

**State of California
AIR RESOURCES BOARD**

Staff Report:

Initial Statement of Reasons for Proposed Revisions to the Airborne Toxic Control Measure for Stationary Compression Ignition Engines

Executive Summary

I. DISCUSSION OF THE PROPOSED REVISIONS

Why is ARB proposing to revise the Airborne Toxic Control Measure for Stationary Compression Ignition Engines (ATCM)?

On February 26, 2004, the California Air Resources Board (ARB or the Board) approved the Stationary Compression Ignition Engine ATCM to reduce diesel particulate matter (PM) emissions from new and in-use stationary diesel engines. Among other provisions, the ATCM contains a 0.15 grams per brake horsepower-hour (g/bhp-hr) PM standard for new stationary compression ignition agricultural engines. Just prior to the effective date of the standard (January 1, 2005), local air districts and agricultural engine distributors notified ARB of their concern about the availability of compliant agricultural pump engines greater than 50 to less than 175 horsepower (hp).

The ARB staff conducted an extensive investigation and reported to the Board at its regularly scheduled Board meeting on March 17, 2005. During the meeting, the Board heard a presentation from ARB staff and testimony from stakeholders within the agricultural industry, agriculture equipment distributors and dealers, engine manufacturers, and the Engine Manufacturers Association. As a result, the Board unanimously took emergency action to remove the requirement that new stationary agricultural pump engines greater than 50 to less than 175 hp meet the 0.15 g/bhp-hr PM standard. In place of the 0.15 g/bhp-hr PM standard, the Board determined that such engines must meet the appropriate California and federal off-road certification standards for new engines, currently known as "Tier 2" standards. This action was based on the very limited availability of 0.15 g/bhp-hr PM-compliant engines in the greater than 50 to 99 hp range and the limited number of manufacturers offering compliant engines in the 100 to 174 hp range.

The limited availability of small compliant stationary agricultural pump engines, coupled with the limited number of manufacturers offering medium-size compliant engines, could reduce the agricultural community's ability to replace dirtier, older, uncontrolled diesel engines with cleaner diesel engines. Currently, many farmers use financial incentives provided by the Carl Moyer Memorial Air Quality Standards Attainment Program (Carl Moyer Program) and the federal Environmental Quality Incentives Program (EQIP) to voluntarily replace older

engines. These voluntary engine replacements may be slowed by limitations in the number and variety of available stationary agricultural pump engines. In addition, farmers may decide to delay replacement, when faced with a choice of replacing an engine with a larger engine or an engine from an unfamiliar manufacturer. This will reduce the effectiveness of the ATCM and its ability to protect the public from the adverse health effects associated with exposure to diesel PM. Furthermore, adverse consequences would occur if farmers were not able to replace engines that had failed, or to install new engines as needed. Also, equipment dealers would not be able to sell non-compliant engines already in stock or on order.

The emergency amendments became effective on April 4, 2005, but will only apply through August 2, 2005. The proposed revisions to the ATCM would ensure the continued availability of new lower-emitting off-road California- and federal-compliant stationary agricultural pump engines by making the emergency regulatory changes permanent.

What are the proposed revisions to the ATCM?

Staff are proposing that the Board revise the ATCM to require that new stationary agricultural pump engines greater than 50 to less than 175 hp comply with less stringent California and federal new off-road engine certification standards instead of the 0.15 g/bhp-hr PM standard. Staff are also proposing several non-substantive clarifications to the regulatory text. These changes and the rationale for them are presented in Appendix D of this Staff Report. All of staff's proposed revisions are included in Appendix A of this Staff Report.

What actions did ARB take to consult with interested parties?

From January through mid-March 2005, ARB staff requested information and interviewed representatives from agricultural industry groups and engine manufacturers, distributors and dealers. In February, 2005, ARB staff attended the World Agricultural Expo in Tulare, California and initiated discussions about ATCM compliance with numerous agricultural equipment vendors. On March 4, 2005, the agenda for the March 17, 2005 Board meeting announced to the public that the Board would hear staff's proposal regarding emergency regulatory action on the ATCM at the meeting. On March 16, 2005, an electronic mailing to approximately 475 stakeholders (including environmental and citizen groups, agricultural and other industry representatives, and engine manufacturers, distributors, and dealers) provided additional information on the emergency regulatory changes to the ATCM that the Board would be considering at its March 17, 2005 meeting. On March 17, 2005, ARB staff presented its findings and recommendations to the Board and the Board took public testimony on the issue. On March 18, 2005, a follow-up electronic mailing informed stakeholders that: 1) the Board had approved emergency action to change the ATCM, 2) the Office of Administrative Law would review the emergency

regulatory changes, and 3) ARB would initiate a rulemaking to amend the ATCM. Additionally, in the April/May 2005 timeframe, ARB will hold one or more noticed public workshops to further discuss these proposed amendments to the ATCM.

What alternatives to the proposed revisions did ARB consider?

ARB staff also considered: 1) not revising the ATCM, 2) revising the 0.15 g/bhp-hr PM standard only for new stationary agricultural pump engines greater than 50 to 99 hp, 3) revising the 0.15 g/bhp-hr PM standard for a limited duration (i.e., one year), and 4) revising the standards for new stationary emergency standby engines as well as for agricultural pump engines. ARB staff do not believe the first two alternatives are viable based on engine availability and associated concerns regarding technical and economic issues. Staff do not believe that the third option is viable because we do not anticipate that engine manufacturers will increase the number of engine models meeting the 0.15 g/bhp-hr PM standard over the next few years.

