COMMENTS OF THE INDUSTRIAL TRUCK ASSOCIATION

JUNE 23, 2005 CALIFORNIA AIR RESOURCES BOARD HEARING

AGENDA ITEM # 05-6-3: LSI ENGINES

# SUMMARY OF ITA'S POSITION

♦THE 2010 HC + NOX STANDARD OF .6G/HP-HR IS UNREASONABLY LOW

♦ALTHOUGH EPA CONCLUDED THAT ITS 2007 STANDARDS REACHED THE LIMITS OF TECHNOLOGICAL FEASIBILITY FROM OPTIMIZING EXISTING EMISSION-CONTROL SYSTEMS, THE CARB PROPOSAL DEMANDS ANOTHER 70% REDUCTION IN HC + NOX FROM THAT SAME TECHNOLOGY

♦CAPPING HC + NOX AT .6 G/HP-HR IS NOT CONSISTENT WITH EPA'S STANDARDS BECAUSE PERMITTING CERTIFICATION TO ONLY ONE POINT ON THE EPA CURVE IS NOT THE SAME AS PERMITTING CERTIFICATION TO ANY POINT ON THE CURVE

♦THE FLEXIBILITY OF THE CURVE IS IMPORTANT BECAUSE THE CURVE IS AT BEST A ROUGH APPROXIMATION OF THE RELATIONSHIP BETWEEN HC + NOX AND CO

♦THE FLEXIBILITY OF THE CURVE IS IMPORTANT TO PERMIT MANUFACTURERS AND USERS TO ACCOUNT FOR EQUIPMENT PERFORMANCE DEMANDS AND INDIVIDUAL WORKERS' EXPOSURE TO CO

♦THE FLEXIBILITY OF THE CURVE IS IMPORTANT BECAUSE THE EFFECTS OF THE 2007 TRANSIENT TEST PROCEDURE WILL REMAIN UNKNOWN FOR SEVERAL YEARS

♦THE FLEXIBILITY OF THE CURVE IS IMPORTANT BECAUSE OF THE UNCERTAINTY CAUSED BY INCONSISTENT LPG FUEL QUALITY

♦THE CURVE HAS NO KNOWN APPLICATION TO GASOLINE ENGINES

♦CERTIFICATION DATA AT ZERO HOURS ON A STEADY-STATE TEST CYCLE IS NOT A FAIR INDICATION OF PROJECTED **IN-USE** EMISSIONS PERFORMANCE ON A **TRANSIENT** CYCLE

♦THE EMISSIONS PERFORMANCE OF HIGHWAY ENGINES HAS LIMITED RELEVANCE TO FORKLIFT ENGINES

COMMENTS OF THE INDUSTRIAL TRUCK ASSOCIATION

NOTICE OF PUBLIC HEARING TO CONSIDER ADOPTION OF NEW EMISSION STANDARDS, FLEET REQUIREMENTS, AND TEST PROCEDURES FOR FORKLIFTS AND OTHER INDUSTRIAL EQUIPMENT

MAY 25, 2006

## I. INTRODUCTION

The Industrial Truck Association ("ITA") respectfully submits these comments concerning the proposal of the California Air Resources Board ("CARB") for adoption of new emission standards, fleet requirements and test procedures for forklifts and other industrial equipment. ITA is the U.S. trade association representing companies around the world that manufacture industrial trucks, or components and attachments for industrial trucks, for sale in the U.S. market.

## II. DISCUSSION

### A. ITA'S PREVIOUS COMMENTS REMAIN UNADDRESSED

ITA's principal concern in this rulemaking proceeding has been and remains CARB's proposal of HC + NOx emissions levels of .6 g/hp-hr in 2010, which represents a reduction of 70% from the 2007 standard of 2.0 g/hp-hr. ITA has already commented at some length on the absence of any legitimate basis to conclude that a reduction of this magnitude is technologically feasible in the lead time required. Those earlier comments, which we incorporate by reference in these comments, remain unaddressed. They can be summarized as follows:

1. EPA, which conducted all of the testing and engineering evaluation for the 2007 standard, and which had a legal obligation to set a standard at the limits of technological feasibility, determined that 2.0 g/hp-hr HC + NOx reached the limits of

technological feasibility. CARB, which has performed no testing and no engineering evaluation, has no basis for disagreeing with EPA's assessment.

2. CARB cannot legitimately rely on steady-state certification data to justify lowering the standard because compliance with the 2010 standard requires transient testing, there is insufficient data to correlate steady-state and transient test results over the useful life of the regulated engines, and CARB's claim of only a 15% HC + NOx "penalty" for transient testing is unsupported.

3. The EPA "curve," on which basis CARB has selected .6g/hp-hr, was derived from limited and widely scattered data, is useful only for showing the broad relationship between HC + NOx and CO, and cannot be used to demonstrate the technological feasibility of meeting the extreme HC + NOx points on the curve.

4. Broad generalizations about adaptation of highway technology ignore the significant differences between the performance expectations for highway and nonroad engines and the economies of scale that distinguish engine production in those respective sectors.

