State of California
AIR RESOURCES BOARD

Resolution No. 03-22

October 23, 2003

Agenda Item No. 03-8-2

WHEREAS, the Legislature in Health and Safety Code section 39602 has designated the State Air Resources Board (ARB or Board) as the air pollution control agency for all purposes set forth in federal law;

WHEREAS, the ARB is responsible for the preparation of the State Implementation Plan (SIP) for attaining and maintaining the national ambient air quality standards (NAAQS) as required by the federal Clean Air Act (the "Act"; 42 U.S.C. section 7401 *et seq.*), and to this end is directed by Health and Safety Code section 39602 to coordinate the activities of all local and regional air pollution control and air quality management districts (districts) necessary to comply with the Act;

WHEREAS, section 39602 of the Health and Safety Code also provides that the SIP shall include only those provisions necessary to meet the requirements of the Act;

WHEREAS, the ARB has primary responsibility for the control of air pollution from vehicular sources, including motor vehicle fuels, as specified in sections 39002, 39500, and part 5 (commencing with section 43000) of the Health and Safety Code, and for ensuring that the Districts meet their responsibilities under the Act pursuant to sections 39002, 39500, 39602, 40469, and 41650 of the Health and Safety Code;

WHEREAS, section 41712 of the Health and Safety Code authorizes the ARB to control volatile organic compound emissions from consumer products, and Health and Safety Code section 39650 *et seq.* authorizes the ARB to control toxic air contaminants;

WHEREAS, the ARB is authorized by Health and Safety Code section 39600 to do such acts as may be necessary for the proper execution of its powers and duties;

WHEREAS, sections 39515 and 39516 of the Health and Safety Code provide that any duty may be delegated to the Board's Executive Officer as the Board deems appropriate;

WHEREAS, the Bureau of Automotive Repair (BAR) is authorized to adopt, implement, and enforce an enhanced vehicle inspection and maintenance (I/M) program pursuant to Health and Safety Code section 44000 *et seq.*;

WHEREAS, the Department of Pesticide Regulation is authorized to control the use of pesticides for the purposes of protecting human health and the environment, including improving air quality, pursuant to Food and Agriculture Code Sections 14102, 12781, 12824-12828, and 12976 *et seq.*;

WHEREAS, on August 1, 2003, the South Coast Air Quality Management District (District) adopted the 2003 Air Quality Management Plan (2003 AQMP), which includes the local control strategy elements of the proposed 2003 revisions for the South Coast Air Basin SIPs for ozone, particulate matter ten microns and less (PM10), carbon monoxide, and nitrogen dioxide, as well as the 2003 Coachella Valley SIP for PM10;

WHEREAS, all of these 2003 SIP revisions rely on emission reductions from the adopted State control programs and the 2003 ozone SIP also relies on expected reductions from proposed new State commitments;

WHEREAS, on May 12, 2003, ARB staff circulated for public review the Proposed 2003 State and Federal Strategy for the California State Implementation Plan (Statewide Strategy), identifying proposed defined measures for near-term adoption and long-term measures to be assessed for inclusion in future SIP updates, addressing the requirements applicable to the SIP revision, and including an analysis of the potential environmental impacts of the defined statewide measures;

WHEREAS, on August 25, 2003, ARB staff released a revised Statewide Strategy that incorporated changes based on public comments; such changes include references to recent ARB action on emission reduction commitments to reduce particulate matter pollution in the San Joaquin Valley, low-sulfur standards for diesel fuel, consolidation of two measures targeting large off-road spark-ignition engine emissions, further definition of ARB's proposal concerning long-term emission reductions for the South Coast Air Basin, and other minor updates and corrections;

WHEREAS, in further response to public comment, ARB staff proposed changes to the Statewide Strategy at the October 23, 2003 hearing to modify the text and expected emission reductions for measures LT/MED-DUTY-1, ON-RD HVY-DUTY-3, and OFF-RD CI-1, to modify the State's adoption commitments to reflect additional reductions in reactive organic gas (ROG) and nitrogen oxides (NOx) from LT/MED-DUTY-1, and to reflect additional NOx reductions from ON-RD HVY-DUTY-3 and OFF-RD CI-1;

WHEREAS, Attachment A to this Resolution summarizes the revisions to the Statewide Strategy document, including modified text for measures LT/MED-DUTY-1, ON-RD HVY-DUTY-3, and OFF-RD CI-1, as well as modified versions of Table I-6, State Annual Adoption Commitments for Near-Term Measures; and Table I-7, State Strategy for the South Coast Ozone SIP;

WHEREAS, in response to comments containing specific proposals for new measures to be included in the Statewide Strategy, ARB staff proposed at the October 23, 2003 hearing an additional State commitment to evaluate additional control concepts between 2004 and 2006;

WHEREAS, Attachment A to this Resolution includes the additional State commitments to evaluate additional control concepts between 2004 and 2006; measures found to be feasible will be brought to the Board for its consideration between 2005 and 2009; staff's feasibility evaluation will include analyses of cost-effectiveness, potential emission benefits, technical feasibility, socioeconomic impacts and environmental justice considerations as well as the identification of funding and legal constraints;

WHEREAS, at the October 23, 2003 hearing the Board added a new commitment for a measure to achieve 97 tons per day (tpd) of combined ROG and NOx reductions in the South Coast Air Basin by 2010, as specified in Attachment A-7 to this Resolution;

WHEREAS, in its presentation to the Board at the October 23, 2003 hearing, ARB staff proposed that the State achieve up to 66 tpd of the long-term ROG plus NOx reduction commitment in the South Coast Air Basin in 2010 from concepts (including those described in Attachment A-1) that would require new authority or funding to implement, contingent on obtaining adequate authority and funding;

WHEREAS, the revisions to the Statewide Strategy document reflected in Attachment A were made available to the public at the October 23, 2003 hearing prior to Board action;

WHEREAS, at the October 23, 2003 hearing, the Board amended the Statewide Strategy document to incorporate the additional commitments reflected in Attachment A to this Resolution; together, these documents comprise the Final Statewide Strategy;

WHEREAS, the Final Statewide Strategy would update and entirely replace the comprehensive State control strategy and specific measures contained in the applicable 1994 Ozone SIP (as modified in 1999 for the South Coast Air Basin);

WHEREAS, measure ON-RD HVY-DUTY-3 in the Final Statewide Strategy would replace the Board's commitment for mobile source measure M-17, Additional Emission Reductions From Heavy-Duty Vehicles, submitted to the U.S. Environmental Protection Agency (U.S. EPA) on April 15, 1998, but never approved by U.S. EPA as a SIP revision;

WHEREAS, the Final Statewide Strategy includes the proposed State commitments in Section I.D.1 for new measures and emission reductions to help the South Coast Air Basin attain the ozone NAAQS by 2010;

WHEREAS, the modified State commitments for emission reductions in the South Coast Air Basin as described in Attachment A to this Resolution replace the corresponding numbers presented throughout the revised Statewide Strategy document released on August 25, 2003;

WHEREAS, for areas of the State that have not yet achieved the full amount of emission reductions that ARB previously committed to in the existing SIP, the Final Statewide Strategy would retain the statewide commitments to achieve those same aggregate emission reductions;

WHEREAS, when nonattainment areas develop new or revised attainment SIPs, the State commitments for new measures and emission reductions would be reflected as necessary to achieve the air quality goals of the region;

WHEREAS, the Final Statewide Strategy includes a commitment by BAR to improve the existing Enhanced I/M program by achieving additional reductions;

WHEREAS, Appendix I-1 of the Final Statewide Strategy includes evidence of BAR's commitment to implement the Enhanced I/M improvements described in measure LT/MED-DUTY-2;

WHEREAS, the Final Statewide Strategy proposes that ARB staff would commit to submit to the Board and propose for adoption the 19 defined near-term statewide ARB control measures, plus the additional ARB measure for the South Coast Air Basin set forth in Attachment A-7;

WHEREAS, the Final Statewide Strategy proposes that the Board shall take action on the ARB near-term measures and, in combination with the benefits of the Enhanced I/M improvements by BAR, achieve the annual emission reductions for the South Coast Air Basin specified in Table I-6 on or before the dates in Table I-6; such action by the Board may include any action within its discretion;

WHEREAS, the Final Statewide Strategy proposes that the State would achieve additional emission reductions in defined near-term measures of 50 tpd of ROG and 59 tpd of NOx in the South Coast Air Basin by 2010;

WHEREAS, the Final Statewide Strategy proposes that the State may meet the emission reduction commitments for the South Coast Air Basin by adopting one or more of the defined control measures, by adopting one or more alternative measures, or by implementing incentive program(s), so long as the total new reductions in ROG and NOx by 2010 are achieved;

WHEREAS, the 2003 ozone attainment demonstration for the South Coast Air Basin demonstrates a need for additional ROG and NOx emission reductions from new long-term measures to attain the ozone NAAQS;

WHEREAS, the South Coast District adopted a local commitment to achieve 31 tpd of the ROG reductions needed from new long-term measures;

WHEREAS sources under federal jurisdiction make up 31 percent of NOx emissions and 8 percent of ROG emissions in the 2010 baseline inventory of the 2003 Ozone SIP for the South Coast Air Basin;

WHEREAS, the 2003 Ozone SIP for the South Coast Air Basin and the Final Statewide Strategy propose that federal sources contribute further emission reductions of 18 tpd ROG and 68 tpd NOx in the South Coast Air Basin as part of the long-term measures needed by 2010;

WHEREAS, the ARB is charged with ensuring California's SIP compliance, and is thus ultimately responsible for ensuring that the necessary long-term measures are identified by 2007 and the emission reductions are achieved by 2010;

WHEREAS, in the Final Statewide Strategy, ARB staff proposes the long-term strategy that would require ARB to lead a multi-agency (State, federal, local) effort with the public between now and 2007 to assess potential control concepts for every type of emission source and develop the full scope of strategies needed to achieve the remaining emission reductions from new long-term measures in the South Coast Air Basin by 2010;

WHEREAS, if U.S. EPA does not carry out its legal responsibility for new emission reductions, ARB staff proposes that the federal reductions of 18 tpd of ROG and 68 tpd of NOx be added to the ARB long-term commitment;

WHEREAS, federal law as set forth in section 110(l) of the Act and title 40, C.F.R., section 51.102 requires that one or more public hearings, preceded by at least 30 days notice and opportunity for public review, must be conducted prior to the adoption and submittal to U.S. EPA of any SIP revision;

WHEREAS, the California Environmental Quality Act (CEQA) requires that no project which may have significant adverse environmental impacts may be adopted as originally proposed if feasible alternatives or mitigation measures are available to reduce or eliminate such impacts, unless specific overriding considerations are identified which outweigh the potential adverse consequences of any unmitigated impacts;

WHEREAS, Board regulations provide that prior to taking final action on any proposal for which significant environmental issues have been raised, the decision maker shall approve a written response to each such issue;

WHEREAS, in consideration of the Statewide Strategy, the changes reflected in Attachment A, the written and oral testimony presented by the public, industry, and government agencies, and the environmental documentation prepared by Board staff, the Board finds that:

1. Combined emissions of ROG and NOx are projected to decline by over 960 tpd between 1997 and 2010 due to adopted State, federal, and local controls.

2. Additional emission reductions from State measures are needed to protect public health and attain the NAAQS in the South Coast by 2010. The District has relied on these reductions to demonstrate attainment in the 2003 AQMP, and has requested their inclusion as part of the South Coast Air Basin Ozone SIP.

3. The ARB is the lead agency for the State measures element of the South Coast SIP revision, has considered the environmental analysis set forth in Section V of the Statewide Strategy, and concurs in the analysis of potential environmental impacts.