Regarding the fourth option, revising new emergency standby engine PM standards, the ARB staff are continuing to gather information regarding the availability of 0.15 g/bhp-hr PM-compliant emergency standby engines and will report its findings to the Board along with any necessary revisions.

What is the environmental impact of the proposed revisions to the ATCM?

As a result of this action, ARB staff do not anticipate any significant adverse environmental impact. Staff estimate that potential PM reductions of approximately 8 tons per year will not occur. This represents a 3 percent less PM emission reduction than potentially would occur if the current inventory of non-certified (pre-1996) agricultural pump engines were replaced with 0.15 g/bhp-hr engines. We believe that the “loss” in emission reductions will not be as great as 8 tons per year for two reasons. First, we will recommend that Carl Moyer Program funding priority be given to stationary agricultural pump engine applications meeting 0.15 g/bhp-hr PM. We believe that this action will motivate engine dealers and farmers to install the lower emitting engines. Second, we believe that the proposed in-use agricultural engine regulations, under development by both the districts and ARB, will help motivate farmers to install the cleanest engine available or replace the existing engine with an electric motor.

Without the proposed action, some potential emission reductions could be lost if farmers elect not to replace their older dirtier engines.¹ If an existing non-certified (pre-1996) engine were to remain in service, the PM emissions would be two to three times greater than an engine meeting the current new off-road engine

¹ The Stationary Compression Ignition Engine ATCM does not require existing agricultural engines to be replaced. However, if an existing engine is replaced, or, if a new engine is installed, it must meet the new stationary agricultural engine standards in the ATCM.

certification standards. Since engine replacement is voluntary, staff can not predict the exact emission and risk reductions that would occur under either the current ATCM or the proposed revisions; however, staff can predict that no increase in current levels of PM emissions and risk will occur as a result of the proposed revisions.

What is the potential health impact of the proposed revisions to the ATCM?

The proposed revisions are not expected to have any significant adverse health impact. As discussed above, there is the potential for not achieving up to 8 tons per year of diesel PM by this action. This would mean that rather than achieving a projected 72 percent reduction in PM emissions from stationary agricultural engines, we would achieve a PM reduction of about 69 percent. For new engines in the greater than 50 to less than 175 hp range, PM emissions under this proposal would be slightly higher than anticipated in the original ATCM. As a result, individuals living near these agricultural pump engines would be exposed to slightly higher levels of diesel PM compared to the exposure anticipated in the original ATCM. Offsetting this potential for increased exposure is the potential that, without this action, higher emitting engines would not be replaced at all. Given the offsetting potential, and the anticipated benefits of recommending Carl Moyer Program funding priority to the lower emitting engines, staff do not anticipate any significant adverse health impacts from this action.

What is the cost impact of the proposed revisions to the ATCM?

ARB does not expect the proposed revisions to result in any increased costs for buyers, sellers, or manufacturers of stationary diesel agricultural pump engines. The revisions are expected to facilitate the transition to cleaner engines and avert potential disruptions in the agricultural engine market and potential cost impacts to farmers and equipment distributors and dealers.

How do the proposed revisions to the ATCM relate to ARB's goals for Environmental Justice?

The proposed revisions to the ATCM are consistent with the environmental justice policy to reduce health risks from toxic air contaminants in all communities, including low-income and minority communities, regardless of location. The proposed revisions would allow farmers to continue to replace older, dirtier, uncontrolled diesel agricultural pump engines greater than 50 to less than 175 hp with cleaner diesel engines, thereby reducing emissions of, and exposure to, diesel PM, an identified toxic air contaminant.

II. RECOMMENDATION

Staff recommend that the Board adopt the ARB's proposed regulatory changes to the ATCM for Stationary Compression Ignition Engines. The proposed revisions

to the ATCM's PM standards for new stationary compression ignition agricultural pump engines greater than 50 to less than 175 hp are necessary to ensure the availability of compliant engines. These revisions would protect public health as well as prevent disruption and economic hardship for farmers and engine distributor/dealers by allowing the replacement of dirtier, older, uncontrolled diesel engines with cleaner diesel engines that meet California and federal new off-road engine certification standards. Staff further recommend that guidance be provided to the local air districts recommending that Carl Moyer Program funding priority be given to stationary agricultural pump engine applications meeting 0.15 g/bhp-hr PM.

In addition, staff recommend that the Board adopt several proposed non-substantive clarifications to the regulatory text (Please see Appendix D of this Staff Report). All of staff's proposed revisions are included in Appendix A of this Staff Report.

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Technical Support Document

I. BACKGROUND

A. OVERVIEW

This report provides the basis for staff's proposed revisions to the Airborne Toxic Control Measure for Stationary Compression Ignition Engines (ATCM) particulate matter (PM) standards for new agricultural pump engines greater than 50 to less than 175 horsepower (hp). As of this writing, the proposed revisions do not address any other applications for compression ignition engines. The report includes information about the current standards, the need for ATCM revision, the proposed revised ATCM standards, regulatory alternatives considered, and potential environmental and economic impacts. In addition, the information and definitions provided in "Staff Report: Initial Statement of Reasons for Proposed Rulemaking - Airborne Toxic Control Measure for Stationary Compression Ignition Engines," September 2003, are hereby incorporated into this report by reference.

B. ATCM FOR STATIONARY COMPRESSION IGNITION ENGINES

At a public hearing on February 26, 2004, the California Air Resources Board (ARB or the Board) adopted the ATCM for Stationary Compression Ignition Engines in accordance with California's Toxic Air Contaminants Program. Among other requirements, the ATCM established best available control technology (BACT)-based PM emission performance standards for new stationary compression ignited engines.

