment levels could not be adequately determined. Since the SFTP emission benefit estimations are conservative in nature to ensure that only those tons per day benefit that will be realized are counted, adjustments to the NMHC and CO emission levels were not made. (See also Agency Response to Comment 10.)

12. Comment: SEMA believes that both the U.S. EPA final rule and the proposed ARB regulation fail to meet the federal Clean Air Act Amendment requirement to more accurately represent real-world driving conditions. The new cycle, US06, is based upon the inclusion of extreme data that skewed the average speeds and accelerations of the cycle to figures higher than what is generally experienced by most drivers. The need to include transient dynamometer load adjustment factors for a number of vehicles to even be able to follow the cycle clearly supports this contention. (SEMA)

Agency Response: The US06 test cycle identified by the ARB is in all respects identical to the test cycle adopted by U.S. EPA. In extensive 1992 driving surveys conducted in Los Angeles as well as three other major U.S. metropolitan area, speeds and accelerations much greater than those on the current certification test procedure (FTP) were recorded. Based on this data set, driving cycles were developed, including the US06. This cycle was not designed to be a representative cycle (cycle parameters such as speeds and accelerations in proportion to in-use parameters) and contained a higher proportion of speeds and accelerations. Together with the FTP, these tests would cover virtually all of in-use driving. However, not every vehicle is driven the same way. Through the driving surveys, some types of vehicles were determined to be driven less aggressively than the typical vehicle. These include low-powered passenger cars and trucks, and medium-duty trucks. For this reason, dynamometer load adjustment factors are allowed for those vehicles that must use full throttle over a specified period of time to follow the driving trace. For medium-duty vehicles, they do not need to be tested at half payload as in the FTP. Thus, the US06 cycle is believed to be representative of those driving conditions outside of the FTP for the majority of vehicles, and adjustments are allowed for lower-powered vehicles and medium-duty vehicles.

13. Comment: There is considerable concern over the US06 cycle's potential effects on catalyst and engine/emission system component durability. Of special concern is the requirement for a minimum air to fuel ratio calibration of lean-best torque (LBT) with a tolerance of six percent. Aftermarket manufacturers must be allowed the ability to redefine LBT through recalibration even if the variation from the OEM setting exceeds six percent as long as the

emission levels are within acceptable limits. Similarly, aftermarket manufacturers must be allowed the right to deviate from a LBT calibration when component durability would be adversely affected, subject to Executive Officer approval, similar to vehicle manufacturers. Failure to make this allowance would effectively eliminate the potential for developing many aftermarket products since lean air to fuel mixtures would result in excessive exhaust temperatures and premature component deterioration. (SEMA)

Agency Response: The purpose of the LBT requirement is to ensure that the vehicle's fueling strategy is properly calibrated to eliminate the use of excessive fuel and associated HC and CO emissions. It is not intended to limit the amount of enrichment time or to require lean air to fuel mixtures. The regulations and test procedures as amended in this rulemaking are applicable only to the original equipment manufacturers. A separate set of test procedures, which has not been amended in this rulemaking, is applicable to the aftermarket certification and in many respects mimics the original equipment manufacturer certification requirements. Although the current aftermarket certification regulations do not explicitly require SFTP testing and compliance with SFTP requirements such as the LBT, the test procedures allow the Executive Officer to require alternative emission testing such as the SFTP to characterize the emission performance of an aftermarket part. The authority of the Executive Officer to allow a redefinition of LBT and a calibration richer than LBT during the evaluation of an aftermarket part, when such steps are shown to be necessary to protect the emission control components, is not affected by this rulemaking.