4. The ARB's environmental analysis indicates that there may be potential adverse environmental impacts from the proposed State measures in the areas of air quality, water quality, energy demand, hazardous waste, and solid waste; however, these impacts are speculative and cannot be quantified until the scope of the measures is defined by actual proposed regulations.

5. The Board has considered alternatives to the State measures and has identified no feasible alternatives at this time which would reduce or eliminate any potential adverse environmental impacts, while at the same time ensuring that necessary emission reductions will be achieved.

6. At this time there are no feasible mitigation measures that ARB can impose to lessen the potential adverse impacts of the proposed State measures on the environment, and no less stringent alternatives which will accomplish the goals imposed by federal law with fewer potential environmental impacts.

7. None of the modifications made to the Statewide Strategy since May 12, 2003 alter any of the conclusions reached in the environmental impact analysis, or would require recalculation of the environmental analysis as provided in CEQA guidelines section 15088.5.

8. The potential adverse environmental impacts of the proposed State measures are outweighed by the substantial air quality benefits that will result from their adoption and implementation.

9. The considerations identified above override any adverse environmental impacts that may occur from adoption and implementation of the State measures.

10. As regulations implementing the new ARB measures are developed, detailed environmental impact analyses, including a discussion of regulatory alternatives and mitigation measures, will be performed in conjunction with the rulemaking process.

11. As regulations implementing the new ARB measures are developed, specific economic impact analyses will be performed in conjunction with the rulemaking process and considered by the Board in acting on those regulations.

12. ARB regulations which have been adopted and are reflected in the baseline emission projections in the SIP were subjected to environmental review by the Board at the time of their adoption and no further analysis is required at this time.

NOW, THEREFORE, BE IT RESOLVED, the Board hereby approves the SIP revision and adopts the SIP commitments for statewide measures set forth in the Statewide Strategy, as modified by Attachment A to this Resolution, including specific emission reductions from defined near-term measures for the South Coast Air Basin by 2010 and a schedule of commitments to evaluate additional control concepts between 2004 and 2006; measures found to be feasible will be brought to the Board for its consideration between 2005 and 2009; staff's feasibility evaluation will include analyses of cost-effectiveness, potential emission benefits, technical feasibility, socioeconomic impacts and environmental justice considerations as well as the identification of funding and legal constraints;

BE IT FURTHER RESOLVED, the Board approves the written responses to significant environmental issues that were raised during the comment period; these responses are set forth in Attachment B to this Resolution;

BE IT FURTHER RESOLVED, the Board directs the Executive Officer to forward these ARB and BAR commitments to the U.S. EPA for inclusion in the SIP to be effective, for purposes of federal law, upon approval by the U.S. EPA.

BE IT FURTHER RESOLVED, that the Board delegates authority to the Executive Officer to calculate and commit to new emission reductions from implementation of the Final Statewide Strategy that she determines to be appropriate for specific areas violating the NAAQS in California, as attainment SIPs are developed or revised in those areas.

BE IT FURTHER RESOLVED, that the Board directs the Executive Officer to work with the U.S. EPA and take appropriate action to resolve any completeness or approvability issues that may arise regarding the SIP submission.

BE IT FURTHER RESOLVED, that the Board directs the Executive Officer to return to the Board in no later than one year with explicit agency allocations, at the State and local level, for the remainder of the long-term reductions.

BE IT FURTHER RESOLVED, that the Board directs the Executive Officer to conduct, during each of the next three years, an annual SIP Implementation Summit with participation from technical experts, academia, consultants, and other interested stakeholders.

BE IT FURTHER RESOLVED, that the Board directs the Executive Officer to return to the Board every 12 months over the next three years with explicit ARB commitments for the adoption and implementation of control measures to achieve the long-term reductions contained in the approved State strategy.

BE IT FURTHER RESOLVED, that the Board directs the Executive Officer to continue to review the technological feasibility, cost-effectiveness, and economic impacts of the defined ARB measures and to include any necessary and appropriate modifications to the control strategies when they are proposed for Board consideration.

BE IT FURTHER RESOLVED, that the Board certifies pursuant to 40 C.F.R. section 51.102 that the State elements being considered as a SIP revision were adopted after notice and public hearing as required by 40 C.F.R. section 51.102, and directs the Executive Officer to submit the appropriate supporting documentation to U.S. EPA along with any SIP submittal that is approved.

I hereby certify that the above is a true and correct copy of Resolution 03-22, as adopted by the Air Resources Board.

Stacey Dorais, Clerk of the Board

ATTACHMENT A-1

Schedule for Evaluation of Long-term Measures And, Where Feasible, Adoption

The Air Resources Board commits staff to evaluate the feasibility of the following control concepts for adoption as State Implementation Plan (SIP) measures by the dates specified below. Staff's feasibility evaluation will include analyses of potential emission benefits, technical feasibility, cost-effectiveness, socioeconomic impacts and environmental justice considerations as well as the identification of funding and legal constraints. Where funding or legal authority constraints have been identified, Board adoption dates are contingent on the availability of funding or legislative action to address these constraints. ARB commits to bring those measures that are found to be feasible, in consideration of all the factors listed above, to the Board for consideration according to the listed adoption dates.

Category	Description	Evaluation Completion Date	Adoption Date
In-Use Light/Medium Duty Vehicles	▪ Obtain funding incentives to voluntarily retire passenger vehicles, including evaluation of OEM vehicle manufacturers accelerating vehicle retirement based on sales	2005	2007 *(Funding may be needed)*
Smog Check	▪ Evaluate repealing the 30-year rolling exemption	2004	2006 *(Authority needed)*
	▪ Evaluate more stringent post-repair smog check cutpoints	2004	2005-2006
	▪ Evaluate Phase III OBD with remote notification	2005-2006	2008 *(Authority needed)*
	▪ Evaluate annual inspections for older vehicles	2004	2006 *(Authority needed)*
	▪ Evaluate ASM testing for all wheel drive vehicles	2004	2005-2006

Category	Description	Evaluation Completion Date	Adoption Date
Off-Road Vehicles	▪ Obtain funding for cleaner off-road equipment	2005-2006	2008 *(Funding needed)*
On-Road Heavy Duty Vehicles	▪ Obtain funding for incentives for cleaner trucks and buses, including school buses, and consideration of alternative diesel fuels	2005-2006	2007 *(Funding needed)*
Recreational Vehicles/Marine	▪ Evaluate strategies to accelerate turnover of existing 2-stroke marine engines	2006	2007 *(Funding needed)*
	▪ Evaluate further emission reductions from retrofit/replacement of existing marine engines	2006	2007-2009
Small Off-Road Engines	▪ Evaluate requiring up to 60% of residential lawn and garden equipment to be electric	2004	2006-2009
	▪ Obtain funding for incentives to scrap small off-road engines	2005	2007 *(Funding needed)*
Ships/Ports	▪ With SCAQMD and ports, evaluate options for requiring cold ironing for ships that frequently visit South Coast ports	2004	2005
	▪ Evaluate strategies to reduce emissions from auxiliary engines on ships while hotelling	2004	2006
Locomotives	▪ Evaluate approaches to reduce emissions from in-use locomotives	2005-2006	2005-2006
	▪ Evaluate emission reductions for switcher and short-haul locomotives not subject to the MOU	2004	2006-2009
	▪ Evaluate approaches to reduce emissions from passenger rail	2005	2005-2006
Fuels	▪ Evaluate standards for diesel engine lubricating oils	2005-2006	2006-2009
	▪ Evaluate fuel standards for locomotives and marine vessels	2004	2006
	▪ Evaluate new reformulated gasoline standards	2004	2006-2009
Consumer Products	▪ Evaluate further consumer products regulations	2005-2006	2006-2009

ATTACHMENT A-2
REVISED LT/MED-DUTY-1

a. LT/MED-DUTY-1: Replace or Upgrade Emission Control Systems on Existing Passenger Vehicles

Time Frame: Adopt 2005; Implement 2007-2008

Responsible Agency: ARB

Proposed Strategy:

ARB is currently performing a test program to evaluate the potential benefits of mandatory replacement of catalysts, oxygen sensors and evaporative emission carbon canisters on older passenger cars. These components are the heart of a modern emission control system, but they deteriorate during the life of a vehicle through thermal stress and chemical contamination. While it is known that these components deteriorate, the benefits associated with their replacement are less certain because of interactions between the "new" parts and the other "old" parts of a vehicle.

As of October 2003, through the test program, ARB has replaced oxygen sensors and/or catalysts on about two dozen vehicles and evaporative canisters on about 30 vehicles. Results have been mixed, with the most promising results so far from the replacement of catalysts. ARB plans more testing to further investigate repair effectiveness, durability of repair, and cost-effectiveness.

It is possible that a mandatory equipment replacement program could specify lower cost "new" parts (i.e., aftermarket parts), because the remainder of the vehicle's life is expected to be short at the time of retrofit. The performance of the lower cost parts needs to be evaluated compared to the old parts on the cars and to new factory (higher cost, original equipment) parts.

The most likely mechanism to identify vehicles for a mandatory replacement program is through the biennial Smog Check program. In addition, ARB and the Bureau of Automotive Repair (BAR) are currently conducting a $2 million remote sensing study. One goal of the study is to investigate whether remote sensing could be an effective tool to supplement Smog Check by identifying high-emitting vehicles. Other goals of the study include determining whether remote sensing could be used to clean screen vehicles and exempt them from Smog Check, to direct vehicles to test-only stations, and/or to characterize the California vehicle fleet.

The test program needs to include enough cars to provide reasonable confidence in its conclusions. Testing one car takes from a couple of weeks to a month. Thus, given the time necessary to complete the test program, the decision on whether to

proceed with a mandatory program is expected to occur in 2004. Regulations would follow in 2005, if the pilot program shows the potential for significant benefits at reasonable cost and funding can be identified. The program would be implemented in 2007 or 2008, with benefits between zero (decision not to proceed) to 20 tpd of ROG and 20 tpd of NOx in the South Coast Air Basin in 2010. These estimates include an additional 1 tpd of ROG and 2 tpd of NOx benefits from including medium-duty vehicles in the parts replacement program. The benefits for the South Coast and the San Joaquin Valley are summarized in Tables II-A-6 and II-A-7. (The staff has not yet estimated the benefits of adding medium-duty vehicles to the parts replacement program in the San Joaquin Valley, so Table II-A-7 does not reflect these benefits.) If improvements to California's Smog Check program occur, they would impact the same vehicles targeted by the mandatory equipment replacement program and so might reduce the potential emission benefits of such a program.

Table II-A-6
LT/MED-DUTY-1: Replace or Upgrade Emission Control Systems on Existing Passenger Vehicles
(South Coast, Summer Planning, tpd)

Pollutant	2010
ROG	0-20
NOx	0-20
CO	0-140

Table II-A-7
LT/MED-DUTY-1: Replace or Upgrade Emission Control Systems on Existing Passenger Vehicles
(San Joaquin Valley, Winter Planning, tpd)

Pollutant	2010
ROG	0-2.4
NOx	0-2.7
PM10	0

SIP Commitment for Measure LT/MED-DUTY-1

South Coast 2003 SIP Commitment:

ARB staff proposes to commit to bring this measure to the Board by 2005. The measure as proposed to the Board will achieve, at a minimum, between 0 and 20 tpd of ROG reductions and between 0 and 20 tpd of NOx reductions in the South Coast Air Basin in 2010.

