

***Clean Air Act Advisory Committee
Mobile Sources Technical Review Subcommittee
Key Bridge Marriot - Arlington, Virginia
Draft Minutes - April 16, 1997***

INTRODUCTION

The Mobile Sources Technical Review Subcommittee held its eighth meeting at the Key Bridge Marriot Hotel in Arlington, Virginia on April 16, 1997. The meeting was chaired Bob Sawyer, University of California Berkeley. Mr. Sawyer opened the meeting by welcoming all attendees. He announced that John Hornbeck, Kentucky, and Janet Hathaway, NRDC, have joined the subcommittee. Margo Oge, EPA, also welcomed everyone. She noted that she reported the overall subcommittee findings to the parent CAAAC at their last meeting, and conveyed the CAAAC's appreciation of the subcommittee's work. The next CAAAC meeting is in August. Ms. Oge promised to provide the full committee a report on all subcommittee and workgroup efforts. She discussed the possibility of holding the subcommittee meetings close to and prior to the full committee meetings so that issues raised at subcommittee meetings can be discussed at the full committee meeting.

The following agenda items were covered during the meeting and are summarized below:

- Report on Activities of the Phase II RFG Workgroup.
- Reconsideration of the Oxygenated Fuels Workgroup.
- Formation of a Workgroup on Innovative and Incentive-Based Policies.
- Report on Activities of the Heavy-duty Workgroup.
- Report on Activities of the Modeling Workgroup.
- Briefing on the Partnership For a New Generation of Vehicles.
- OMS Response to January 1997 Recommendations from the In-Use Deterioration Workgroup.
- Report on Activities of the In-Use Deterioration Workgroup since January 1997.
- EPA Status and Plan for Completing the Reassessment of In-Use Deterioration.
- Subcommittee Report to the CAAAC.
- Meeting Wrap-up.

REPORT ON ACTIVITIES OF THE PHASE II RFG WORKGROUP - Debbie Wood, EPA

The first Workgroup meeting was held on April 11th. Chuck Freed, Director of EPA's Fuels and Energy Division, and John Hornbeck, Kentucky Dept. For Environmental Protection, Co-Chair this Workgroup. The workgroup is composed of numerous stakeholders including auto, oil, and engine manufacturers; states; environmental and public health associations; automobile fleet associations; and DOE. The workgroup developed a brief mission statement that outlines their goal to implement a smooth transition to Phase II RFG. At their meeting, the workgroup discussed California's experience in implementing their Phase II RFG program. Several members of the workgroup were directly involved in this effort.

The workgroup's objective is to gather and review all available relevant data, identify data gaps, prepare plans to fill data gaps, and prepare a consistent and concise message based on the data. The goal is to have this information prepared nine months prior to the required RFG implementation date of January 1,

2000.

The workgroup formed two teams--an Education Team and a Testing Team. Janet Hathaway, NRDC, and Don Purcell, PPEMA, will chair the Education Team. Jim Steiger, AAMA, and Ms. Wood will chair the Testing Team. The teams will meet May 29th, and the Workgroup will meet again on July 17th. Margo Oge asked what assistance the subcommittee can provide to the workgroup. Ms. Wood responded that she is looking forward to advice from the subcommittee. Bob Sawyer added that groundwater contamination with MTBE is an important issue that has created problems for California. John Kowalczyk, Oregon, asked about EPA's opt-in program. Ms. Wood responded that the program was published in the Federal Register and several states have expressed interest. However, no formal proposals are available. EPA is examining the legal issues of statewide RFG areas and would like to offer as many options to states as possible. Bob Slott asked about the effects of the new NAAQS on RFG implementation. Margo Oge noted that many of these issues will be worked by the NAAQS implementation group.

RECONSIDERATION OF THE OXYGENATED FUELS WORKGROUP - Phil Lorang, EPA

The Agency is seeking the subcommittee's agreement and concurrence to forego establishing a workgroup to address oxygenated fuels. Due to staff and subcommittee member constraints, the Agency instead is considering a cooperative agreement with an academic institution to perform a study. Significant peer review is planned, especially on the design section. Subcommittee members had no objections to this plan.