For new stationary agricultural and emergency standby engines greater than 50 hp, the PM standard was set at 0.15 grams per brake horsepower-hour (g/bhp-hr). At the time the standard was adopted, ARB believed that compliant agricultural and emergency standby engines would be available in the horsepower sizes needed because off-road new engine certification test results indicated several engine models of various sizes with exhaust emissions at or below 0.15 g/bhp-hr PM. The ATCM's current 0.15 g/bhp-hr PM standard is identical to the current California and federal off-road certification standards for new compression ignition engines greater than or equal to 175 hp. However, the current ATCM standard is more stringent than the current "Tier 2" California and

federal off-road certification standards for new engines greater than 50 to less than 175 hp. These standards are shown in Table 1-2 of this Staff Report.

Table I-1

**California and Federal Off-Road New Compression Ignition Engine
Particulate Matter Emission Standards***

Horsepower	Model Year		
	2005-2010 (g/bhp-hr)	2011 (g/bhp-hr)	2012+ (g/bhp-hr)
50-74	0.30	0.30	0.02
75-99	0.30	0.30	0.01
100-174	0.22	0.22	0.01
175-749	0.15	0.01	0.01

*The Board has adopted off-road new compression ignition engine certification standards identical to federal standards for such engines.

Just prior to January 1, 2005, local air districts and engine distributors notified ARB of their concern that 0.15 g/bhp-hr PM-compliant engines greater than 50 to less than 175 hp commonly used in agricultural irrigation pump applications were not available. ARB staff initiated an investigation to evaluate the technical and economic feasibility of the ATCM standard for small- to medium-sized agricultural pump engines. During this investigation, ARB met with dealers and distributors representing the major manufacturers of agricultural pump engines. ARB also reviewed off-road engine certification test data for pump applications and consulted with engine manufacturers and with air districts and organizations representing agricultural businesses. Based on the information gathered, ARB staff determined that there is very limited availability of compliant stationary diesel agricultural pump engines greater than 50 to 99 hp and that the availability of such engines in the 100 to 174 hp range is limited to one or two manufacturers.

Moreover, the availability of 0.15 g/bhp-hr PM-compliant engines greater than 50 to less than 175 hp is likely to be limited until 2012 when California and federal off-road new engine PM certification standards are scheduled to become more stringent as shown in Table I-1. Engine manufacturers preferentially design engines to meet national standards, rather than to meet California ATCM standards because of the relatively small market niche for agricultural pump engines. Additional information on the need for the proposed revisions is presented in Section II of this Staff Report.

(ARB, 2003b; ARB, 2004; ARB, 2005a; ARB, 2005b; CCR, 2004; CFR, 2004; FR, 2004)

C. PURPOSE AND AUTHORITY

At its March 17, 2005 meeting, the Board adopted emergency regulatory amendments changing the ATCM's current 0.15 g/bhp-hr PM emission standard for new stationary agricultural pump engines greater than 50 to less than 175 hp to be identical to California and federal new off-road engine certification standards. The emergency amendments became effective on April 4, 2005, but will only apply through August 2, 2005. This Staff Report, including the proposed modified regulation in Appendix A, provides the administrative process necessary to finalize the emergency regulatory changes approved by the Board.

Table I-2 shows the revisions to the ATCM proposed by staff. It is necessary to adopt the proposed revisions to ensure that California farmers can continue to readily obtain, install, and use new stationary agricultural irrigation pump engines greater than 50 to less than 175 hp without undue disruption or economic hardship. Farmers are currently replacing older engines voluntarily using incentives provided by the Carl Moyer Memorial Air Quality Standards Attainment Program (Carl Moyer Program) and the federal Environmental Quality Incentives Program (EQIP). These agricultural pump engine replacements may be slowed by limitations in the number and variety of available engines. In addition, farmers may decide to delay replacement, when faced with a choice of replacing an engine with a larger engine or an engine from an unfamiliar manufacturer.

Table I-2

**Proposed Revised Particulate Matter Emission Standards
for New Stationary Agricultural Compression Ignition
Engines Greater than 50 to Less Than 175 HP**

Horsepower	Current ATCM (g/bhp-hr)	Proposed ATCM Revision (g/bhp-hr)	Current Tier 2 California-Federal Off-Road Engine Standards (g/bhp-hr)
>50-74	0.15	0.30	0.30
75-99	0.15	0.30	0.30
100-174	0.15	0.22	0.22

As a result of the proposed revisions, farmers would be allowed to replace older, dirtier, uncontrolled diesel engines with cleaner diesel engines, thereby reducing emissions and public exposure to diesel PM. ARB staff are not proposing revisions to the ATCM's 0.15 g/bhp-hr PM standard for new stationary agricultural pump engines greater than or equal to 175 hp because it is already identical to current California and federal off-road certification standards for new compression ignition engines of that size. Also, the proposed revisions would not change the ATCM's requirement that the PM standards for new stationary

engines of all sizes keep pace with California and federal new off-road engine certification standards as they become more stringent in the 2011/2012 timeframe (See Table I-1).

In addition, staff recommend that the Board adopt proposed non-substantive clarifications to the regulatory text. These changes and the rationale for them are presented in Appendix D of this Staff Report. All of staff's proposed revisions are included in Appendix A of this Staff Report.