San Joaquin Valley 2003 PM10 SIP Commitment:

On June 26, 2003, the Board approved State commitments for the San Joaquin Valley's PM10 SIP. ARB staff commits to complete the Pilot Program and propose a control measure if the approach described above proves to be feasible and effective. If the approach is found to be feasible and effective, the Board will consider this measure by 2005. Emission reductions from this measure will be used toward meeting ARB's commitment to adopt new measures between 2002 and 2008 that reduce emissions by an additional 10 tpd NOx and 0.5 tpd direct PM10 in the San Joaquin Valley by 2010.

Commitments for Future SIPs:

As other areas of the State develop attainment SIPs that require additional emission reductions to show progress and/or attainment, we will work with the appropriate local air districts to determine which State and/or federal measures are appropriate to include for federal approval.

ATTACHMENT A-3
REVISED ON-RD HVY-DUTY-3

c. ON-RD HVY-DUTY-3: Pursue Approaches to Clean Up the Existing and New Truck/Bus Fleet -- In-Use Emission Control, Engine Software Upgrade, On-Board Diagnostics, Manufacturers' In-Use Compliance, Reduced Idling

Time Frame: Adopt 2003-2006; Implement 2004-2010

Responsible Agency: ARB

Proposed Strategy:

New engine standards, together with compliance and enforcement programs designed to ensure that new engines maintain their low emission levels, will provide significant reductions over time. In addition to implementing programs that target new engines and vehicles, ARB must also focus its efforts on reducing emissions from the existing heavy-duty diesel vehicle fleet in order to improve air quality and benefit public health in the near-term. The measures discussed here form a comprehensive strategy to reduce harmful emissions from both the new and in-use heavy-duty vehicle fleet and to ensure that ARB's heavy-duty vehicle program achieves maximum emission benefits.

In 1998, ARB revised the South Coast SIP to replace measure M7, Accelerated Retirement of Heavy-Duty Vehicles, with measure M17, In-Use Reductions from Heavy-Duty Vehicles. M17 described two strategies to reduce emissions from in-use heavy-duty vehicles – incorporating NOx screening into existing roadside smoke inspection to identify malmaintained vehicles for repair and developing an in-use compliance testing and recall program (including the potential use of on-board diagnostic systems). The measure also included market-based incentives as a supplement to ensure that the emission reduction commitments in M17 were met. U.S. EPA has not approved this SIP revision. Since 1998, ARB staff has investigated the two strategies described in M17. Results from field tests indicate that repairing malmaintained heavy-duty engines is not an effective strategy – sometimes leading to post-repair increases in NOx emissions. ARB staff believes that engine software upgrades (described below) are a more effective means of reducing emissions from trucks that are already on the road. ARB staff is continuing to pursue programs aimed at requiring on-board diagnostic systems and in-use vehicle testing. These programs are incorporated into this measure.

In-Use Emission Controls: In February 2000, ARB adopted a fleet rule that requires public transit agencies to aggressively reduce NOx and PM emissions from their urban buses. The use of hardware-based retrofit systems verified through ARB's Diesel Emission Control Strategy Verification Procedure to reduce PM emissions is an important part of the transit bus rule. As called for in the Diesel Risk Reduction Plan, which was adopted by the Board in September 2000, ARB is expanding its opportunities

to achieve PM reductions, and in most cases, ROG reductions, through the implementation of additional rules targeting specific heavy-duty diesel trucks. The in-use emissions control rules were originally envisioned as primarily PM control measures; however, because of the statewide need for NOx reductions and the need to minimize impacts on affected heavy-duty diesel fleets, the ARB is now committing to an integrated approach to achieve PM, NOx, and ROG reductions.

PM, NOx, and ROG emission reductions may be achieved through a variety of strategies, including engine repowers, accelerated fleet turnover, and retrofits with verified emission control strategies. The use of cleaner fuels, including alternative fuels, low sulfur diesel fuel, and alternative diesel fuels (such as diesel water emulsions) may also contribute to emission reductions. As with other ARB regulations, the in-use rules will not prescribe the emission control strategies that fleet operators must use. The strategies that operators select, however, must use ARB-verified technology and ARB-certified engines, and must meet the emission reduction targets specified by the in-use rules.

Depending on the strategy chosen by operators, the use of low-sulfur diesel fuel may be an integral strategy component. Most catalyst-based diesel particulate filters provide the greatest emission reductions when used with low-sulfur diesel fuel (sulfur content of 15 ppmw or less), and some NOx retrofit systems may require the use of low sulfur diesel fuel as well. One retrofit system that requires the use of low-sulfur diesel fuel combines a lean NOx catalyst with a diesel particulate filter; this system has already been verified by the ARB for use on limited engine families produced by two engine manufacturers.

Through the Diesel Emission Control Strategy Verification Procedure, ARB adopted a multi-level approach for categorizing strategies based on their verified PM emission reductions. "Level 1" verification applies to strategies that achieve at least a 25 percent PM reduction; "Level 2" verification applies to strategies that achieve at least a 50 percent PM reduction; and "Level 3" verification applies to strategies that achieve at least an 85 percent PM reduction, or reduce exhaust PM levels to no more than 0.01 g/bhp-hr. The verification procedure also allows for strategy verification based on a minimum 15 percent NOx emission reduction when coupled with at least a Level 1 PM verification. Together with regulations that will require the use of retrofits or other strategies verified to the highest level possible, this multi-level approach ensures the development of high-efficiency control strategies. At the same time, it allows for lower level reductions in applications where higher level options are not yet available, thus ensuring that diesel PM and NOx emissions are reduced in a timely manner when and where they can be realized.

The in-use emission reduction rules are intended to provide a flexible and progressive in-use emission control program that achieves the highest level of PM emission control possible while also achieving significant NOx reductions. As stated previously, the in-use rules were originally intended to focus primarily on PM reductions. The staff also expected the rules to achieve some level of ROG reductions. The

currently verified diesel particulate filters, for instance, achieve ROG reductions commensurate with the level of PM reductions achieved. The staff now also expects the fleet rules to achieve NOx reductions. NOx reductions will be based on a particular strategy's verified NOx reduction capability; strategies verified for NOx reductions must achieve a minimum 15 percent reduction and may be verified for greater NOx reductions in 5 percent increments.

Table II-B-7 presents staff's estimate of the range of emission benefits for the South Coast Air Basin that would be achieved through implementation of the fleet rules.

Table II-B-7
ON-RD HVY-DUTY-3: Pursue Approaches to Clean Up the Existing and New Truck/Bus Fleet: In-Use Emission Control
Estimated Emission Reductions
(South Coast, Summer Planning, tpd)

Pollutant	2005	2006 (Annual Average)	2008	2010	2020
ROG	0.04 – 0.09	0.09-0.3	0.8 – 2.6	1.4 – 4.5	0.5 – 1.7
NOx	Not Quantified			8 - 10	NQ
PM10	0.02 – 0.04	0.03 – 0.2	0.2 – 1	0.4 – 1.6	0.2 – 0.5
CO	Not Quantified			6 - 18	NQ

Engine Software Upgrade: ARB staff is proposing to require the installation of low NOx software in heavy-duty diesel vehicles with 1993 through 1998 model year engines for which low NOx software was developed under the Consent Decrees. The installation of low NOx software is also known as engine recalibration, chip reflash or engine software upgrade. In this procedure, the engine's electronic control module (ECM) is reprogrammed to reduce NOx emissions from levels achieved during typical in-use driving conditions.

Prior to installing low NOx software, the 1993 through 1998 model year engines emit "off-cycle" NOx. Off cycle NOx are emissions greater than the emissions allowed in the engine certification process; these off-cycle emissions occur when the ECM recognizes that the engine is not being driven in accordance with the federal test procedure used for engine certification.

Upgrading the software on a heavy-duty diesel engine's ECM provides opportunities to reduce NOx emissions. To comply with the Low NOx Rebuild Program contained in the federal Consent Decrees and similar state Settlement Agreements, engine manufacturers were required to provide engine dealers and distributors with low NOx rebuild kits to reduce the off-cycle emissions from specified engines. Under the provisions of the Consent Decrees, these kits implement certain software and/or minor hardware changes to achieve the necessary NOx reductions. To date, the available low

NOx rebuild kits have relied only on engine software upgrades; the kits have not included hardware changes. In general, the engine software upgrade reduces NOx emissions by eliminating advanced computer controls – "defeat devices" – that produce excess off-cycle NOx emissions during steady-state vehicle operation, such as on-highway driving.

When the Consent Decrees were signed, it was assumed that the low NOx rebuild kits would be installed at the time of normal engine rebuild, typically around 200,000 to 300,000 miles of service. The engine manufacturers have complied with the provisions of the Low NOx Rebuild Program requiring them to provide dealers and distributors with low NOx rebuild kits (i.e., engine software upgrade kits). ARB staff, however, estimates that only four to ten percent of the low NOx rebuild kits have been installed in applicable engines. As diesel engines have become increasingly durable, fewer rebuilds are being performed or are performed at higher mileage intervals. As such, the Low NOx Rebuild Program has not yet achieved its expected emission benefits.

The ARB staff believes that off-cycle NOx emissions should be eliminated now. To ensure that emission benefits are achieved, ARB staff will propose to the Board in October 2003 a mandatory heavy-duty diesel engine software upgrade measure to reduce NOx emissions. We estimate that there are about 100,000 California-registered heavy-duty diesel vehicles with engines eligible for the software upgrades. Implementation of this measure would begin in 2004. This measure would expand upon the original requirements of the Low NOx Rebuild Program by requiring the installation of software upgrades on applicable engines. The proposed mandatory measure would not require any engine hardware changes. The reductions associated with this proposed measure are necessary to mitigate a portion of the off-cycle emissions that occurred due to the use of "defeat devices."

Table II-B-8 below shows the estimated NOx reductions that could be achieved through the implementation of a mandatory engine software upgrade measure. These reduction estimates are based on the assumption that software upgrades are installed on all applicable 1993 through 1998 model year heavy heavy-duty diesel and medium heavy-duty diesel engines in vehicles registered in California. The estimates presented below were calculated using confidential emissions data obtained during the Consent Decree negotiations, and VMT estimates provided by the Southern California Association of Governments. ARB staff intends to propose that engines in heavy-duty diesel vehicles registered out of state also be subject to this regulatory measure; the staff is now in the process of finalizing any additional emission benefits that may be achieved.

Table II-B-8
ON-RD HVY-DUTY-3: Pursue Approaches to Clean Up the Existing and New Truck/Bus Fleet: Mandatory Engine Software Upgrade
Estimated Emission Reductions for MHDDE and HHDDE
California Registered Trucks
(South Coast, Summer Planning, tpd)

Pollutant	2005	2006 (Annual Average)	2008	2010	2020
NOx	13 - 17	12 – 16	11 -14	8 - 10	0 - 1

On-Board Diagnostics (OBD): As ARB implements more stringent emission standards, engine manufacturers are incorporating into their engine designs more sophisticated emission control devices such as exhaust gas recirculation systems, fuel injection rate shaping techniques, particulate filters, NOx adsorbers, and other electronic controls. To maintain low emission levels over time, these emission control devices must continue to perform properly throughout each vehicle's life.

One strategy to ensure that sophisticated emission controls perform adequately over time is to require a comprehensive OBD system on all heavy-duty vehicles. The current diagnostic systems voluntarily implemented by manufacturers are designed primarily to detect gross failures of components (e.g., disconnections and other circuit failures, rather than deterioration or reduced performance) without regard to the emission level associated with the malfunction. The measure proposed here would require OBD systems to detect malfunctions of virtually every component that can cause an emission increase before the emissions exceed a specified level. While discussed here primarily as a heavy-duty diesel engine strategy, it would also apply to heavy-duty gasoline engines used in vehicles with a GVWR greater than 14,000 pounds.

