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# Air Resources Board

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Arnold Schwarzenegger  
Governor

March 25, 2008

Mail-Out #MSC 08-07

TO: All Interested Parties

SUBJECT: WORKSHOP TO DISCUSS THE CALIFORNIA REGULATIONS AND TEST PROCEDURES FOR SMALL OFF-ROAD ENGINES (SORE) AND LARGE SPARK-IGNITION (LSI) ENGINES WITH AN ENGINE DISPLACEMENT LESS THAN OR EQUAL TO ONE LITER (LSI  $\leq$  1 L)

Air Resources Board (ARB or Board) staff invites you to participate in a public workshop on April 21, 2008, in El Monte, California, to discuss proposed amendments to the California regulations and test procedures for SORE and LSI  $\leq$  1 L. Specifically, the discussion will focus on standards for LSI  $\leq$  1 L, modifications to the SORE emissions credit program, and other minor changes in the regulatory language. This is the second workshop in continuation of the rulemaking process. The proposed regulations are scheduled to be presented to the Board at the September 25-26, 2008 hearing.

The workshop will be held at the date, time and location listed below:

**Date:** April 21, 2008  
**Time:** 1:30 p.m. – 3:30 p.m.  
**Location:** California Air Resources Board –Annex 4 Auditorium  
9530 Telstar Avenue  
El Monte, California 91731

## Background

### *Small Off-Road Engines*

In December 1990, the Board approved emission control regulations for new small off-road spark-ignition engines. In 1998, the regulations were revised as a result of Board directed outreach and analysis of the SORE manufacturers' ability to comply with the 1999 Tier 2 standards.

One of the changes made in 1998 was the establishment of production emission credits, which provided compliance flexibility to the engine manufacturers during the

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transitional period of emission standard changes. At the time, the United States Environmental Protection Agency (U.S. EPA) was also considering the use of production emission credits in addition to the certification credits. Staff believed that allowing production emission credits would harmonize with U.S. EPA and would also ease the burden on small engine manufacturers by rewarding those manufacturers which had built cleaner engines early. Ultimately, however, U.S. EPA decided against offering production emissions credits as an option for these engines and equipment. Production credits were not needed to comply with tier 2 standards.

On November 14, 2007, staff held a workshop to inform interested parties about the plan to terminate the production emission credit program and make changes to the certification emission credit program. On February 8, 2008, ARB met with the Engine Manufacturers Association (EMA), the Outdoor Power Equipment Institute (OPEI) and their members to discuss possible alternatives to the staff's proposal.

#### *Large Spark-Ignition Engines*

In May of 2006, the Board approved new regulations for the LSI > 1 L category. However, the portion of the LSI ≤ 1 L was not addressed during the 2006 rulemaking. In April 2007, U.S. EPA proposed a federal Phase 3 combined hydrocarbon and oxides of nitrogen (HC+NO<sub>x</sub>) emission standard of 8 grams per kilowatt-hours (g/kW-hr) for the LSI ≤ 1 L engines starting in the 2011 model year (MY). At ARB's November 14, 2007 workshop, staff proposed aligning with the 8 g/kW-hr standard for these engines.

Since that time, staff has reconsidered its position. Further review of certification data shows the populations of the LSI ≤ 1 L engine category, the number of engine families, and the maximum power ratings of engines within it have grown significantly. The relatively larger displacement and power ratings indicate a migration from the more stringently regulated LSI > 1 L category to the less stringently regulated LSI ≤ 1 L category. In fact, 20 out of 32 of 2007 MY certified LSI ≤ 1 L engine families have engine displacements size above 950 cubic centimeters (cc). Furthermore, the type of engines within the category has changed. More than 70 percent of engine families are water-cooled multicylinder engines. These engines are more akin to the LSI > 1 L engines than the air-cooled single cylinder engines typical of the SORE category, which suggests that they should be regulated accordingly.

At the February 8, 2008 meeting, EMA and OPEI suggested that LSI ≤ 1.0 L regulations and test procedures should remain consistent with the SORE regulations. Staff requested LSI ≤ 1.0 L manufacturers provide additional supporting information, and shortly afterwards sent out a questionnaire to industry. This survey is intended to help staff to understand the level of technology currently utilized by the LSI ≤ 1.0 L

manufacturers and manufacturer specific issues including equipment cost, engine durability, and market trends. At this time, staff has received replies from 14 manufacturers (including some who have indicated they do not intend to participate in the LSI  $\leq$  1.0 L engine market), representing approximately 70 percent of the market. Any manufacturer who has not yet submitted detailed responses is urged to do so as soon as possible.