D. PUBLIC OUTREACH AND ENVIRONMENTAL JUSTICE

1. Public Outreach

ARB staff conducted public outreach to ensure that affected and interested parties were aware of, and had the opportunity to participate in, the development and review of its regulatory proposals. Prior to the Board's approval of the ATCM on February 26, 2004, the ARB held eight public workshops, two public hearings, and numerous meetings and discussions with representatives of industry groups, environmental organizations, local air districts, and State and federal agencies. For a more detailed summary of public outreach efforts made prior to the rulemaking hearing, please see Section I.D. of "Staff Report: Initial Statement of Reasons for Proposed Rulemaking - Airborne Toxic Control Measure for Stationary Compression Ignition Engines," September 2003.

Based on concerns expressed to ARB about the availability of small- to medium-size new stationary agricultural pump engines, ARB staff requested information and talked with representatives from major agricultural industry groups and engine manufacturers, distributors and dealers. In February, 2005, ARB staff attended the World Agricultural Expo in Tulare, California and initiated discussions about ATCM compliance with numerous agricultural equipment vendors. On March 4, 2005, the agenda for the March 17, 2005 Board meeting announced to the public that the Board would hear staff's proposal regarding emergency action on the ATCM at the meeting. On March 16, 2005, an electronic mailing to approximately 475 stakeholders (including environmental and citizen groups, agricultural and other industry representatives, and engine manufacturers, distributors, and dealers) provided additional information on the emergency regulatory changes to the ATCM that the Board would be considering at its March 17, 2005 meeting. On March 17, 2005, ARB staff presented its findings and recommendations to the Board and the Board took public testimony on the issue. On March 18, 2005, a follow-up electronic mailing informed stakeholders that: 1) the Board had approved emergency action to change the ATCM, 2) the Office of Administrative Law would review the emergency regulatory changes, and 3) ARB would initiate a rulemaking to amend the ATCM. Additionally, in the April/May 2005 timeframe, ARB will hold one or more noticed public workshops to further discuss these proposed amendments to the ATCM.

2. Environmental Justice

The ARB is committed to integrating environmental justice in all of its activities. On December 13, 2001, the Board approved "Policies and Actions for Environmental Justice," which formally established a framework for incorporating environmental justice into the ARB's programs, consistent with the directives of State law. Environmental justice is defined as the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulation, and policies. These policies apply to all communities in California, but recognize that environmental justice issues have been raised more in the context of low-income and minority communities.

The "Policies and Actions for Environmental Justice" are intended to promote the fair treatment of all Californians and to cover the full spectrum of ARB activities. Underlying these policies is a recognition that the ARB needs to engage community members in a meaningful way as it carries out its activities. People should have the best possible information about the air they breathe and about what is being done to reduce unhealthy air pollution in their communities. The ARB recognizes its obligation to work closely with all communities, environmental and public health organizations, industry, business owners, other agencies, and all other interested parties to successfully implement these policies. (ARB, 2001)

The proposed revisions to the ATCM are consistent with the environmental justice policy to reduce health risks from toxic air contaminants in all communities, including low-income and minority communities, regardless of location. The proposed revisions would allow farmers to continue to replace older, dirtier, uncontrolled diesel agricultural pump engines greater than 50 to less than 175 hp with cleaner diesel engines, thereby reducing emissions of, and exposure to, diesel PM, an identified toxic air contaminant. The amount of diesel PM emission and exposure reduction in low-income, minority, and other communities would depend on the number, use, and replacement rate of such engines in the area.

II. NEED FOR REVISIONS

A. STATIONARY AGRICULTURAL PUMP ENGINE EMISSION INVENTORY

In California, pumping water for the irrigation of crops and to provide water for livestock is the predominant agricultural activity requiring a stationary source of power. Statewide, approximately 80 percent of agricultural pumps are powered by electric motors. Nearly all of the remaining agricultural pumps are powered by compression ignition engines using diesel fuel. For year 2002, ARB staff

estimate approximately 5,300 stationary diesel-fueled agricultural irrigation pump engines emitting about 564 tons per year (TPY) of particulate matter, statewide (See Appendix C of this Staff Report). Using diesel agricultural engine horsepower distribution data from the San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD) and average horsepower for each size category, ARB calculated emissions based on pump engine size as shown in Table II-1. (ARB, 2003a; NASS, 2003; SJVUAPCD, 2005)

Table II-1

Estimated 2002 Total Statewide Stationary Diesel-Fueled Agricultural Pump Engine Particulate Matter Emissions

Horsepower	Number of Engines	Tons Per Year PM
>50-74	100	3
75-99	100	4
100-174	2,000	134
>175	3,100	423
Total	5,300	564

B. AVAILABILITY OF AGRICULTURAL PUMP ENGINES WITH EXHAUST EMISSIONS AT OR BELOW 0.15 G/BHP-HR PARTICULATE MATTER

Manufacturers design new off-road engines to comply with California and federal new off-road engine certification standards. The availability of 175 hp and greater stationary agricultural pump engines that comply with the ATCM's 0.15 g/bhp-hr PM standard is not an issue because California and federal new off-road engine standards are currently 0.15 g/bhp-hr for engines of that size. However, the ATCM's 0.15 g/bhp-hr PM standard is more stringent than California and federal standards for new off-road compression ignition engines greater than 50 to less than 175 hp.

Tables II-2 and II-3 are based on ARB's review of 2005 off-road compression ignition engine certification testing data and information from major manufacturers of agricultural pump engines. Table II-2 shows that about 10 percent of 50 to 99 hp engines manufactured for the agricultural market test at or below 0.15 g/bhp-hr PM. Table II-3 shows that approximately 50 percent of 100 to 174 hp engines manufactured for the agricultural market test at or below 0.15 g/bhp-hr PM and that 80 percent of these engines are produced by a single manufacturer. Also, although engine models test at or below 0.15 g/bhp-hr PM, they are certified to maintain PM exhaust emission levels at or below 0.30 g/bhp-hr (for 50-99 hp engines) or 0.22 g/bhp-hr (for 100-174 hp engines).