The comprehensive OBD system would alert the vehicle operator of the malfunction through a dashboard light; valuable information about the malfunction would be stored in the on-board computer to assist technicians in diagnosing and repairing the malfunction. As with light-duty vehicles, an OBD system for heavy-duty vehicles would likely not require the addition of many new sensors or components. Instead, the OBD system would consist primarily of software in the existing on-board computer and would use many of the existing engine and emission control sensors.

Because the heavy-duty vehicle fleet is predominantly diesel-fueled, the benefits of an OBD program would primarily be associated with heavy-duty diesel vehicles with GVWRs greater than 14,000 pounds. Nonetheless, the potential OBD strategy would also apply to gasoline heavy-duty vehicles with GVWRs greater than 14,000 pounds, and would also provide additional emission benefits from heavy-duty gasoline vehicles.

ARB staff is working closely with U.S. EPA on developing an OBD program for heavy-duty engines and vehicles. ARB staff expects to present a proposal to the Board in the 2003 to 2004 timeframe with implementation beginning in 2007. Because many trucks in interstate commerce are registered outside of California, it is also necessary for U.S. EPA to adopt the same regulatory requirements. We expect U.S. EPA adoption in 2004 with federal implementation also beginning in 2007.

Manufacturer-Required In-Use Vehicle Testing: This proposed measure would require manufacturers of heavy-duty diesel engines to test a specific number of engines per engine family by procuring and testing in-use vehicles at various mileage intervals. The responsibility for procuring and testing vehicles would be on the engine manufacturers, not on ARB. If the vehicles tested do not meet applicable emission standards, the engine manufacturer may be required to test additional vehicles to determine if an engine recall is required. This program component may also include mechanisms to streamline the engine certification process in order to ease engine manufacturers' testing burden. ARB is working closely with U.S. EPA to develop this measure. ARB staff expects to propose this measure to the Board in 2004, the same timeframe in which U.S. EPA is expected to adopt an in-use compliance program. Beginning in 2005, a pilot program in California will be used to generate data and gain experience in testing heavy-duty diesel engines on-road with on-board measurement systems. A fully implemented and enforceable manufacturer-run in-use compliance program for both ARB and U.S EPA will begin in 2007.

Reduced Truck and Bus Idling: To date, ARB's heavy-duty emission control program has focused on engine emission standards without specifically targeting idling emissions. Nonetheless, ARB staff recognizes that idling emissions pose a serious air quality and health threat, particularly at warehouse/distribution centers located in areas that may already be disproportionately impacted by pollution, or at school bus stops populated by young children who are particularly sensitive to the impacts of pollution.

During idle operations, heavy-duty vehicles consume large amounts of diesel fuel, increase emissions, and produce noise. While idling practices vary among truck drivers by season and geographic location, a study by the Argonne National Laboratory indicates that long-haul trucks in the United States idle between five hours and ten hours per day, depending on the season. This same study also estimates that the average heavy-duty long-haul truck idles about six hours per day for 303 days annually[1]. When resting or sleeping, truck drivers may keep the engine running at idle to heat or cool the sleeper and/or cab, and to provide power to operate on-board appliances such as refrigerators, microwaves, television sets, and laptop computers. Heavy-duty trucks are also typically operated at idle to keep the engine block and diesel fuel warm for easy start-up during the winter months.

Some proactive trucking firms implement their own voluntary restricted-idling programs, and certain cities and municipalities already enforce ordinances that prohibit

[1] Stodolsky, F.; Gaines, L.; Vyas, A. *Analysis of Technology Options to Reduce the Fuel Consumption of Idling Trucks*; Argonne National Laboratory; ANL/ESD-43. June 2000.

extended idling. ARB staff is now developing measures expanding upon these local efforts to reduce idling emissions from both new and in-use heavy-duty diesel vehicles.

New Vehicles: For new vehicles, ARB staff plans to present to the Board a proposal in the 2003-2004 timeframe that would require idle-limiting devices on California-registered new heavy heavy-duty vehicles (diesel vehicles with GVWRs greater than 33,000 pounds) starting with the 2007 model year. These vehicles are typically used in line haul service and provide the greatest opportunities for reductions in idling emissions. The idle-limiting devices could range from systems that automatically shut down an engine after a specific time, to stop/start systems that automatically stop and start the engine as necessary to maintain engine and cab temperature and battery voltage within pre-set limits. Different idle-limiting technologies would be fully evaluated during ARB's public process for regulatory development. This regulatory strategy could also incorporate the use of alternative power systems, such as auxiliary power units, thermal storage systems, and truck stop electrification, to supply power for cab and on-board appliance functions as necessary.

Based on staff estimates, NOx emissions would be reduced by less than one ton per day in the SCAB in 2010. This estimate is based on the assumption that the average idling time for a heavy heavy-duty diesel truck would be reduced by 25 percent to 50 percent through the use of an idle-limiting device.

In-Use Vehicles: ARB in December 2002 adopted an Airborne Toxic Control Measure (ATCM) to reduce idling emissions from school buses, thereby reducing toxic diesel PM and other associated toxic air contaminants. The ATCM also includes provisions to limit idling from other heavy-duty vehicles operating near and on school grounds. While the ATCM provides some modest emission benefits that would reduce region-wide exposure to unhealthful exhaust emissions, the main purpose of the measure is to reduce localized exposure to diesel PM and other toxic air contaminants in the vicinity of schools.

To address heavy-duty vehicles operating at locations other than schools, ARB staff also plans to conduct an assessment to identify possible approaches for reducing diesel PM emitted from heavy-duty trucks and transit buses during idling operations. ARB staff plans to complete this assessment by the end of 2003. This assessment would examine the magnitude of current and future idling emissions, the level of human exposure, and possible approaches for reducing idling emissions. Staff would examine a wide range of approaches. Approaches to be examined would include operator education programs, public information, and fleet operator training programs. Additional approaches to be examined would include local ordinances restricting idling, no-idle zones, and requiring idle-limiting devices for certain fleets. Development of an airborne toxic control measure would be pursued to implement the regulatory aspects of this effort.

Alternatively, ARB staff may consider the feasibility of a legislative approach to restrict heavy-duty vehicles throughout the State from idling for extended time periods at loading docks, bus stops, and other areas where idling emissions occur. Similar to the regulatory approach, this strategy would restrict idling at various sources, thus reducing toxic diesel PM emissions and other associated toxic air contaminants.

Table II-B-9 shows the estimated emission benefits from all the approaches in this measure in the San Joaquin Valley. The staff has not yet estimated the additional NOx reductions that could be achieved in the San Joaquin Valley through implementation of the in-use emission control fleet rules. As such, the additional NOx reductions are not reflected in the table below.

Table II-B-9
ON-RD HVY-DUTY-3: Pursue Approaches to Clean Up the Existing and New Truck/Bus Fleet –In-Use Emission Control, Engine Software Upgrade, On-Board Diagnostics, Manufacturers' In-Use Compliance, Reduced Idling
Estimated Emission Reductions
(San Joaquin Valley, Winter Planning, tpd)

Pollutant	2010
ROG	1.5
NOx	4
PM10	0.1

SIP Commitment for Measure ON-RD HVY-DUTY-3

South Coast 2003 SIP Commitment:

ARB staff proposes to commit to bring this measure to the Board between 2003 and 2006. The measure as proposed to the Board will, at a minimum, achieve between 1.4 and 4.5 tpd of ROG reductions and between 16 and 21 tpd of NOx reductions in the South Coast Air Basin in 2010.

San Joaquin Valley 2003 PM10 SIP Commitment:

On June 26, 2003, the Board approved State commitments for the San Joaquin Valley's PM10 SIP. ARB staff commits to bring this measure to the Board between 2003 and 2006. Emission reductions from this measure will be used toward meeting ARB's commitment to adopt new measures between 2002 and 2008 that reduce emissions by an additional 10 tpd NOx and 0.5 tpd direct PM10 in the San Joaquin Valley by 2010.

ATTACHMENT A-4
REVISED OFF-RD CI-1

a. OFF-RD CI-1: Pursue Approaches to Clean Up the Existing Heavy-Duty Off-Road Equipment Fleet [Compression-Ignition Engines]

Time Frame: Adopt 2004-2008; Implement 2006-2010

Responsible Agencies: ARB

New heavy-duty diesel engine standards provide significant, long-term reductions in emissions as the fleet turns over. Compliance and enforcement programs are designed to ensure that new engines maintain their low emission levels. However, to improve air quality and benefit public health in the near-term, emissions from the existing heavy-duty diesel equipment fleet must be reduced.

The strategies discussed here specifically target in-use emissions from the existing fleet. These strategies can provide near-term reductions, depending on when they are implemented, but they can also provide longer-term reductions lasting until each affected vehicle is replaced with a newer vehicle meeting more stringent emission standards.

The public transit bus fleet rule, adopted by the ARB in February 2000, requires transit agencies to reduce NOx and PM emissions from their buses. As called for in the Diesel Risk Reduction Plan, which was adopted by the Board in September 2000, ARB is expanding its opportunities to achieve PM reductions, and in most cases, ROG reductions. These reductions will be accomplished through the implementation of additional rules targeting not only other on-road vehicles, but heavy-duty diesel off-road vehicles and equipment as well. The in-use emission control rules were originally envisioned as primarily PM control measures; however, because of the statewide need for NOx reductions and the need to minimize impacts on affected heavy-duty diesel equipment operators, the ARB is now committing to an integrated approach to achieve PM, NOx and ROG reductions.

There are a variety of options available to reduce PM, NOx, and ROG emissions from existing diesel off-road engines including retrofit technology, engine repowers, accelerated fleet turnover, and other options.

The installation of hardware-based retrofit technologies, such as diesel particulate filters and lean NOx catalysts, has the potential to reduce emissions. Through the Diesel Emission Control Strategy Verification Procedure, ARB adopted a multi-level approach for categorizing strategies based on their verified PM emission reductions. "Level 1" verification applies to strategies that achieve at least a 25 percent PM reduction; "Level 2" verification applies to strategies that achieve at least a 50 percent PM reduction; and "Level 3" verification applies to strategies that achieve at least an 85 percent PM reduction, or reduce exhaust PM levels to no more than

0.01 g/bhp-hr. The verification procedure also allows for strategy verification based on a minimum 15 percent NOx emission reduction when coupled with at least a Level 1 PM verification. Together with regulations that will require the use of retrofits or other strategies verified to the highest level possible, this multi-level approach ensures the development of high-efficiency control strategies. At the same time, it allows for lower level reductions in applications where higher level options are not yet available, thus ensuring that diesel PM and NOx emissions are reduced in a timely manner when and where they can be realized. Currently, a PM control system that also achieves NOx reductions has been verified for use on a limited number of on-road diesel engine families; the system is capable of reducing NOx emissions by approximately 25 percent. Transfer of this technology to off-road engines could possibly provide another option to reduce NOx emissions.

Another means to reduce emissions is to replace older, uncontrolled engines with new, certified engines meeting the Tier 1 standards (referred to as engine repowers). Replacing uncontrolled engines with Tier 1 engines has the potential to reduce NOx emissions by approximately one-third. Because of the significant technical changes to achieve Tier 2 emission levels (including significant frame and body design changes), the potential for repowering uncontrolled engines with Tier 2 engines is small. Replacing older vehicles/equipment with new, lower-emitting models (referred to as accelerated fleet turnover) would also reduce emissions of PM and NOx.

The use of low-sulfur diesel fuel may be an integral strategy component. Most catalyst-based diesel particulate filters provide the greatest emission reductions when used with low-sulfur diesel fuel (sulfur content of 15 ppmw or less). Reductions in both NOx and PM emissions could be achieved through the use of cleaner burning fuels such as alternative fuels or diesel water emulsions.