FORMATION OF A WORKGROUP ON INNOVATIVE AND INCENTIVE-BASED POLICIES - Virginia McConnell, RFF

Ms. McConnell stated that several subcommittee and workgroup members have expressed an interest in investigating incentive-based policies to implement some of the workgroup recommendations. A meeting was scheduled for the following day to discuss the potential role of an incentives workgroup. Bruce Bertelsen has agreed to co-chair such a group with Ms. McConnell. The goal is to review policies that already exist and bring these efforts and new recommendations to the subcommittee. The subcommittee has both policy and technical experts, and should be able to thoroughly examine in-use emissions, repair policies, clean car issues, fleet turnover, and related issues. Lucy Audette would most likely be the EPA representative.

Margo Oge added that close coordination with existing groups that are looking into such policies is important. There is a CAAAC Economic Incentives Group; an economic incentives group in the NAAQS implementation group; and a transportation subgroup that discusses mobile source incentives. The approach to date has been broad and not specific to vehicle in-use issues. Close communication with these groups should prevent overlap of efforts. Ms. McConnell asked whether it makes sense for the subcommittee to suggest its own policies to the CAAAC. Incentives for OBDII and the repair of vehicles have not been discussed in other venues and most of the technical expertise is based in this subcommittee. Sam Leonard, GM, added that he believes these issues should be discussed in the CAAAC Economic Incentives subcommittee and not duplicated in a new MSTR subcommittee workgroup. Margo Oge noted that most of these groups are looking at the broad issues and often lack the narrow technical expertise present in the subcommittee. Ms. McConnell noted that the technical expertise on the MSTR adds significant value when questions of feasibility are discussed. Pat Rahe, Hogan and Hartson, added that a new workgroup that discusses specific implementation issues and concepts would be helpful. Ms. Oge will

ask Ben Henneke, Chair of the Economic Incentives Committee, to attend the next subcommittee meeting to ensure that coordination occurs.

REPORT ON ACTIVITIES OF THE HEAVY-DUTY WORKGROUP - Glenn Passavant

Mr. Passavant discussed the status of the Heavy-Duty Engine Workgroup. The workgroup last met on April 3, and received support to move into Phase II of their effort. Mr. Passavant discussed the Draft Phase I report and offered to provide copies once completed.

The Phase I effort examined whether a research engine at SwRI is sensitive to fuel changes (i.e., cetane and aromatic changes) and representative of engines under development by the engine manufacturers. The workgroup concluded that the Phase II effort is warranted because of the results from Phase I. The workgroup decided to look at three factors: mono- and poly aromatics; fuel density; and cetane.

Three experiments are proposed: 1) the core experiment, 2) the cetane experiment, and 3) the density experiment. Mr. Passavant presented a graphic describing the fuel matrix and proposed experiments. Cetane will be examined at three levels to identify where the addition of cetane has no further effect. Other variables will be examined at two levels because the response is believed to be linear. Another experiment will compare a high natural cetane fuel (53) with a high cetane additive fuel to examine differences. The workgroup settled on 12 fuels for the matrix. Mr. Passavant presented a proposed polynomial equation that describes the fuel effects. Approximately 80-105 tests will be conducted for the experiment, including reference checks, to ensure that the effects are real and not due to changes in the engine. Throughout these tests, total aromatics will range from 13 to 21 percent and 28 to 36 percent, cetane will range from 43 to 48 to 53 using an additive, a natural 43 cetane fuel and natural 53 cetane fuel will be compared to the additive fuels, density will range from 0.83 to 0.86, and aromatics will range from 3 to 11.

Sam Leonard, GM, asked about a recent report from Europe that identified differences in natural and added cetane. This European study showed no positive effect of cetane additives on NOx emissions, while the Workgroup's Phase I results showed a negative effect of cetane additives on NOx emissions. Mr. Passavant added that engines without exhaust gas recirculation (EGR) may behave differently than those with EGR. In addition, the sulfur content of the fuel may have an effect. The workgroup is discussing whether to "dope" the fuels to the same sulfur content. The effectiveness of the additive may depend on the level of sulfur in the fuel. Mr. Passavant added that the fuel blending effort is a Herculean task. The presentation described goals for the fuel blends; the actual fuels will not have these precise parameters, but will be very close.

Phase III of the workgroup's efforts will take a more refined fuel matrix and test these fuels on the better 2004 engine prototypes. The workgroup will report results in the form of changes from the baseline, so that engine manufacturers will not have to reveal actual numbers that may provide proprietary information to their competitors. One member of the audience commented that the proposed polynomial may be improved if the change in density is allowed to vary more. Mr. Passavant responded that a statistician has been hired to work on these issues early in the process.