Since manufacturers design engines to comply with national off-road new engine standards, the limited availability of 0.15 g/bhp-hr PM-compliant stationary agricultural pump engines greater than 50 to less than 175 hp is not likely to change until 2012. In 2012, California and federal standards for new off-road engines 50 to 74 hp will change from 0.30 to 0.02 g/bhp-hr; for engines 75 to 99 hp from 0.30 to 0.01 g/bhp-hr; and for engines 100 to 174 hp from 0.22 to 0.01 g/bhp-hr.
(ARB, 2004; ARB, 2005a; ARB, 2005b; CCR, 2004; CFR, 2004; FR,2004)

Table II-2

Agricultural Pump Engine Availability in the 50-99 HP Range

Horsepower	Manufacturer				
	A	B	C	D	E
50-69	2	0	0	*	0
70-89	0	0	0	0	1
90-99	1	2	*	0	1
Total Pump Engines	14	20	5	4	9
Ratio of Compliant to Non-compliant Engines	3/14	2/20	0/5	0/4	2/9
Total A-E Compliant vs. Non-compliant Engines = 7/52					

* No pump engines in the hp range for 2005.

Table II-3

Agricultural Pump Engine Availability in the 100-174 HP Range

Horsepower	Manufacturer				
	A	B	C	D	E
100-120	0	3	*	0	0
121-140	1	7	0	0	0
141-160	1	7	*	0	1
161-174	4	14	0	1	0
Total Pump Engines	20	37	2	7	4
Ratio of Compliant to Non-compliant Pump Engines	6/20	29/37	0/2	1/7	1/4
Total A-E Compliant vs. Non-compliant Pump Engines = 37/50					

* No pump engines in the hp range for 2005.

C. ISSUES ASSOCIATED WITH LIMITED AVAILABILITY OF COMPLIANT ENGINES

In consultation with the agricultural community and engine manufacturers, distributors, and dealers, ARB staff identified the following critical issues associated with the limited availability of 0.15 g/bhp-hr PM-compliant stationary agricultural pump engines greater than 50 to less than 175 hp:

- Certain existing engines can not be replaced with similar models from the same manufacturer because the appropriate replacement engine does not comply with the 0.15 g/bhp-hr PM standard. Generally, farmers prefer to repower with similar make and model engines based on familiarity with service and maintenance requirements, cost, and/or brand loyalty. These preferences are important because the replacement of older, dirtier diesel engines with new cleaner engines is voluntary and may be slowed or delayed if the engines farmers want are not available.
- Replacing existing engines with engines of different makes, models, or horsepower sizes may result in requiring farmers to purchase engines not specifically suited to the pumping tasks required. Moreover, such replacement may entail burdensome costs to farmers of up to several thousand additional dollars for the replacement engine plus up to several thousand additional dollars for ancillary equipment.
- Carl Moyer Program funding for the replacement of stationary agricultural pump engines greater than 50 to less than 175 hp has been impacted due to the limited availability of engines meeting the 0.15 g/bhp-hr PM standard. Applications for replacement engines not meeting the standard can not be completed.

These issues are expected to result in some farmers not voluntarily replacing pre-1996 uncontrolled stationary diesel agricultural pump engines greater than 50 to less than 175 hp. There are estimated to be about 950 of these pre-1996 engines currently in use. The replacement of older, dirtier, uncontrolled diesel agricultural pump engines with cleaner diesel engines has been actively promoted and supported by the ARB, local air districts, the State Legislature, the United States Environmental Protection Agency, and others for more than five years. Over this time period, engine distributors and dealers indicate from 300 to 500 stationary agricultural pump engines greater than 50 to less than 175 hp have been sold per year. If engine replacement does not proceed, anticipated reductions in emissions of, and exposure to, diesel PM can not be achieved. This will reduce the effectiveness of the original ATCM and its ability to protect the public from the adverse health effects associated with exposure to diesel PM.

Another issue that has created some unintended economic impacts is that a number of dealers were confused about how the ATCM applied to engines

funded under the Carl Moyer Program. Several dealers indicated that they thought that Moyer funded engines did not have to meet the 0.15 g/bhp-hr PM limit. As a result, some California dealers and distributors have several hundred engines on hand or on order that do not meet the 0.15 g/bhp-hr PM standard. Because of this, and the fact that the ATCM did not contain a “sell-through” provision, some dealer/distributors were left with expensive inventories of Tier 2-certified engines that can not be sold in California. The emergency regulation approved by the Board on March 17, 2005, allows dealer/distributors to sell these engines until the emergency regulation expires on August 3, 2005. Given the typical processing time for Carl Moyer and EQIP program applications, it is unlikely that all of these engines will be sold by August 3, 2005. The proposed revisions would address this issue by eliminating the August 3, 2005 deadline for the sale of Tier 2-certified engines. Additional information on the issues associated with limited availability of 0.15 g/bhp-hr PM-compliant engines is provided in Section III.D. and Appendix C of this Staff Report. (ARB, 2005b)

III. PROPOSED REVISIONS

A. SUMMARY

Table III-1 summarizes the proposed revisions to the ATCM. Essentially, ARB staff are proposing that the Board revise the ATCM to require new stationary agricultural pump engines greater than 50 to less than 175 hp to comply with California and federal new off-road engine certification PM standards instead of a 0.15 g/bhp-hr PM standard. Staff are not proposing any revisions to the ATCM's 0.15 g.bhp-hr PM standard for new stationary agricultural pump engines greater than or equal to 175 hp because that standard is already identical to the current California and federal off-road certification standards for new compression ignition engines of that size. The proposed revisions would not change the ATCM's requirement that PM standards for new stationary agricultural pump engines of all sizes keep pace with California and federal new off-road engine standards as they become more stringent in the 2011/2012 timeframe (See Section I, Table I-1, of this Staff Report).