In-use emission control programs for off-road vehicles/equipment could be implemented through a variety of approaches. One such approach could require large State construction contracts to include a demonstration of reductions as a contract condition. In addition, an in-use emission control rule for off-road equipment could apply specifically to publicly-owned fleets. ARB could also establish a best available control technology requirement, as we did in the solid-waste collection vehicle regulation, and prescribe a phase-in schedule.

While an off-road in-use emission control program is certainly feasible, its effectiveness may be less than optimum without a statewide registration program. This is because it would be difficult to track certain types of retrofitted off-road equipment, thereby hampering the ability to directly enforce the retrofit installation. Therefore, ARB staff is also considering a proposal for a registration requirement in California for off-road equipment (see measure OFF-RD CI-2).

A likely timeframe for implementing an in-use emission control rule for privately-owned off-road vehicles/equipment would be to start in 2007. By that time, there should already be widespread availability of low-sulfur diesel fuel (sulfur content of 15 ppmw or

less), which is necessary for many retrofit technologies to perform effectively and reliably. For publicly-owned fleets, however, a phased-in implementation schedule beginning earlier may be considered since California refiners are capable of producing very low sulfur diesel fuel in sufficient quantities for fleet use.

Table II-C-6 below shows the estimated emission benefits in the South Coast Air Basin from implementation of the in-use emission control rules. Table II-C-7 shows the estimated benefits in the San Joaquin Valley. The staff has not yet estimated the NOx reductions that could be achieved in the San Joaquin Valley through implementation of the in-use emission control rules. As such, the NOx reductions are not reflected in Table II-C-7.

Table II-C-6
OFF-RD CI-1: Pursue Approaches to Clean Up the Existing Off-Road Equipment Fleet [Compression-Ignition Engines]
Estimated Emission Reductions
(South Coast, Summer Planning, tpd)

Pollutant	2005	2006 (Annual Average)	2008	2010	2020
ROG	n/a	0.03-0.10	0.8-2.8	2.3-7.8	1.3-4.3
NOx	n/a	NQ	NQ	8-10	NQ
PM10	n/a	0.02-0.06	0.6-1.9	1.6-5.4	0.9-3.2
CO	Not Quantified			9-29	NQ

Table II-C-7
OFF-RD CI-1: Pursue Approaches to Clean Up the Existing Off-Road Equipment Fleet [Compression-Ignition Engines]
Estimated Emission Reductions
(San Joaquin Valley, Winter Planning, tpd)

Pollutant	2010
ROG	1.0
NOx	0
PM10	0.4

SIP Commitment for Measure OFF-RD CI-1

South Coast 2003 SIP Commitment:

ARB staff proposes to commit to bring this measure to the Board between 2004 and 2008. The measure as proposed to the Board will, at a minimum, achieve between 8 and 10 tpd of NOx and between 2.3 and 7.8 tpd of ROG reductions in the South Coast Air Basin in 2010.

San Joaquin Valley 2003 PM10 SIP Commitment:

On June 26, 2003, the Board approved State commitments for the San Joaquin Valley's PM10 SIP. ARB staff commits to bring this measure to Board between 2004 and 2008. Emission reductions from this measure will be used toward meeting ARB's commitment to adopt new measures between 2002 and 2008 that reduce emissions by an additional 10 tpd NOx and 0.5 tpd direct PM10 in the San Joaquin Valley by 2010.

Commitments for Future SIPs:

As other areas of the State develop attainment SIPs that require additional emission reductions to show progress and/or attainment, we will work with the appropriate local air districts to determine which State and/or federal measures are appropriate to include for federal approval.

ATTACHMENT A-5

Table I-6
State Annual Adoption Commitments for Near-Term Measures
2003 South Coast Ozone SIP
(emission reductions in tons per day in 2010, summer planning inventory)

	2003	2004	2005	2006	Total State Reductions from Near-Term Measures
ROG	10	4	22	14	50
NOx	11	5	23	20	59

In addition to the emission reduction commitments identified in Table I-6, the ARB also commits to achieving further ROG and NOx reductions as specified in Attachment A-7 to Resolution 03-22.

ATTACHMENT A-6

Table I-7
State Strategy
2003 South Coast Ozone SIP
(tons per day in 2010)

Strategy (Agency)	Name	Final Action Date	Implementation Date	Expected Reductions (South Coast 2010)*	
				ROG	NOx
DEFINED STATE MEASURES TO BE DEVELOPED AND PROPOSED					
LT/MED-DUTY-1 (ARB)	Replace or Upgrade Emission Control Systems on Existing Passenger Vehicles	2005	2007-2008	0-20	0-20
LT/MED-DUTY-2 (BAR)	Improve Smog Check to Reduce Emissions from Existing Passenger and Cargo Vehicles	2002-2005	2002-2006	5.6-5.8	8.0-8.4
ON-RD HVY-DUTY-1 (ARB)	Augment Truck and Bus Highway Inspections with Community-Based Inspections	2003	2005	0-0.1	0
ON-RD HVY-DUTY-2 (ARB)	Capture and Control Vapors from Gasoline Cargo Tankers	2005	2006-2007	4-5	0
ON-RD HVY-DUTY-3 (ARB)	Pursue Approaches to Clean Up the Existing and New Truck/Bus Fleet	2003-2006	2004-2010	1.4-4.5	16-21
OFF-RD CI-1 (ARB)	Pursue Approaches to Clean Up the Existing Heavy-Duty Off-Road Equipment Fleet (Compression Ignition Engines)	2004-2008	2006-2010	2.3-7.8	8-10
OFF-RD CI-2 (ARB)	Implement Registration and Inspection Program for Existing Heavy-Duty Off-Road Equipment to Detect Excess Emissions (Compression Ignition Engines)	2006-2009	2010	NQ	NQ
OFF-RD LSI-1 (ARB)	Set Lower Emission Standards for New Off-Road Gas Engines (Spark Ignited Engines 25 hp and Greater)	2004-2005	2007	0	0.8
OFF-RD LSI-2 (ARB)	Clean Up Off-Road Gas Equipment Through Retrofit Controls and New Emission Standards (Spark-Ignition Engines 25 hp and Greater)	2004	2006-2012	0.8-2.0	2-4
SMALL OFF-RD-1 (ARB)	Set Lower Emission Standards for New Handheld Small Engines and Equipment (Spark Ignited Engines Under 25 hp such as Weed Trimmers, Leaf Blowers, and Chainsaws)	2003	2005	1.9	0.2
SMALL OFF-RD-2 (ARB)	Set Lower Emission Standards for New Non-Handheld Small Engines and Equipment (Spark Ignited Engines Under 25 hp such as Lawnmowers)	2003	2007	6.3-7.4	0.6-1.9
MARINE-1 (ARB)	Pursue Approaches to Clean Up the Existing Harbor Craft Fleet – Cleaner Engines and Fuels	2003-2005	2005	0.1	2.7

Strategy (Agency)	Name	Final Action Date	Implementation Date	Expected Reductions (South Coast 2010)*	
				ROG	NOx
MARINE-2 (ARB)	Pursue Approaches to Reduce Land-Based Port Emissions – Alternative Fuels, Cleaner Engines, Retrofit Controls, Electrification, Education Programs, Operational Controls	2003-2005	2003-2010	0.1	0.1
FUEL-1 (ARB)	Set Additives Standards for Diesel Fuel to Control Engine Deposits	2006-2009	2006-2010	NQ	NQ
FUEL-2 (ARB)	Set Low-Sulfur Standards for Diesel Fuel for Trucks/Buses, Off-Road Equipment, and Stationary Engines	2003	2006	Enabling	Enabling
CONS-1 (ARB)	Set New Consumer Products Limits for 2006	2003-2004	2006	2.3	0
CONS-2 (ARB)	Set New Consumer Products Limits for 2008-2010	2006-2008	2008-2010	8.5-15	0
FVR-1 (ARB)	Increase Recovery of Fuel Vapors from Aboveground Storage Tanks	2003	2007	0-0.1	0
FVR-2 (ARB)	Recover Fuel Vapors from Gasoline Dispensing at Marinas	2006-2009	2006-2010	0-0.1	0
FVR-3 (ARB)	Reduce Fuel Permeation Through Gasoline Dispenser Hoses	2004	2007	0-0.7	0
PEST-1 (DPR)	Implement Existing Pesticide Strategy	---	1996-2010	Baseline	N/A
Potential Range for Defined Near-Term State Measures				33.3-72.9	38.4-69.1
Minimum Commitment Via Adoption 2003-2006				50	59
ADDITIONAL MEASURE					
(ARB)	Achieve Further Emission Reductions from On-Road and Off-Road Mobile Sources and Consumer Products	2005-2008	2006-2010	97	
PROCESS FOR LONG-TERM STRATEGY					
LONG-TERM STRATEGY (ARB)	Lead Multi-Agency Effort (State, federal and local) and Public Process Beginning in 2004 to Identify and Adopt Long-Term Measures, Including up to 66 tpd ROG+NOx Reductions Contingent on Authority and Funding	2004-2007	2010	118-233**	0-159**

* Based on ARB's summer planning emission inventory for the 2003 South Coast SIP.

** Range based on how much of 97 tpd commitment is achieved from ROG versus NOx, and U.S. EPA action on federal responsibility for 18 tpd ROG and 68 tpd NOx reductions.

ATTACHMENT A-7

Achieve Further Emission Reductions from On-Road and Off-Road Mobile Sources and Consumer Products

Time Frame: Action 2005-2008; Implement 2006-2010

Responsible Agency: ARB

Proposed Strategy:

This measure proposes to achieve additional emission reductions from on- and off-road mobile sources and consumer products. Such emission reductions are needed to ensure expeditious progress and attainment of federal ambient air quality standards.

The emission reduction target set forth herein is in addition to that specified for other short-range measures to be implemented by ARB. To implement this measure and achieve the overall emission reduction target, ARB — contingent upon their feasibility as evaluated as specified in the first paragraph of Attachment A-1 of Resolution 03-22 — will develop and adopt regulations for on- and off-road mobile sources and consumer products between 2005 and 2008, with implementation in 2006-2010. These regulations and other actions may include any of the following items or other actions as deemed appropriate by staff and the Board.

- Light and Medium-Duty Vehicles
  - Replacement of catalytic converters/carbon canisters on all applicable models at approximately 100,000 mile intervals.
  - Enhance the I & M program for light and medium-duty vehicles by using remote sensing to identify high emitters.
  - 4-wheel/all wheel-drive exemption from loaded mode testing.
  - New reformulated gasoline standards that primarily reduce sulfur contents, cap RVP, lower distillation temperatures, and olefins.
- Heavy-Duty Diesel Trucks/Buses
  - Retrofit of applicable in-use vehicles with add-on controls such as lean-NOx catalysts.
- Recreational Marine
  - Replacement of 2-stroke recreational marine engines with cleaner 4-stroke engines through an incentive program such as a buy-back program.
  - Retrofit applicable 4-stroke recreational marine engines with catalytic converters.

- Construction/Industrial Diesel
  - Require or incentivize the repowering of existing off-road diesel construction and industrial equipment with engines meeting new engine emission standards.
- Residential Lawn and Garden
  - Phase-in of zero-emitting residential lawn mowers and garden equipment.
- Consumer Products
  - Additional reductions from consumer products through the transfer of low and ultra-low VOC stationary source technologies to consumer products such as clean-up solvents.
- Ships
  - Cold ironing for ships calling on the Ports of Long Beach and Los Angeles.
- Trains
  - Non-MOU switcher and short-haul locomotives to use low-emission units such as LNG and battery/diesel hybrids.