The focus of the Phase I, II, and III experiments is to identify the potential for fuel changes to affect pollutant emissions. At this point in the process, the costs of potential fuel changes are not being considered until the potential effects are identified. Janet Hathaway asked whether HC speciation and particulate size were being examined. Mr. Passavant responded that the steady-state AVL8 test used at SwRI will not examine these parameters, but the engine manufacturers may look at these variables using their engines and transient tests.

Testing should begin in June and should be completed in November. The current schedule calls for four tests per week, but this number may be increased. Statistical analyses should be completed in January or February of next year.

Bob Sawyer commented that the workgroup is generating quite a bit of new data and asked whether the workgroup could review the status of in-use deterioration data for diesel engines. Mr. Passavant responded that the Agency would prepare a presentation for the next meeting.

REPORT ON ACTIVITIES OF THE MODELING WORKGROUP - Lois Platte

Ms. Platte reviewed the status of the activities underway by the Modeling Workgroup. The workgroup regularly discusses EPA modeling projects and provides feedback to the Agency. Workgroup members also review materials of interest and provide individual comments to the Agency. Recently, MOBILE6 plans have been the primary focus. In addition, work assignments have been reviewed by the workgroup prior to submittal to contractors.

Literature reviews are underway to provide the Agency with comments and potential applicability of research to EPA's modeling efforts. Methodologies are being reviewed for cycle corrections, OBD effects, and high emitters. Another effort is a "big picture" paper that examines modeling issues by model users and users and the applicability of MOBILE to meet these users' needs. The workgroup reviewed a draft outline of the paper and draft text is being developed from interviews with selected users.

Ms. Platte discussed the status of MOBILE6. EPA held a workshop in March to present proposals for changes to the current model. These proposals are available on the OMS website and EPA will accept comments through the end of May.

Ms. Platte described some of the proposed major changes to MOBILE6. New driving cycles were developed to replace those based on 1970's data. New data, including FTP studies, instrumented and chase-car data, and new driving cycles based on speed and type of roadway have been developed. Start emissions also are separated from running emissions. Real-time diurnal data are being used. In-use deterioration will be changed because of the work underway in that workgroup. Fuel sulfur effects will also be included and are expected to reduce emissions for three-way catalysts as sulfur is reduced. High emitters will most likely be treated as one or more separate groups.

BRIEFING ON THE PARTNERSHIP FOR A NEW GENERATION OF VEHICLES - Karl Hellman, EPA

The Partnership for a New Generation of Vehicles (PNGV) requires participation from numerous Federal agencies and other partners. This program was developed to address U.S. dependence on foreign oil, environmental health benefits, and domestic vehicle industry competitiveness. Dr. Hellman began by stating that since 1980, the operational cost of driving a vehicle has dropped 50 percent, vehicle miles traveled have increased 43 percent, and transportation energy consumption has increased by 14 percent.

The goals of the PNGV program include: 1) advanced manufacturing technologies; 2) near-term vehicle improvements; and 3) prototypes with up to triple fuel efficiency.

EPA is primarily involved with goal three. To achieve this goal, the PNGV program is narrowing the technology focus to ultimately develop concept vehicles and then move to production prototypes. Candidates for development include low emission technologies, new materials, advanced design simulations, ultracapacitors and flywheels, hybrid vehicles, fuel cells and fuel reformers, turbines and CDI engines, Stirling engine, efficient electronics and electrical devices, and advanced batteries. The PNGV vehicle has to be affordable.

Three paths have been developed to achieve the 3X fuel economy improvement. All paths include 90 percent efficient energy storage, 76.5 percent efficient driveline, 20 percent lower drag, 20 percent lower rolling resistance, and 30 percent lower accessories loads.

The overall weight reduction goal is 40 percent. Numerous technical accomplishments have been achieved in areas such as hybrid test vehicles, methanol-to-hydrogen reformers, hydrogen storage tanks, cast aluminum formation, bonding of dissimilar materials, flywheel energy storage, exhaust catalysts, computer modeling for tire design, engine combustion research, and new airbag designs.