The Board's adoption of these proposed revisions would make permanent the emergency regulatory changes approved by the Board on March 17, 2005.

In addition, staff recommend that the Board adopt several proposed non-substantive clarifications to the regulatory text. These changes and the rationale for them are presented in Appendix D of this Staff Report. All of staff's proposed revisions are included in Appendix A of this Staff Report. (ARB, 2004; CCR, 2004; CFR, 2004; FR, 2004)

Table III-1

**Proposed Revised Particulate Matter Emission Standards for
New Stationary Agricultural Compression Ignition
Engines Greater Than 50 and Less Than 175 HP***

Horsepower	Current ATCM (g/bhp-hr)	Proposed ATCM Revision (g/bhp-hr)	Current Tier 2 California-Federal Off-Road Engine Standards (g/bhp-hr)
>50-74	0.15	0.30	0.30
75-99	0.15	0.30	0.30
100-174	0.15	0.22	0.22

*The Board has adopted off-road new compression ignition engine certification standards identical to federal standards for such engines.

B. EMISSIONS AND RISK ANALYSIS FOR THE PROPOSED REVISIONS

Without the proposed ATCM revisions, ARB staff believe that there will be a limited supply of agricultural pump engines in the greater than 50 to less than 175 hp range, and an associated escalation of the cost for the complying engines due to limited supply. As a result, some farmers that otherwise would have voluntarily replaced their existing stationary agricultural pump engines may not do so. This could result in less PM emission reductions than anticipated under the original ATCM.

Staff are recommending that the ATCM be revised to require stationary agricultural pump engines greater than 50 to less than 175 hp to meet the current Tier 2 California and federal new off-road engine certification standards. This action will result in somewhat less emission reductions compared to what would have occurred if 0.15 g/bhp-hr engines were available. Below, staff compare what these PM emission reductions would be if farmers were to replace uncontrolled engines (model year 1995 and earlier) under each scenario. For this evaluation, staff assumed that farmers would not voluntarily replace model year 1996 and later Tier 1- and Tier 2-certified engines. The Carl Moyer Program, established in 1998, has helped many farmers purchase certified replacement engines and generally requires that these engines be used at least five to seven years.

Using ARB staff's best current estimate of PM emissions from stationary agricultural pump engines (ARB, 2003a) indicates a total for all stationary and portable agricultural pump engines of about 870 tons per year (TPY), statewide. Approximately 35 percent of these are estimated to be portable engines leaving a

total PM estimate from stationary agricultural pump engines of about 560 TPY. Staff apportioned these emissions to the horsepower and control categories using a horsepower-weighted distribution. This distribution is based on extrapolating the distribution of engines developed by the San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD, 2005). This approach gives emissions from uncontrolled engines of 240 TPY. For these uncontrolled engines, Table III-2 gives the baseline emissions and compares the potential PM emission reductions under the existing ATCM to those from the proposed revised ATCM.

Table III-2

**Estimated Particulate Matter Emissions Reductions
for the Current and Proposed ATCM**

Horsepower	Baseline Emissions (TPY)	Current ATCM (TPY reduced)	Proposed Revised ATCM (TPY reduced)	Difference (TPY)
>50-99	3.3	2.8	2.2	0.6
100-174	57	41.4	34.1	7.3
≥175*	179.7	128.8	128.8	0
Total	240	173	165.1	7.9

*The current ATCM's PM standard for agricultural engines greater than or equal to 175 hp would not be changed by the proposed revisions.

The additional PM emission reductions that would result from replacement of all uncontrolled engines with engines that meet the 0.15 g/bhp-hr PM standard instead of engines that meet the current Tier 2 new off-road engine PM standards would be at most eight (8) tons per year. This is about three (3) percent of the baseline PM emissions from uncontrolled stationary agricultural pump engines and about one (1) percent of PM emissions from all stationary agricultural pump engines, statewide.

To evaluate the potential risk to the public from engines emitting PM at the Tier 2 off-road engine standards rather than the ATCM standard, ARB staff performed air quality modeling for engines representative of the greater than 50 to 99 hp and 100 to 174 hp categories. The analysis showed the potential for a small increase in risk. However, offsetting this potential for increased risk is the potential that higher emitting engines would not be replaced at all and the diesel PM emissions and risk from this source would continue unabated. The current ATCM does not require existing stationary agricultural pump engines to be replaced. It requires that if an existing engine is replaced, the replacement engine must meet the new stationary agricultural engine standards in the ATCM. Given the technical and economic issues discussed earlier, retaining the current ATCM's 0.15 g/bhp-hr PM standard for new stationary agriculture pump engines

is likely to reduce voluntary replacement of older engines. As this occurs, the emission and risk reductions anticipated by the current ATCM will be reduced. Since engine replacement is voluntary, staff can not predict the exact emission and risk reductions that would occur under either the current ATCM or the proposed revisions; however, staff can predict that no increase in current levels of PM emissions and risk will occur as a result of the proposed revisions.