The following table presents the additional emission reductions targeted in this control measure. ARB commits to achieve, at minimum, the ROG and NOx reduction target in this control measure through adoption and implementation of any combination of feasible control strategies affecting on-road and off-road mobile sources and consumer products.

Achieve Further Emission Reductions from On-Road and Off-Road Mobile Sources and Consumer Products (South Coast, Summer Planning, tpd)

Pollutant	2010
ROG + NOx	97

SIP Commitment to Achieve Further Emission Reductions from On-Road and Off-Road Mobile Sources and Consumer Products

South Coast 2003 SIP Commitment:

ARB staff proposes to implement this measure beginning in 2005. The measure will achieve a combined 97 tpd of ROG and NOx reductions in the South Coast Air Basin in 2010.

Comments

1. **Comment**: Nissan's forklift line-up is comprised of battery, LSI engine, and CI engine forklifts. Each type of forklift has its merit and characteristics, and ultimate purchasers have an inevitable reason for their selection of electric forklifts or engine powered forklifts. One of the reasons customers choose engine forklifts over electric forklifts is because the battery in electric forklifts have a potentially hazardous nature and disposal has a negative effect on the environment. (Nissan Motor Co., LTD, September 30, 2003).

   Agency Response:

   ARB contracted with A.D. Little / Acurex Environmental Corporation to evaluate fuel-cycle (indirect) emissions and battery disposal issues. While electrification of forklifts will result in the increased production and use of batteries, Acurex determined that lead-acid batteries are well regulated and banned from municipal solid waste landfills. Additionally, California has an established recycling infrastructure, and the recycle rate for lead-acid batteries is currently over 95%.

   An increase in the number of spent batteries to be processed could potentially have an impact on the recycling industry and on the disposal system for non-recyclable materials. Leasing, deposit, or rebate programs for electric batteries could be required to increase recycling. Exchanging a spent battery for a new battery at the time of replacement could also reduce waste impacts. With these mitigation measures in place, battery disposal impacts should not be significant.

   ARB staff responded previously to this comment as part of the Board's consideration of the San Joaquin Valley 2003 PM10 SIP (SJV PM10 SIP). The public hearing on the SJV PM10 SIP was held on June 23, 2003. The ARB's response to comments for the SJV PM10 SIP are hereby incorporated by reference and attached.

2. **Comment**: Any measure by CARB or the District which may affect the operational capacity of one or more of the airports in the Basin might be perceived as providing air quality impact reductions at the constrained airport, but this does not mean that there has been a net air quality benefit in the Basin generally. If passenger traffic is reduced at one airport in the Basin because of regulatory constraints, that traffic may be served at another Basin air port or the displaced passengers may choose to drive to their ultimate destination. For environmental purposes, the significant difference is that those passengers will have to either drive further to reach the second airport to obtain the air service that they desire, or they will have to drive to their final

destination, thereby increasing regional VMT and traffic congestion – with the concomitant negative impacts on air quality. (Air Improvement Resource, Inc. June 30, 2003, Comments on Draft Socioeconomic Report for the 2003 Revisions to the Air Quality Management Plan for the South Coast Air Basin.)

Agency Response:

The State Strategy for the California SIP does not include any control measures that would affect capacity at airports.

3. **Comment:** Complying with requirements outlined in CONS1 and CONS2 may be technically infeasible at this time. The Board must keep in mind that to have companies build products that may meet VOC reduction goals but provide our customers with products that do not perform to their expectations will ultimately drive them to find other products. The alternative products they find may have higher VOCs or may be more hazardous to the environment in other ways or may be more hazardous for them to use. (Mark Gindling, Director of Research, Buckeye International, October 13, 2003)

   Agency Response:

   Health and Safety Code section 41712 requires the ARB to set VOC limits that are technologically and commercially feasible. Thus, a VOC limit can not be set which would require a manufacturer to reformulate its product so that the product would not perform its basic intended function. In setting VOC standards, the ARB staff takes this legal mandate seriously and ensures that products complying with the standards will be efficacious. Therefore, we do not expect companies to switch to alternative products that might have adverse environmental impacts.

4. **Comment:** Industry disagrees with ARB's proposal to evaluate limiting the use of hydrocarbon propellants in the aerosol form of consumer products. If the aerosol industry is forced to adopt for example, dimethyl ether as a propellant of choice, the resulting products will have more propellant with a higher reactivity than the current formulations. (Allen M. Stegman, Corporate Manager of Environmental Affairs, Valspar, October 17, 2003; CSPA, October 23, 2003; Alan Howarth, President, Hydrosol, Inc., October 15, 2003; Ian Gecker, President, Ian Gecker & Associates Consulting, LLC, October 19, 2003; Stephen Bates, General Manager, Shield Packaging of California, October 20, 2003; Harry B. McCain, Vice President of Technical Services, Aeropres Corporation, October 14, 2003)

   Agency Response:

   While we agree that propane and butane are less photochemically reactive than some other VOCs, they are VOCs, and are not low enough in reactivity to qualify for exemption. In fact, dimethyl ether is lower in reactivity than normal or iso-butane (Propane 0.56; n-butane 1.33; iso-butane 1.35; dimethyl

ether 0.93). Hence, depending on the hydrocarbon propellant blend the hydrocarbon propellant could be more reactive than a dimethyl ether propelled product.

Our experience has shown that, in the case of aerosol coatings, water-based products formulated with dimethyl ether as propellant and co-solvent are considerably less reactive than their solvent-based hydrocarbon propelled counterparts. It is also worth noting that dimethyl ether performs a dual function in products containing water acting both as a solvent for the active ingredients, as well as the means to expel the product. Hydrocarbon propellants, such as propane and butane, are fairly poor solvents, leading to the addition of higher reactive VOCs to provide solvency for active ingredients.

Limiting use of hydrocarbon propellants is one of several options that staff will evaluate for future, additional VOC reductions.

When setting standards for aerosol products, the ARB will analyze the possibility that propellants with higher reactivity will be used, and will structure the regulatory requirements to ensure that an increase in ozone formation will not result.

5. **Comment:** ARB's proposal to evaluate limiting the use of hydrocarbon propellants in the aerosol form of consumer products may increase global warming. (CSPA, October 23, 2003)

Agency Response:

Alternative compounds used to meet lower VOC limits in the Proposed Strategy's consumer products measures could be greenhouse gases. For aerosol products to meet the VOC limits in the proposed regulations, manufacturers may choose to replace some or all of the typical hydrocarbon propellants with HFC-152a or CO2, both of which are greenhose gases. HFC-152a has no ozone depletion potential, does not contribute to the formation of ground level ozone, is low in toxicity, and is only mildly flammable. In addition, HFC-152a has the lowest global warming potential of all the HFCs and an atmospheric lifetime of only 1.5 years. Due to the high cost of HFC-152a (as much as five to seven times greater than other hydrocarbon propellants), it is anticipated that manufacturers will use as little HFC-152a as possible when reformulating their aerosol products. Consequently, the impact on global warming from the increased use of HFC-152a should be negligible. However, further analysis of the properties and effects of HFC-152a is needed. Should the analysis reveal significant impacts, ARB staff would reassess the control strategy. CO2 used as a replacement for hydrocarbon propellants would be a recycled byproduct from existing processes and would therefore not contribute to global warming.

RESPONSES TO ENVIRONMENTAL ISSUES RAISED DURING THE 45-DAY PUBLIC REVIEW PERIOD FOR THE SAN JOAQUIN VALLEY 2003 PM-10 SIP

Responses to Comments

on

Proposed State Implementation Plan Measures: LT/MED-DUTY-1, LT/MED-DUTY-2, ON-RD HVY-DUTY-3, OFF-RD CI-1, OFF-RD LSI-2, and OFF-RD LSI-3

Comments

1. **Comment**: Forklift operators prefer propane-powered forklifts because of their ability to outperform electric forklifts under rigorous conditions (e.g., push and pull loads, operate up and down inclines, and maintain a higher travel speed and lift speed when loaded). If forced to purchase electric forklifts, they would shift to diesel-powered forklifts instead in order to satisfy the demands of their business operations. This would result in higher NOx emissions (than from a propane-powered forklift), and greater exposure to toxic air contaminants (the California Air Resources Board (ARB) identified the particulate matter component of diesel exhaust as a toxic air contaminant in 1998).2

Commenter number: 1-6, 9, 11, 12, 16-33, 36-38, 40-43, 45, 47, 51, 59, 62, 64-67, 69-72,74-79, 82-189, 191-213, 215-219, 306-314, 316-323, 330, 331, 334-336, 338-343, 345-346, 348-354, 357-366, 368-388, 392-432, 434-482, 484, 486-491, 493, 497-502, 504-507, 509-510, 512-515, 517, 519, 548-556, 561, 563-564, 568-573, 575-584, 586, 588, 590, 603-605, 608-617, 619, 621-622.

Agency Response:

This comment was directed at State Implementation Plan (SIP) Measure LSI-3, which required that all purchases and leases of new forklifts with a lift capacity of less than 8,000 pounds be electric-powered. LSI-3 has since been replaced in the SIP by LSI-2 Consolidated (LSI-2C). LSI-2C does not contain the same electric lease/purchase requirement. Instead, LSI-2C directs staff to assess the feasibility of establishing emission standards that are more stringent than those required by LSI-1 based on the availability of zero and near-zero emission forklift technologies. This provides facility operators with the flexibility to continue to operate internal combustion engine-powered (primarily propane) forklifts if necessary and obviates the impulse to purchase diesel forklifts.

Any regulation implementing the commitments of LSI-2C will be developed with full consideration of the operational limits of electric forklifts and the needs of forklift operators. Specific exemptions and requirements will be determined, in consultation with industry, during the regulatory development process. The regulatory development process will also include careful consideration of diesel forklift purchases and forklift rentals to ensure these categories are not utilized to circumvent the regulation and cause unintended emissions increases.

The issue of exposure to the particulate matter component of diesel exhaust, which is a toxic air contaminant, is addressed in the agency response to comment 14.

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2 A list of the commenters is at the end of the document.

2. Comment: An increase in electric forklifts would result in a corresponding increase in the electrical energy required to recharge the batteries on a regular basis. An increase in electrical consumption would, in turn, create a greater demand for electricity at generating facilities. The ARB is aware of the energy supply shortage that existed in California in the spring and summer of 2001.

Commenter number: 7, 15, 44, 53, 57, 59-60, 68, 73, 80-81, 88-132, 222, 272, 305, 319, 327, 333, 337, 340-343, 382, 394-424, 439-467, 473, 496, 508, 510, 512-519, 548-562, 587, 605, 607, 609, 613, 620.

Agency Response:

In considering this comment, ARB staff referred to an analogous comment pertaining to the Zero Emission Vehicle Regulation. In that analysis, the ARB in cooperation with the California Energy Commission evaluated the impacts to our electricity supply from battery electric vehicles. First, most vehicle recharging occurs during off-peak hours due to lower rates and convenience, and will not contribute to the shortages that have been prevalent during peak hours. Second, the total number of electric vehicles and electricity demand from them is extremely small when compared to the overall system demand. Vehicles on the road today account for about 0.005 percent (5/1000ths of one percent) of the total annual energy use. In the larger numbers reasonably expected by the electric vehicle regulations, total electrical use from battery electric vehicles would have been approximately 0.12 percent (12/100ths of one percent) of the projected demand in 2010. In recognition of this energy demand and the fact that new power plants are being built to alleviate the peak power shortages over the new decade, ARB believes that the use of battery electric vehicles will have no meaningful impact on California's energy situation.