14. Comment: The facilities and equipment required for running both the US06 and SC03 cycles are costly, and are clearly beyond what is normally utilized by, or even available to, aftermarket companies. No independent facility which is available to the aftermarket is capable of running these test cycles for federal and California vehicles. SEMA believes that ARB must take steps to ensure that a sufficient number of test facilities capable of running the proposed test cycles (in a reasonable time and at a fair cost) are readily available to the aftermarket before such proposals may be implemented and enforced relative to the aftermarket. (SEMA)

Agency Response: A limited number of independent test facilities will be available in the near future to conduct SFTP testing, because use of the single-roll electric dynamometer will be required for all certification testing, phased-in beginning the 2001 model year in California. One facility in Northern California is currently equipped with a single-roll dynamometer in an environmental cell and thus, can conduct both the US06 and the air-conditioning tests. The incremental cost for conducting the US06 or the air-conditioner test with an FTP is $500. Two Southern California laboratories are in the process of installing single-roll dynamometers or will do so in the near future. Staff expects that in the next several years additional independent laboratories will have the capability of conducting the SFTP tests. Additionally, as more independent facilities equipped with single-roll dynamometers and environmental cells are available, the competitive pricing of conducting the tests will likely result in reduced costs.

15. Comment: If acceptable facilities are unavailable, the aftermarket should be allowed the use of engineering evaluation of a given product's potential effects during the US06 and SC03 operating conditions as an alternative to conducting the SFTP for certification. Currently, ARB allows evaluations to be considered in order to avoid unnecessary FTP or other testing. Since the amount of driving conducted under FTP conditions far exceeds that which is encountered during the US06 and SC03 cycles, a worst case evaluation of a given product's overall emission contribution would likely indicate a *de minimus* effect would be attributable to the latter conditions in actual use. (SEMA)

Agency Response: Current ARB regulations allow the original equipment manufacturer and the aftermarket manufacturer to avoid unnecessary FTP and other testing by requiring only the emission tests that are needed to show sufficient emission control to meet a given set of emission standards. The amount of SFTP testing required for aftermarket certification will be determined by application of the aftermarket regulations. In joint studies conducted by the automotive industry, U.S. EPA, and the ARB in the early 1990s, it was found that although the FTP represented the majority of in-use driving, the unrepresented driving resulted in large emission increases in HC, CO, and NOx emissions. The new cycles, US06 and SC03, were designed to represent 28 percent and 52 percent, respectively, of summertime in-use driving. If these driving conditions were not effectively controlled and evaluated through conducting emission tests, large emission increases could occur. In addition, as discussed in the Agency Response to Comment 14, one facility is currently available and more facilities should be available in several years when the regulations become applicable.

16. Comment: If California's LEV standards become applicable nationwide as a result of the National LEV regulation, the concerns SEMA has with ARB's SFTP proposal with California vehicles would be far more onerous. In particular, the aftermarket's need to overcome the potential problems imposed by nationally-varying climates, fuels, and usage patterns, etc, cannot reasonably be expected to be satisfied without access to facilities. (SEMA)

The potential for the implementation of the LEV program, including the SFTP requirements, on a national basis would have a debilitating effect on many aftermarket companies that sell products outside of California. The double jeopardy of not only reducing the applicable emission limits but of also requiring the additional testing conditions which ARB has proposed would likely be too much of a burden for these companies. (SEMA)

Once again, SEMA recommends that provisions be made to ensure that aftermarket manufacturers may continue to be allowed to demonstrate emission compliance if ARB's proposed SFTP standards for the LEV program are applicable on a national basis. Such provisions may include allowing an engineering evaluation concept or a waiver from SFTP requirements. (SEMA)

Agency Response: The ARB does not have the authority to implement the LEV program on a national level; the U.S. EPA bears the responsibility for the implementation of a National LEV program as well as the aftermarket compliance issues resulting from this program. Thus, it is more appropriate for these particular issues to be addressed by the U.S. EPA. In any event, controlling vehicular emissions during high-speed and high-load driving as well as air-conditioner usage is needed in California in order to help achieve attainment of the national ambient air quality standards. The adopted SFTP standards will require control of vehicular emissions, particularly NOx emissions, during aggressive driving and air-conditioner usage. In order to reduce the testing burden on manufacturers, the California SFTP testing requirements mirror the Federal requirements in all aspects, while requiring compliance with a more stringent set of SFTP emission standards for California vehicles. The Staff Report identifies the substantial emission benefits associated with the implementation of the SFTP emission standards and test procedures in California: 133 tons per day statewide of NMHC plus NOx emissions by 2020. Application of the SFTP test procedures is necessary to ensure that these emission benefits are realized in the state