C. AVAILABILITY OF EMERGENCY STANDBY ENGINES COMPLYING WITH THE 0.15 G/BHP-HR PARTICULATE MATTER STANDARD

During testimony at the March 17, 2005 Board meeting, the Board was requested to also amend the ATCM's 0.15 g/bhp-hr PM standard for new stationary compression ignition emergency standby engines. Staff intend to investigate this issue and report to the Board at the May 2005 Board meeting.

D. ALTERNATIVES TO THE PROPOSED REVISIONS

ARB staff considered the following four alternatives to the amendments. For each option, staff have identified both technical and economic issues.

1. Do nothing (leave the requirements in the ATCM standing),
2. Revise the requirements of the ATCM only for agricultural pump engines 50 to 99 hp,
3. Revise the 0.15 g/bhp-hr standard for a limited duration (i.e., one year), or
4. Revise the ATCM requirements for new stationary emergency standby engines as well as for agricultural pump engines.

Option 1 – Do not revise the ATCM.

If the ATCM requirements for new stationary agricultural pump engines greater than 50 to less than 175 hp remained in place, some farmers would delay pump engine replacements. If a delay was not feasible, farmers could consider three options for meeting the ATCM standard: purchase a different brand of engine, replace an existing small (greater than 50 to less than 175 hp) uncontrolled engine with a larger engine, or install a diesel particulate filter on a new small engine. Replacing an existing engine with a different make and model engine will be feasible in some, but not all cases. For example, as shown in Tables II-2 and II-3 of this Staff Report, in the 70 to 89 hp range, we found only one complying engine on the market. In several cases (i.e., 50 to 69 hp and 100 to 120 hp) we found only one manufacturer offering complying engines. In addition, replacing an existing engine with a different make and model can require replacement of the pump or other ancillary equipment, significantly increasing the cost.

Replacing existing small stationary diesel agricultural pump engines with larger engines has some significant drawbacks. Most pump engine manufacturers and dealers recommend that an agricultural pump engine be operated under at least a 60 to 70 percent load. Operating at lesser loads, particularly during the initial breaking-in period, may cause excess piston ring wear and oil leakage or "slobber." Oil slobber increases engine wear and decreases engine life. Under certain situations, a larger engine may use more fuel and emit more than a smaller engine. Also, a larger replacement engine would cost from 10 to 35 percent more than a smaller engine and may require that one or more pieces of ancillary equipment be replaced at additional cost.

Farmers could comply by purchasing a diesel particulate filter (DPF) and having it installed on a new engine that did not meet the 0.15 g/bhp-hr PM standard. This option could increase the cost of replacement by 30 to 50 percent. In some instances, using a DPF could double the capital cost of the engine. There would be some additional maintenance costs compared to an engine without a DPF. Currently there are no DPF systems that have received ARB verification for off-road engine agricultural pump applications. For engines equipped with DPFs, periodic testing and inspections may be needed to ensure compliance. Testing and inspection further increase the cost of compliance. Thus, this alternative would substantially increase the costs and regulatory burden for farmers. Based upon these technical and economic issues, staff did not recommend this option.

Option 2 - Revise the ATCM only for agricultural pump engines greater than 50 to 99 horsepower.

The ATCM could be revised to require that new stationary agricultural pump engines meet new off-road engine Tier 2 certification standards rather than the 0.15 g/bhp-hr PM standard only for engines greater than 50 to 99 hp. Staff evaluated the potential change in emissions and risk based on the assumption that the engines most likely to be replaced in the near future would be uncontrolled engines purchased prior to 1996. Stationary agricultural pump engines purchased in California on or after 1996 are more likely to be certified to Tier 1 or Tier 2 California-federal new off-road engine standards. Table III-3 shows our best estimate of the number of uncontrolled engines versus total engines in each of the size ranges.

Table III-3

Estimated Uncontrolled versus Total Statewide Stationary Diesel-Fueled Agricultural Pump Engines

Horsepower	Uncontrolled Engines	Total Engines
> 50 to 99	90	200
100 to 174	860	2,000
>175	1,300	3,100
Total	2,250*	5,300

*950 uncontrolled engines in the 50 to 174 hp range.

Changing the 0.15 g/bhp-hr PM standard only for the engines in the greater than 50 to 99 horsepower range would address the size category in which the availability of engines capable of meeting the 0.15 g/bhp-hr PM standard is most severely limited. The limitation for engines in the 100 to 174 hp range is less severe because more than half of the engine models are capable of complying with the 0.15 g/bhp-hr PM standard. However, 80 percent of those complying engines are produced by a single manufacturer. While this option might result in lower emissions, if farmers were reluctant to switch to a different manufacturer, replacement of existing higher-emitting engines would likely be delayed. This option is likely to result in higher costs to farmers who did choose to buy engines from a different manufacturer due to the need to replace ancillary equipment. Staff did not propose this option due to concerns about the limited number of manufacturers offering complying engines, the potential for increased costs associated with replacing ancillary equipment, the potential negative economic impact on dealer/distributors who could not sell engines currently in inventory, and the potential for farmers to delay replacing older engines.

Option 3. Revise the ATCM by postponing the 0.15 g/bhp-hr standard for a year.

Under this option, the 0.15 g/bhp-hr PM standard could be receded for a limited duration, for example one year, to allow for additional time for more engine manufacturers to produce 0.15 g/bhp-hr PM-compliant engines. This would be a viable option if staff were confident that engine manufacturers were likely to produce complying engines. However, staff are not confident that this will occur for two reasons. First, the number of stationary agricultural pump engines in the greater than 50 to less than 175 hp range that would be sold in California is very small relative to the total number of engines sold in this horsepower range. This makes it very unlikely that engine manufacturers will produce a California-only 0.15 g/bhp-hr PM-compliant agricultural pump engine. Second, engine manufacturers are faced with meeting more stringent oxides of nitrogen (NOx) standards for these same engines beginning in 2007/2008. In order to meet the lower NOx limits, it is likely that the PM emissions levels for these engines will

increase closer to the allowable certification levels of 0.30 or 0.22 g/bhp-hr. As this occurs, we anticipate that fewer engines will be offered that meet the 0.15 g/bhp-hr PM limit and some of the engines currently meeting that limit will no longer do so. Given these considerations, staff is not proposing this as a viable option.