To get a sense of the additional energy burden that LSI-3 represented, staff assumed that 15,000 electric forklifts with an average of 50 horsepower (37.3kW) would be operated at a 30 percent load factor for 1900 hours per year. The resulting energy demand is about 15% more than that determined for electric vehicles. Thus, electric forklifts would have about the same energy demand of electric vehicles in 2010, or about 0.14 percent (14/100ths of one percent) of the projected demand in 2010 (see above discussion).

3. Comment: Propane is one of the cleanest of all fossil fuels, is non-toxic, and can be used to safely power forklifts both indoors and outdoors. When following the service maintenance schedule, it ensures the best possible emissions. And with propane, there is no spillage loss or evaporation into the atmosphere.

Commenter number: 7, 82, 134-189, 191-200, 220-305, 333, 383, 387, 618.

Agency Response:

The commenter is correct in stating that propane is one of the cleanest of the fossil fuels. Emissions from propane-powered forklifts, however, are still significant. In addition, evaporative emissions from propane tank filling is three times greater than evaporation from refueling gasoline-powered lifts. The first step in reducing overall forklift emissions was CARB's 1998 Off-Road LSI Engine Regulations that phased in, in 25 percent increments, a requirement that all new forklifts meet a 3.0 gram per brake horsepower-hour (3.0 g/bhp-hr) NOx standard by 2004. The next step was to harmonize the State standard with the federal requirement to decrease emissions further to 2.0 g/bhp-hr by 2007. While these two steps reduce the emissions from propane significantly, the implementation of zero and near-zero emission standards will provide the State with emission reductions that it needs as it tries to achieve healthful air quality standards for its citizens. Also see comment #8 regarding upstream emissions relative to electricity.

4. **Comment**: From an emissions standpoint, the sealed fuel system in a propane-powered forklift meets federal standards for clean emissions and propane-powered forklifts are approved by the federal Food and Drug Administration for use in food processing plants.

Commenter number: 222, 272, 300.

Agency Response:

Again, we acknowledge that propane is cleaner than most other fossil fuels. However, while a well-maintained and controlled propane-powered forklift may be able to meet the federal Occupational Safety and Health Administration (OSHA) worker safety standards, it will still contribute to poor ambient air quality in the State. Given that we still need to identify SIP emission reductions that will one day allow us to achieve federal ambient air quality standards, we need to look at all feasible zero and near-zero emission control options at our disposal.

5. **Comment**: By next year, 100 percent of new propane forklifts will have to comply with CARB's 1998 emission standards Off-Road LSI Engine Regulations. These new forklifts, redesigned in the last five years to meet the Tier 1 LSI emissions standards and certified to levels well below the requirements, are significantly cleaner than existing forklifts and should be given a chance to help in the overall emissions reductions we all desire. How can you justify the use of low emissions technology on new forklifts and then turn around and prohibit their use without first understanding the positive impact that these new forklifts will have on the environment?

Commenter number: 1-6, 8-9, 13, 15-33, 36-38, 40, 42-43, 45, 47, 49, 56, 60, 62, 64-68, 70-87, 133, 201-213, 215-218, 222, 272, 300, 306-314, 316-324, 327, 329-331, 334-343, 345-346, 348-354, 356-369, 371-374, 376-381, 384-386, 388-430, 432-472, 474-482, 484-491, 493-495, 497-498, 500-507, 509, 511, 557-560, 562-564, 568-584, 586, 588, 590-591, 603-604, 606, 608-617, 619, 621-622.

Agency Response:

More emissions reductions are needed than we achieved with the Tier I rule. The proposal is feasible and should therefore be considered. Forklifts produced and sold meeting the 1998 standards are making a significant contribution to clean air. The LSI-I measure calls for ARB to align California spark ignition standards with federal standards in 2007, forcing further design anyway. Combined LSI 2 & 3 explores the use of alternative near zero emission standards that will build on existing work to reduce emissions.

6. **Comment**: The requirement to purchase electric forklifts could have the unintended consequence of causing users to retain older forklifts past their normal useful life (operators may seek to extend the lifetime operational capability of current forklifts rather than purchase electric lifts). This creates the possibility of significantly eliminating gains in emissions reductions, as reflected in the attached analysis by Sierra Research.

Commenter number: 11, 13, 15, 41, 49, 56, 60, 80-81, 222, 272, 324, 340-343, 356, 367, 385, 394-424, 433, 439-468, 492, 494-495, 499, 503, 507, 511, 557-560, 562, 566, 578, 591, 606, 609, 613.

Agency Response:

Sierra Research, in commenting on SIP Measure LSI-3 in their June 21 and 24, 2003 memos to the Western Propane Gas Association estimated the impact of decreased sales of new electric forklifts as a result of users attempting to extend the useful life of their existing ICE forklifts. Sierra Research modified the age distribution of the 2010 fleet assuming reduced sales of 10 and 20 percent (as compared to 100 sale of electric.) In the second memo, more severe assumptions of 15 and 30 percent were made. The impact of this revised assumption was a reduction in, or complete elimination of emission benefits from LSI-3. While Sierra Research didn't normalize the age distribution to 100 percent in these analyses, resulting in underestimates of new electric forklift sales and overestimates of the increased retention of older ICE forklifts, it is apparent that if a high percentage of users retained older forklifts, it would have an impact on emission reductions.

However, SIP Measure LSI-2C does not require that 100 percent of new forklift sales or leases be electric. Instead, it requires that staff assess the feasibility of establishing emission standards more stringent than those required by SIP Measure LSI-1 based on the availability of zero and near-zero emission forklift technologies. Staff expects that

the economic impact of these more stringent LSI engine emission standards on forklift users would be relatively minor, reflecting the prevalence of low-emission technology in new forklifts. Thus, we do not expect to see a significant increase in the number of users seeking to extend the lifetime operational capability of their existing forklifts.

7. **Comment**: Instead of tightening regulations on forklifts, we should be focused on implementing low emission technologies for other engines such as portable generators, diesel-powered refuse trucks, and school buses. We should also focus on reducing commuting and development since 40 percent of current emissions are from automobiles.

Commenter number: 1-6, 9, 16-33, 36, 38, 40, 42-43, 45, 47, 62, 64-67, 70-72,74-79, 82-87, 133, 190, 201-210, 212-213, 215-218, 306-314, 316-318, 320-323, 330-331, 334, 338-339, 345-346, 348-354, 357-360, 362-366, 368-369, 371-374, 376-381, 384, 386, 388, 392-393, 425-430, 434-438, 469-472, 474-482, 484, 486-491, 493, 497-502, 504-507, 509, 564-565, 569-573, 575-577, 579-584, 586, 588, 590, 603-604, 608, 610-612, 614-617, 619-622.

Agency Response:

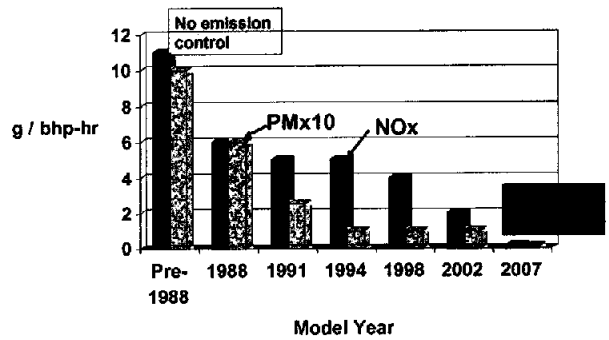
The SIP is California's roadmap for meeting federal health-based air quality standards. It is essential that the SIP include all cost-effective measures to obtain emission reductions from various emission sources. This is essential not only to obtain clean air for the citizens of California, but also to prevent the loss of federal highway funds for local areas.

The ARB already has a program to control emissions from mobile sources, and in particular, heavy-duty vehicles, including vehicles such as dump trucks, solid waste collection vehicles, fuel cargo tankers, larger delivery trucks, urban buses and school buses, motor homes, and line haul trucks.

As a result of this program, the ARB has gradually reduced NOx and PM emissions by over 95 percent from the mid-1980s to the near-zero levels of the 2007 standards, as shown in Figure 1.

Figure 1

Reducing Diesel Emissions
California New Truck Standards



Additional measures will be forthcoming to ensure new engines maintain low emissions, to ensure existing engines emit at the lowest feasible levels, and to push heavy-duty technology to achieve zero emissions, where possible.

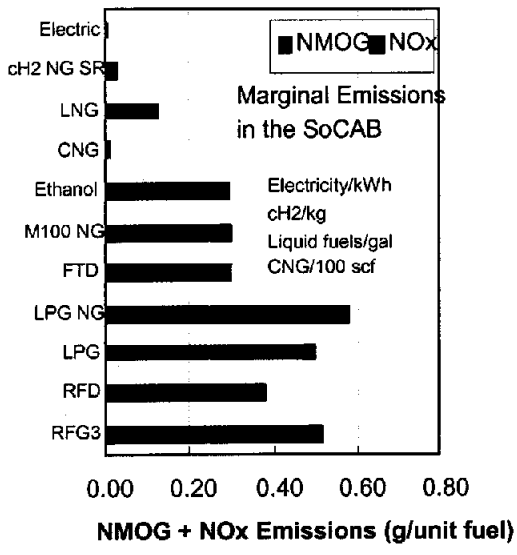
The ARB also has a program to control emissions from portable equipment. Registered engines must comply with technological requirements which may include 4-degree injection timing retard, turbochargers, aftercooler/intercoolers, or catalysts. In addition, some portable engines may be required to meet established emission limitations, visible emission limitations, fuel specification requirements, and recordkeeping and reporting requirements.

8. Comment: I cannot imagine that the adoption of LSI – 3 and the resulting pollution associated with manufacturing batteries, battery storage and disposal, required electrical infrastructure, increased electrical generation during on-peak hours and future diesel forklift purchases will in any way provide fewer exhaust emissions in the long run than the measures you have already adopted. Increased electrical generation shifts the burden of emission certification to the generator and places a greater burden on the energy supply infrastructure. Also, in supplying electrical energy for use in forklift applications, there would be a corresponding increase in energy required to overcome the associated losses inherent in the distribution of electrical energy from the source (power plant) through the distribution network (power lines) before it reaches its end purpose.

Commenter number: 1-6, 9, 13, 16-33, 36-38, 40, 42-45, 47, 49, 51-54, 56-57, 59, 62-79, 82-87, 133, 201-210, 212-213, 215-218, 306-318, 321-324, 327, 330-331, 333-335, 337-343, 345-346, 348-355, 357-369, 371-384, 386, 388-389, 391-432, 434-467, 469-473, 475-482, 484-491, 493, 496-507, 509, 516, 518, 557-560, 562-564, 568-584, 586-588, 590, 603-604, 607-617, 619, 621-622.

Agency Response:

To assess total vehicle emissions from electric vehicles, ARB contracted with A.D. Little / Acurex Environmental Corporation to evaluate fuel-cycle (indirect) emissions and battery disposal issues. The report relied on the California Energy Commission to quantify power plant emissions for electric vehicles. These results were added to ARB's own emissions model to compare the different vehicle technologies. The results showed that when taking into account both direct and indirect emissions, the per-vehicle emissions for battery electric vehicles are about 90 percent lower for NMOG and NOx, when compared to a LPG powered vehicle. We expect that comparisons of electric versus propane forklifts will show similar results.



The use of electric forklifts will increase electricity demand from power plants and the increase in power production will increase emissions (primarily NOx) from power plants somewhat. Air district permitting programs are in place to minimize these emission increases. However, overall emissions should decrease significantly as internal combustion engines in the forklifts are replaced with engines using energy produced through the cleaner combustion of natural gas in power plants equipped with sophisticated pollution controls. The upstream analysis by A.D. Little/Accurex described above illustrates this point.