5. Despite CARB's admission that fuel quality is critical to attaining the proposed emissions limits, it is obvious that CARB will not resolve the fuel problem by the 2007 effective date.

All that has changed since ITA filed its initial comments is that nearly a year of lead time has elapsed. This loss of lead time only further weakens CARB's claim of technological feasibility within the lead time provided.[1] ITA's biggest concerns continue

[1] CARB's Initial Statement of Reasons ("ISOR") accompanying last year's proposal stated, "Approximately three-quarters of the engine families that certified in 2004 for use in forklifts had combined tested HC+NOx emissions of 0.6 g/bhp-hr or

to be the uncertainties created by the new transient test cycle and the lack of control over fuel quality. These latest comments address primarily these two interrelated issues.

B. CARB HAS NOT PROPERLY ACCOUNTED FOR THE EMISSIONS "PENALTY" ASSOCIATED WITH THE TRANSIENT TEST CYCLE

All of the certification data that CARB relies upon to support the 2010 standard is based upon emissions testing under the steady-state cycle, known as the C-2 cycle, which has been in use for many years. Beginning with model year 2007, however, certification must be made under both the C-2 cycle and the new, extremely rigorous transient cycle developed by EPA. ITA long ago raised the issue of the effect of the new transient cycle on emissions, but ITA members have only recently gained experience in running the cycle and observing its sometimes startling effect impact on emissions results. Some of the data, which is highly confidential, have recently been shared with CARB staff and should be given far greater weight than the data and analysis that appears in the ISOR.

In both the withdrawn and the current ISOR, CARB states that the transient test cycle could account for an increase in emissions of 15%. This conclusion is based on three critical subconclusions: (1) that HC emissions will increase 30%, (2) that NOx emissions will not increase, and (3) that HC and NOx emissions each represent 50% of the HC + NOx total. Following is the current ISOR's explanation:

> Some manufacturers have expressed concerns about the impact of the 2007 transient test cycle on the feasibility of achieving the proposed new engine standards. To date, information provided by the Southwest Research Institute indicates that, under the transient test cycle, hydrocarbon

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below." For 2005 certifications, however, there were 24 engine families certified for use in forklifts, with only 7 of them, or less than 30%, having combined HC + NOx emissions of .6g/hp-hr or below. Moreover, several of the largest suppliers of LSI engines had the highest certification levels, averaging somewhere around 300% of the 2010 standard. This is not evidence of progress in achieving compliance.

> emissions from an LPG engine increased by about 30 percent, but NOx emissions remained relatively constant. In a review of 13 forklift engine families (of 19 total) in our 2004 certification test database, NOx constituted approximately 50 percent of the HC+NOx emissions. At 50 percent HC, the new test cycle could lead to a potential emissions increase of 15 percent over emissions from the steady state test cycle. However, all but one of the 13 engine families would still have an HC+NOx certification level of less than 1.0 g/bhp-hr because in instances where the HC emissions were high, the corresponding NOx emissions were low. Clearly, the new test cycle does not prevent compliance with the proposed 2007 standard.

At ITA's request, staff provided the data underlying the claim that NOx and HC each constituted about 50% of the HC + NOx combination, which is critical to the conclusion that there is a 15% HC + NOx penalty associated with the transient test. This data, which came from emissions testing of thirteen engine families, simply does not support this 50-50 split between HC and NOx. While the average and median percentages of NOx in the data were approximately 50%, the data were so meager and scattered that the average and median figures are useless to any conclusion about the typical HC/NOx split. While only one of the 13 engine families had anything near the claimed 50-50 split, HC and NOx otherwise varied wildly: NOx was only 3 percent on two of the engine families, but was between 90% and 100% on three others. The following chart[2] depicts the data:

[2] The HC and NOx values from which the chart was created were provided by staff to ITA. Where a range of values was provided for an engine, ITA used the average of the high and low emissions.

| Engine | A | B | C | D | E | F | G | H | I | J | K | L | M |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HC% | 4 | 97 | 78 | 67 | 14 | 0 | 97 | 24 | 10 | 76 | 44 | 38 | 87 |
| NOx% | 96 | 3 | 22 | 33 | 86 | 100 | 3 | 76 | 90 | 24 | 56 | 62 | 13 |

If staff were correct in its conclusion that the expected HC/NOx split is 50%, then the HC + NOx penalty is almost 30% for engines B and G, but is zero or almost zero for engines A and F. All of these calculations and conclusions, however, are a misuse of the data. In ITA's opinion, the only conclusion that can be drawn from this data is that the data do not reveal any "typical" HC + NOx split, much less a 50-50 split. Accordingly, the test results say nothing about the "penalty" associated with the transient test.