Option 4 – Revise the ATCM for emergency standby engines as well as for agricultural pump engines.

ARB staff lack information on which to base a recommendation regarding emergency standby engines less than 175 hp. For example, insufficient data is available to estimate the number of emergency standby engines needed to be replaced per year. Moreover, staff have not identified significant technical impediments to replacing an emergency standby engine with one from a different manufacturer. However, staff will continue to gather information on the availability of engines meeting the ATCM requirements for emergency standby and non-pump engines and will report to the Board on this issue at the May 2005 Board meeting.

IV. ECONOMIC IMPACT

The proposed revisions to the ATCM are expected to relieve the potential for cost increases for affected engines. The proposed revisions increase the number and types of engines available to farmers and do not cause shifts in the agricultural engine market or purchase of ancillary equipment. Engine dealers and distributors indicate they have sufficient engines that are certified to meet the current California and federal new off-road engine standards to supply the stationary agricultural pump market.

For dealers that have engines in stock or on order that do not meet the 0.15 g/bhp-hr PM standard of the current ATCM, the revisions will have an economic benefit since they would allow the engines to be sold in California. A potential economic impact on manufacturers unable to produce engines that meet the 0.15 g/bhp-hr PM standard would be averted by adoption of the amendments.

If the proposed revisions to the ATCM are adopted, manufacturers that currently offer 0.15 g/bhp-hr PM engines in the greater than 50 to less than 175 hp range may not sell as many of these engines as they might have if the current ATCM remained in place. This situation would be mitigated to some extent if replacement engines meeting the 0.15 g/bhp-hr PM limit are given priority for incentive funding under the Carl Moyer Program.

The potential impact to state and local governments due to the ATCM has been addressed in "Staff Report Initial Statement of Reasons for Proposed Rulemaking - Airborne Toxic Control Measure for Stationary Compression

Ignition Engines," September 2003. The proposed revisions will not result in any change in costs to state or local governmental agencies previously identified in that rulemaking. (ARB, 2003b; ARB, 2005b)

V. ENVIRONMENTAL IMPACT

On balance, staff believe that the proposed revisions to the Stationary Diesel Engine ATCM will have no adverse environmental impact. The potential increases in PM emissions for engines in the greater than 50 to less than 175 hp range, will be balanced by decreases that will occur due to the greater likelihood that farmers will replace older engines with the more widely-available Tier 2-certified engines.

Statewide, approximately 2,250 uncontrolled (i.e., non-certified) stationary agricultural pump engines operate in California. About 950 of these 2,250 engines are in the greater than 50 to less than 175 hp range. An average PM emission factor for these older engines is 0.7 g/bhp-hr. Replacing these uncontrolled engines with new Tier 2-certified engines or with engines meeting the 0.15 g/bhp-hr PM standard, would achieve a significant reduction in diesel PM. As shown in Table V-1, if all of the estimated 2,250 non-certified engines were replaced with engines meeting the current ATCM, we would achieve a PM emissions reduction of 173 tons per year. If all of the non-certified engines were replaced with engines meeting the proposed revised ATCM, we would achieve a PM emissions reduction of about 165 tons per year.

Table V-1

Estimated Particulate Matter Emissions Reductions for the Current and Proposed ATCM

Horsepower	Baseline Emissions (TPY)	Current ATCM (TPY reduced)	Proposed Revised ATCM (TPY reduced)	Difference (TPY)
>50-99	3.3	2.8	2.2	0.6
100-174	57	41.4	34.1	7.3
≥175*	179.7	128.8	128.8	0
Total	240	173	165.1	7.9

*The current ATCM's PM standard for agricultural engines greater than or equal to 175 hp would not be changed by the proposed revisions.

In the last column in Table V-1, is staffs' estimate of the maximum difference (7.9 tons per year) in PM reduction that could occur under the proposed revised ATCM. This represents about a 3 percent loss in PM emission reductions when one compares projected current and proposed ATCM emission reductions to 2002 baseline emission levels. (ARB, 2003a; SJVUAPCD, 2005)

Offsetting this potential for increased PM emissions, is the potential that without this action higher emitting engines would not be replaced at all. The current ATCM does not require existing stationary agricultural pump engines to be replaced. It requires that if an existing engine is replaced, the replacement engine must meet the new stationary agricultural engine standards in the ATCM. Given the technical and economic issues discussed earlier, retaining the current ATCM's 0.15 g/bhp-hr PM standard for new stationary agriculture pump engines is likely to reduce voluntary replacement of older engines. As this occurs, the emission reductions anticipated by the current ATCM will be reduced. It is not possible for staff to predict how much voluntary replacement may be reduced. However, if about 10 percent of the non-certified engines greater than 50 to less than 175 hp are not replaced because of technical or economic issues, the PM emission reduction "loss" will be more than 8 tons per year. (ARB, 2003a; SJVUAPCD, 2005).

To maximize the emission reductions achieved by the ATCM, staff recommend that local air districts be encouraged to give Carl Moyer Program incentive funding priority to engines that meet 0.15 g/bhp-hr PM.

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