While electrification of forklifts will result in the increased production and use of batteries, Acurex determined that lead-acid batteries are well regulated and banned from municipal solid waste landfills. Additionally, California has an established recycling infrastructure, and the recycle rate for lead-acid batteries is currently over 95%.

An increase in the number of spent batteries to be processed could potentially have an impact on the recycling industry and on the disposal system for non-recyclable materials. Leasing, deposit, or rebate programs for electric batteries could be required to increase recycling. Exchanging a spent battery for a new battery at the time of replacement could also reduce waste impacts. With these mitigation measures in place, battery disposal impacts should not be significant.

Increased electrical demand in general was discussed in the agency response to Comment 2. While not discussed in that response, the increased energy demand for electric forklifts does factor in losses associated with the distribution of electricity.

The increased pollution associated with an increase in the use of diesel-powered forklifts is addressed in the agency response to comments 1 and 14.

9. Comment: When considering the overall energy efficiency scenario, the current propane user who switches to electric-powered forklifts would actually consume more energy resources to operate the equipment than previously used with propane. Propane has a proven, reliable supply infrastructure that would not consume any more energy resources than currently exist. One hundred percent of the energy received by the customer is available for use in the engine.

Commenter number: 14, 44, 48, 50, 55, 327, 340-343, 370, 394-424, 439-467, 492, 503, 511, 557-560, 592-602, 606, 609, 613, 620.

Agency Response: The ARB staff has assessed overall system efficiency for light-duty vehicles as part of the Zero Emission Vehicle program. In 2000, the ARB and California Energy Commission funded research to analyze the fuel-cycle energy conversion efficiency for various fuel types, including battery electric and LPG vehicles. The findings of this research demonstrate that the use of electric motors in light duty vehicles is extremely efficient when compared to other technology options. While the research did not specifically compare forklift technologies, staff expects that many of the same attributes that make light-duty electric vehicles more efficient than internal

combustion technologies will remain true for forklifts. Staff is unaware of any data that would change this conclusion.

10. Comment: Require forklift retrofits (closed loop feedback systems and three-way catalysts). There should be an incentive to retrofit or trade in old forklifts for the newer CARB certified ones that generate fewer pollutants. Also focus on the development of low-emission technologies and work with affected parties to develop an appropriate phase-in schedule for transitioning to lower-emitting forklift technologies. For example, CARB could create certification "bins" in addition to the existing CARB standard of 3.0 grams/bhp-hr and the soon to be implemented EPA Tier 2 standard of 2.0 grams/bhp-hr. Some manufacturers already produce forklifts that have lower emissions than the CARB and EPA standards. By creating bins, CARB could count these emission reductions toward their SIP commitment.

Commenter number: 11, 41, 190, 329, 367, 390-391, 433, 494-495, 567-568, 591.

Agency Response:

All of these are reasonable suggestions, and most have already been, or soon will be implemented. SIP Measure LSI-2, now incorporated into Measure LSI-2C, provides for the retrofit of existing LSI engines, including forklift engines. Staff estimates that about half of existing forklifts will lend themselves to retrofit with three-way catalysts and in some cases closed-loop control systems. To help forklift operators with the cost of retrofit controls, the Carl Moyer Program guidelines were modified this year to provide incentive grants for the retrofit of existing forklifts.

Staff will be evaluating the feasibility of establishing partial-zero emission forklift or "PZEF" emission standards that are more stringent than those required by SIP Measure LSI-1 based on the certification levels of some of the new forklift technologies. If we can adopt these new standards, we will be able to ensure lower emissions that some forklift engine families have been certified to.

11. Comment: Emission benefits from LSI – 3 have decreased over 50 percent based on analysis performed by Sierra Research accounting for the emissions impact of 2007 federal Tier 2 emission standards, a figure already acknowledged by CARB staff, and could decrease even further. For example, a Sierra Research scenario assumes a 10 percent decrease in new forklift purchases accompanied by equal retention of older, higher-emitting forklifts, and determined that emission benefits would be decreased by as much as another 50 percent. At some point, the benefits of the proposal, if adopted, will be far less than the cost to implement it.

Commenter number: 329, 385, 433, 468, 494-495, 574, 591, 607.

Agency Response:

CARB staff initially calculated emission benefits assuming uncontrolled emissions. CARB staff, in response to comments, later readjusted estimated emissions downward by 57 percent for ROG and 40 percent for NOx to take into account the 1998 Off-Road LSI Engine Regulations. CARB staff cannot modify emissions to account for the 2007 federal Tier 2 standards because emissions reduction commitments associated with the implementation of these standards were already being counted under SIP Measure LSI-1. To reflect these reductions again in the LSI-3 measure would be to double-count them.

ARB staff responded to the Sierra Research scenarios for decreased electric forklift sales (higher retention of older forklifts) and "buying ahead" in Agency Responses 6. and 12., respectively.

12. Comment: The requirement to purchase electric forklifts could have the unintended consequence of causing users to "pre-buy" model year (MY) 2004 ICE forklifts before the electric forklift control measure takes effect. This creates the possibility of significantly eliminating gains in emissions reductions, as reflected in the attached analysis by Sierra Research.

Commenter number: 11, 41, 433, 494-495, 591.

Agency Response:

Sierra Research, in commenting on SIP Measure LSI-3 in their June 21 and 24, 2003 memos to the Western Propane Gas Association quantified the impact of a "buy-ahead" decision. This decision assumed that 25 percent of the lifts put into service in calendar years 2005 through 2008 would be ICE forklifts purchased before the original 2005 implementation date of the rule and complying with the 2004 MY emission standards.

Sierra Research analysis indicates that this "pre-buying" would reduce the emission benefit of LSI-3 by 30 percent. While Sierra Research believes that this "pre-buying" is a conceivable outcome of LSI-3, staff does not believe that LSI-3 will have this outcome. Many LSI-3 commenters expressed concern about the economic impact this regulation would have on their operations and indicated that their profitable operating margin was extremely thin. As such, staff would not expect forklift operators to purchase a new forklift, before their existing forklift is due to be replaced.

However, "pre-buying" is a moot issue since SIP Measure LSI-2C does not require the lease or purchase of electric forklift. As such, there is no incentive for forklift operators to "pre-buy" a 2004 MY forklift to get around the regulation.

13. Comment: ARB did not provide the inventory of existing forklifts with a lifting capacity less than 8,000 pounds. This makes it impossible to calculate baseline emissions. If CARB is relying on historical emissions data, then that data will be

inaccurate because it will fail to take into account the forklift emissions standard adopted in 1998 that imposes a 3.0 gram/bhp-hr NOx emission standard. Any reduction in emissions must be calculated against the 3.0 gram standard. CARB has indicated in its explanatory text concerning LSI-3 that the industry is capable of even greater emissions reductions. Baseline emissions and any benefits of LSI-3 must take this into account.

Commenter number: 432.

Agency Response:

CARB noted in their assumptions that all 25 to 50 horsepower forklifts (population of 5,419) and half of the 51 to 120 horsepower forklifts (population of 19,019) have a lifting capacity of less than 8,000 pounds. This corresponds to approximately 15,000 forklifts. As mentioned in the Agency Response to Comment 11., CARB staff have adjusted the emission benefits expected from LSI-3 to reflect ARB's 1998 Off-Road LSI Engine Regulations. CARB staff will be exploring with industry the possibility of setting tiered lower emission standards so that benefits can be counted toward future SIP commitments (See Agency Response 10.)

14. Comment: CARB is required by its own rules governing toxic air contaminants (TACs) to either quantify the cost to health of increasing diesel particulate emissions or consider the environmental justice issues associated with the increasing emissions, or both.

Commenter number: 432.

Agency Response:

As noted in the Agency Response to Comment 1., LSI-3 was replaced by the LSI-2C proposal, which no longer requires that all new leases and purchase of forklifts with less than 8,000 pound lift capacity be electric. LSI-2C directs staff to evaluate the feasibility of making emission standards more stringent than that required by LSI-1 based on the currently and soon -to-be available, zero and near-zero emission forklift technologies. This provides facility operators with the flexibility to continue to operate internal combustion engine-powered (primarily propane) forklifts if necessary and obviates the need/precludes the purchase of diesel forklifts. Additionally, the regulatory development process will also include careful consideration of diesel forklift purchases and forklift rentals to ensure these categories are not utilized to circumvent the regulation and cause unintended emissions increases.

Consequently, the ARB staff does not expect a significant increase in diesel TAC emissions as a result of this measure. Nor do we anticipate that there will be an significant increase in the level of diesel TAC emissions impacting low income communities and communities of color.

ATTACHMENT A-7

ARB-Short-Term: Further Emission Reductions from On-Road and Off-Road Mobile Sources and Consumer Products

Time Frame: Action 2005-2008; Implement 2006-2010

Responsible Agency: CARB

Proposed Strategy:

This measure proposes to achieve additional emission reductions from on- and off-road mobile sources and consumer products. Such emission reductions are needed to ensure expeditious progress and attainment of federal ambient air quality standards.

The emission reduction target set forth herein is in addition to that specified for other short-range measures to be implemented by CARB. To implement this measure and achieve the overall emission reduction target, CARB — contingent upon their feasibility as evaluated as specified in the first paragraph of Attachment A-1 of Resolution 03-22 — will develop and adopt regulations for on- and off-road mobile sources and consumer products between 2005 and 2008, with implementation in 2006-2010. These regulations and other actions may include any of the following items or other actions as deemed appropriate by staff and the Board.

- Light and Medium-Duty Vehicles
  - Replacement of catalytic converters/carbon canisters on all applicable models at approximately 100,000 mile intervals.
  - Enhance the I & M program for light and medium-duty vehicles by using remotes sensing to identify high emitters.
  - 4-wheel/all wheel-drive exemption from loaded mode testing.
  - New reformulated gasoline standards that primarily reduce sulfur contents, cap RVP, lower distillation temperatures, and olefins.
- Heavy-Duty Diesel Trucks/Buses
  - Retrofit of applicable in-use vehicles with add-on controls such as lean-NOx catalysts.
- Recreational Marine
  - Replacement of 2-stroke recreational marine engines with cleaner 4-stroke engines through an incentive program such as a buy-back program.
  - Retrofit applicable 4-stroke recreational marine engines with catalytic converters.
- Construction/Industrial Diesel

  - Require or incentivize the repowering of existing off-road diesel construction and industrial equipment with engines meeting new engine emission standards.
- Residential Lawn and Garden
  - Phase-in of zero-emitting residential lawn mowers and garden equipment.
- Consumer Products
  - Additional reductions from consumer products trough the transfer of low and ultra-low VOC stationary source technologies to consumer products such as clean-up solvents.
- Ships
  - Cold ironing for ships calling on the Ports of Long Beach and Los Angeles.
- Trains
  - Non-MOU switcher and short-haul locomotives to use low-emission units such as LNG and battery/diesel hybrids.

The following table presents the additional emission reductions targeted in this control measure. CARB commits to achieve, at minimum, the ROG and NOx reduction target in this control measure through adoption and implementation of any combination of feasible control strategies affecting on-road and off-road mobile sources and consumer products.

Further Emission Reductions from On-Road and Off-Road Mobile Sources and Consumer Products (South Coast, Summer Planning, tpd)

Pollutant	2010
ROG + NOx	97

SIP Commitment for Measure Further Emission Reductions from On-Road and Off-Road Mobile Sources and Consumer Products

South Coast 2003 SIP Commitment:

CARB Staff proposes to implement this measure beginning in 2005. The measure will achieve a combined 97 tpd of ROG and NOx reductions in the South Coast Air Basin in 2010.