### **Purpose of Workshop**

Staff intends to propose changes to regulations pertaining to the SORE and LSI  $\leq$  1 L categories to provide greater alignment with other ARB regulations and U.S. EPA regulations and to further reduce emissions from LSI  $\leq$  1.0 L engines. ARB staff welcomes comments and suggestions pertaining to the proposed changes. The proposed changes and ideas follow:

#### *Small Off-Road Engines*

1. Production Emission Credits – Staff is proposing to terminate the generation mechanism of production emission credits beginning with model year 2009. Staff is proposing that these credits would keep their full value until 2012 after which all production credits would be zeroed out. Staff's initial plan was to have the existing production credits lose their value over time through 2014 after which all production credit balances would be zeroed out; however, industry raised concerns that this would have made it difficult to keep track of the changing credit balances each year. Staff's revised proposal chose calendar year 2012 as the end point for keeping credits, because having full credits through 2012 would be equivalent to having credits discounted by twenty percent each year, if no credits were used, as shown in Table 1.

**Table 1. Percent of Credits Remaining Each Year**

<b>Plan</b>	<b>CY2009</b>	<b>CY2010</b>	<b>CY2011</b>	<b>CY2012</b>	<b>CY2013</b>	<b>CY2014</b>
<b>Discounted Value</b>	100%	100%	80%	60%	40%	20%
<b>Constant Value</b>	100%	100%	100%	100%	0%	0%

The constant value plan would reduce the need to keep track of the discounting over time and also allow for a sufficient amount of time to use the credits to ease the burden of the Tier 3 emission standard changes which occurred in 2005, 2007 and 2008 for engines less than or equal to 80 cc, greater than 80 cc but less than 225 cc, and greater than or equal to 225 cc, respectively.

Another option suggested by manufacturers was that the production credit balance be frozen and only be accessible if an enforcement action were made against the manufacturer. Staff is concerned that a manufacturer who has a large bank of credits could purposely submit family emission limit's that are very low, knowing that if they fail the production line testing that they can rely on the banked credits to cover any problems that arise. The majority of production emission credits were obtained under the Tier 2 standards and staff believes that it is inappropriate to allow these credits to be used to offset any future "Tier 4" standards. For that reason, staff would want production credit balances to be zeroed out at the next change in standards.

2. Certification Emission Credits – Staff is proposing that new certification emission credits may be banked for up to five years for each model year. Existing certification credits would be sunsetted in 2014. Staff had initially suggested that these credits would retain full value for two years and then be discounted each year by twenty percent until credits were exhausted; however, as with production emission credits industry feared that discounting of credits would result in an overly complex administrative burden. Therefore, staff is proposing that credits would be fixed at full value for five years which would simplify the tracking of credits, while retaining a linkage to the regulatory useful life of the engines generating the credits.

3. Durability Period or Useful Life – Staff proposes to keep the useful life proposal as written in Mail-Out #MSC 07-29, which would include a "years" interval in addition to the existing "hours" interval. As a reminder, staff is proposing a five year durability period or useful life. For example, the durability period would become either five years or 125 hours, whichever comes first, for an engine which currently has a durability period of 125 hours.

4. Warranty – Because no objections were made to the changes to the warranty program, staff plans to keep the proposal as written in Mail-Out # MSC 07-29 on this topic. The proposal would require the owner's manual to include either a United States contact telephone number or a toll-free number for warranty questions.

5. Enforcement Bond – The enforcement bond issue was not discussed extensively; however, ARB plans to continue to work closely with the U.S. EPA on this matter. Staff would especially like comments on this issue.

### *Large Spark-Ignition Engines*

1. Exhaust Emission Standards – Today's standards for LSI  $\leq$  1 L engines are less stringent than the recently implemented SORE  $\geq$  225 cc standards and U.S. EPA's proposed Phase 3 standards. At the time of the initial rulemaking for these engines in

1998, industry argued that the engines were more similar to SORE engines than the LSI > 1 L engines and therefore it would be more appropriate that they be required to meet the SORE standard. The Board agreed and approved standards equivalent to those for SORE  $\geq$  225 cc. In 2003, the Board approved more stringent standards for SORE  $\geq$  225 cc to take effect in 2008, but the standards for LSI  $\leq$  1 L have not been modified.

Since that time, however the size and power ratings of these engines have significantly increased. As noted above, the populations of the LSI  $\leq$  1 L engine category, the number of engine families, and the maximum power ratings of engines within it have grown significantly. According to the 2008 MY certification data, more than 70 percent of certified LSI  $\leq$  1.0 L engine families have engine displacements greater than 950 cc; most of them are water-cooled multicylinder engines, a technology more typical of the engines greater than one liter than of the small off-road engines. The LSI  $\leq$  1.0 L equipment projected sales is also approaching 50 percent of the total LSI equipment sales. Simultaneously, the number of engine families offered with displacements between 1.0 L and 1.6 L has declined to zero. This strongly suggests that there has been a significant migration from the more stringently regulated LSI > 1 L category to the significantly more lenient LSI  $\leq$  1.0 L category. Therefore, staff is proposing more stringent emissions standards for LSI  $\leq$  1.0 L engines, including eventual alignment with the LSI > 1 L standards in 2014, as shown in Table 2.