The other critical subconclusions underlying the claim of a 15% HC + NOx penalty are that, under the transient test, HC will increase by 30% and NOx will not increase. Despite requesting the information weeks ago, ITA has so far not received CARB's explanation for these conclusions. However, these levels of test-procedure "penalty" for the individual pollutants match the levels that EPA used for inventory purposes in its 2002 Regulatory Support Document. Stating that"[e]missions during transient operation can be significantly higher than during steady-state operation," EPA applied a Transient Adjustment Factor ("TAF") of 1.3-- i.e., a 30% penalty--to an uncontrolled LSI engine's hydrocarbon emissions to account for transient operation. No TAF, meaning a penalty of 0%, was applied to the uncontrolled engine's NOx emissions. It may be that this EPA inventory analysis forms the basis for CARB's statement that "under the transient test cycle, hydrocarbon emissions from an LPG engine increased by about 30 percent, but NOx emissions remained relatively constant."

If so, however, this would be a fundamental misreading of EPA's analysis, because this 30% HC penalty and 0% NOx penalty are EPA's estimates for *uncontrolled* engines. EPA's TAF (penalty) for a *controlled* engine, which is the only engine relevant to this rulemaking, is 2.9 for hydrocarbons and 1.5 for NOx. Thus, if HC and NOx are equal, the combined TAF for a controlled engine is 220% [(290% + 150%) ÷2 = 220%], not 15%. Consulting the chart showing the HC/NOx split for 13 engines shows that the *minimum* penalty, where NOx represents 100% of the HC + NOx total, is 150%, which is 10 times greater than staff's claim of 15%. For the two engines where HC represented 97%, the HC + NOx penalty is over 280%, nearly 20 times greater than staff claims.

ITA questions the relevance of these broad inventory assumptions to the issue of the actual HC + NOx penalty associated with this particular test procedure. Nevertheless, since CARB has apparently chosen to rely upon this EPA analysis, CARB must read the analysis correctly. Having failed to do so, CARB cannot support its conclusion of a 30% HC penalty and no NOx penalty. Adding this error to the errors made in determining the typical HC/NOx split leaves CARB with no rationale whatsoever for the overall conclusion that the transient test procedure imposes a penalty of only 30%. Without knowing the extent of the test-procedure penalty, CARB is not in a position to maintain that the standard is technologically feasible.

As ITA pointed out in its earlier comments, test results from the two forklift engines that EPA analyzed in actually developing the transient test revealed that "transient HC + NOx emissions compared to the steady state emissions were more than double for one engine and more than three times higher for the other." These data points were generated after the data that staff is relying upon, yet the latest ISOR makes no

mention of them. In addition, staff has now seen confidential company information that contradicts the ISOR's discussion of technological feasibility.

Based on this new understanding of the relevant issues, it is incumbent upon staff to rethink the combination of (1) the .6g/hp-hr standard for HC + NOx; (2) the transient test procedure for demonstrating compliance with that standard; and (3) the 2010 effective date of that standard.

### C. THERE IS NO PLAN FOR ADDRESSING THE PROBLEM OF LPG FUEL QUALITY

The original ISOR acknowledged that LPG that does not meet adequate specifications "can prevent an engine from complying with existing and future emissions standards" and promised that "ARB will take the necessary steps to ensure that quality fuel is available to support existing and future LPG-fueled vehicles including developing appropriate specifications, if necessary." ITA's initial comments pointed out the many aspects of the fuel-quality issue and stated our concern "that CARB will not be able to keep the promise because the problem . . . is multi-faceted and has not yet been fully defined." ITA concluded: "ITA does not believe it is realistic to predict that the fuel problem will be solved in time for compliance with such low HC + NOx standards and does not believe it is appropriate to impose such standards in the face of this known problem."

In the nearly one-year period since the initial ISOR, the only progress that CARB has made on the fuels problem is the issuance of a request for proposals to analyze 150 LPG samples that CARB staff intends to collect. The analytical work itself will not be completed for at least another year. Although the analysis presumably will confirm

the fuel-quality problem and will perhaps shed some light on its scope, it will do nothing to solve it. Solving it will likely require a rulemaking proceeding and/or a major enforcement effort in order to change the long-standing business behavior of the myriad participants in the propane production, transmission, storage and distribution sectors. This is a long-term prospect.

Rather than offering a plan for meeting the commitment made in the original ISOR, however, the current ISOR simply deleted the commitment. Without explanation, staff has removed from the ISOR the statement that "ARB will take the necessary steps to ensure that quality fuel is available to support existing and future LPG-fueled vehicles . . .." Since the current ISOR is a verbatim version of the intial ISOR in most respects, the pointed elimination of this earlier statement of commitment concerning the fuel problem is hardly encouraging. The omission of the commitment may be a tacit acknowledgement that it cannot be met in the necessary time frame, but the requirements of technological feasibility cannot be so easily avoided. The fact remains that dependable fuel quality is necessary to support such low emissions levels, but dependable fuel quality is not on the near horizon.

## III. CONCLUSION

For the reasons stated in its initial comments and as elaborated upon here, CARB's 2010 standard of .6g/hp-hr as measured according to the transient test procedure has not been shown to be technologically feasible. ITA would like to work with staff to address the problems created by the transient procedure and believes that a mutually satisfactory solution is available. We therefore hope that the staff will commit its time and attention to these important issues.

Respectfully submitted,

INDUSTRIAL TRUCK ASSOCIATION

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