**Table 2. Current and Proposed Emission Standards for LSI  $\leq$  1 L Engines**

<b>Model Year</b>	<b>Durability Period</b>	<b>HC + NO<sub>x</sub> (g/kW-hr)</b>	<b>CO (g/kW-hr)</b>
<b>Current 2002 and subsequent</b>	1,000 hours or 2 years	12.0	549
<b>Proposed 2010 - 2013</b>	1,000 hours or 2 years	6.5	375
<b>Proposed 2014 and subsequent</b>	5,000 hours or 7 years	0.8	20.6

Emission data from previous rulemakings, certification records, and Southwest Research Institute (SwRI) reports supports industry's ability to meet the proposed 2010 standards. Staff had originally proposed a 6.5 g/kW-hr (5 g/bhp-hr) HC+NO<sub>x</sub> standard in the 1998 LSI rulemaking, based on the SwRI test results with a reasonable compliance margin. There is no question that these levels are technically feasible with a short lead-time; at this time, six currently-certified engine families meet these levels.

The ultimate long-term goal is to harmonize the LSI  $\leq$  1 L standards with the LSI > 1 L standards (0.8 g/kW-hr HC+NO<sub>x</sub>, 20.6 g/kW-hr CO) in 2014 MY. Currently, there are

two engine families certified in 2007 MY with emissions of 0.8 g/kW-hr of HC+NO<sub>x</sub> or less. These engines use three-way catalysts and closed-loop engine management systems which demonstrate the feasibility of the standards. The proposed 2014 implementation would allow five years of lead time for manufacturers who are not yet able to meet the proposed standards to research and develop the requisite technology to be compatible with their engine designs and products.

Staff is also considering lengthening the required durability period to be more consistent with the larger engines, as shown in Table 2 above. Staff is still gathering information on this issue, and encourages submission of relevant data.

2. Estimated Benefit of the Proposal - Table 3 shows the estimated statewide emissions benefit of the staff's proposal in 2014 and 2020. In 2014, it is estimated that the statewide HC+NO<sub>x</sub> emissions would be reduced by 4.7 tons per day. By 2020, the proposal would reduce approximately 15.7 tons per day of HC+NO<sub>x</sub>. The data reflect the latest information on engines in the LSI 25 hp-50 hp category affected by the staff proposal and their emissions.

**Table 3. Estimated benefit of the proposal, statewide annual average**

<b>Year</b>	<b>HC+NO<sub>x</sub> Emission Reductions (tons per day)</b>
<b>2014</b>	4.7
<b>2020</b>	15.7

3. Estimated Costs of the Proposal - Staff is still gathering cost estimates and encourages submission of relevant data.

4. Test Procedures – The LSI ≤ 1 L engines are currently using the 6-mode SORE test procedures for compliance. Staff proposes that LSI ≤ 1 L manufacturers should test their engines with LSI > 1 L procedures for the 2010 through 2013 MY, but allow manufacturers to carry over 2009 model year certification data as long as the supplemental test data are provided and specified conditions are met. Starting in 2014, all LSI engines should be tested using the same test procedures. In addition, staff proposes to require constant-speed LSI engines to demonstrate compliance with the standards over the steady-state test cycle, but not over the transient cycle.

5. Evaporative Emission Requirements – Staff proposes that LSI ≤ 1 L engines meet the same evaporative emission requirements as LSI > 1 L engines starting in 2010.

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## Workshop Materials

The draft regulations, test procedures and a workshop agenda will be available at the workshop and on ARB's SORE website at:

<http://www.arb.ca.gov/msprog/offroad/sore/sore.htm> . If you would like to receive notification by email of updates to the LSI website, please sign up at:

<http://www.arb.ca.gov/listserv/orspark.htm> .

## Additional Information

If you have a disability-related accommodation need, please go to <http://www.arb.ca.gov/html/ada/ada.htm> for assistance, or contact the ADA Coordinator at (916) 323-4916. If you are a person who needs assistance in a language other than English, please go to <http://www.arb.ca.gov/as/eo/languageaccess.htm> or contact the Bilingual Coordinator at (916) 324-5049.

ARB staff is soliciting comments and questions from interested stakeholders before the workshop takes place. Comments or questions about the proposed regulatory changes or related matters can be directed to Mr. Scott Rowland, Manager of the Off-Road Controls Section at [srowland@arb.ca.gov](mailto:srowland@arb.ca.gov) or (626) 575-6676. Comments or questions specific to the SORE proposal can be directed to Ms. Yun Hui Park at [ypark@arb.ca.gov](mailto:ypark@arb.ca.gov) or (626) 450-6263, and comments or suggestions regarding the LSI portion of the proposal can be directed to Mr. Hung-Li Chang at [hchang@arb.ca.gov](mailto:hchang@arb.ca.gov) or (626) 575-6683.

Sincerely,

/s/

Robert H. Cross, Chief  
Mobile Source Control Division

cc: Mr. Tom Cackette  
Chief Deputy Executive Officer