Dr. Hellman made the following points regarding energy and CO₂ emissions impacts of PNGV program vehicles:

- Petroleum and hydrogen provide the least total energy use;
- Renewable fuels use the least fossil energy;
- Renewable fuels produce the least amount of CO₂ emissions; and
- Use of any alternative fuel provides additional petroleum reductions.

Bob Slott, consultant, asked whether the total costs of producing these new vehicles and their fuels have been considered. He added that given the concern about foreign oil production, a methanol or natural gas model would still rely on remote reserves in the Middle East. Dr. Hellman responded that the efforts to evaluate total costs are not as well developed as some might like. In addition, some of these issues and analyses are broader than the PNGV project. Sam Leonard, GM, responded that the automakers are examining development of prototype production vehicles and will not follow a path that wastes industry and shareholder's money on alternative fuels without infrastructure support. He added that the industry does produce alternative fuel vehicles but the public is not demanding them. Janet Hathaway, NRDC, added that an upstream energy consumption analysis for both vehicles and fuels is necessary to understand the least-energy-use model. This issue may be separate from the PNGV process but is nonetheless a valid issue for analysis, especially for global change concerns. Mr. Leonard added that automakers have significantly reduced energy consumption in both manufacturing processes and office space.

The emission reduction targets for the PNGV program vehicle are 0.2 g/mi NO_x (Tier II) and 0.04 g/mi particulates for the diesel engines (ULEV).

Several technical areas are under development as follows:

- NOx aftertreatment - EPA is working with manufacturers to obtain equipment to test at EPA labs;
- Fuels assessment - The proposed engines have small bores (75mm) that may respond differently during combustion to different fuels;
- Engine size/cycles;
- Combustion/fuel injection;
- EGR - Industry is already working on EGR development;
- Engine architecture - Magnesium or unusual construction mechanisms are being evaluated;
- Thermal management - For the hybrid engines, one concern is that depending on the energy storage system, the engine may have to turn on a lot and generate numerous cold starts;
- Friction reduction;
- Air charging;
- Particulate aftertreatment;
- Control strategies;
- Exhaust heat recovery; and
- Fuel injection equipment.

In 1996 and 1997, the National Academy of Science (NAS) summarized the status of PNGV. Dr. Hellman presented tables that summarized their findings.

Tom Cackette asked whether the emission goals set by PNGV are “hard” or “soft” goals. He noted that the NOx aftertreatment requirement needs additional resources. It appears incongruous that the engine is moving through the technology “filter” but the emission target will require a technology breakthrough. Mr. Hellman responded that the PNGV program emission goals have been agreed upon and are “hard” goals for the program. Margo Oge agreed that the goals are “hard.” She has expressed to industry that the focus on a diesel engine raises EPA's concern that NOx and PM emissions meet Tier II goals. Industry has assured the Agency that they are committed to the emission and fuel economy goals. She added that resources for NOx aftertreatment and other research efforts will be increased because of the NAS report. Dr. Hellman added that there are sufficient incentives in the market to develop lean-NOx catalysts; PNGV is one small part of the R&D in this area. Janet Hathaway noted that the presentation does not mention emissions to any great extent. In addition, so much effort has been devoted to this program that she is worried the goals may be revised downward to assure a successful program.

OMS RESPONSE TO JANUARY 1997 RECOMMENDATIONS FROM THE IN-USE DETERIORATION WORKGROUP - Phil Lorang, EPA

Mr. Lorang presented the OMS response to the In-use Deterioration Workgroup's proposed recommendations contained in the workgroup's January 1997 draft report. OMS prepared a document containing the text of the 32 recommendations of the In-use Deterioration Workgroup and a response to each recommendation. Mr. Lorang distributed this document to the subcommittee members and highlighted some of the key responses.

Based on the discussion of the recommendations, the In-use Deterioration Workgroup will investigate implementation possibilities for how an OBDII inspection program would replace tailpipe emission tests and functional tests. Mr. Lorang added that the current I/M rule requires I/M programs to perform OBD inspections on 1996 and newer cars, beginning in January 1998. EPA currently feels that it lacks the practical field experience necessary to tell states how to do this. The Agency intends to undertake a rulemaking that will delay this requirement until January 1999. Regarding data collection from OBDII inspection programs, Virginia McConnell, RFF, added that data about repair costs are useful for program evaluation and it would be beneficial to collect this from vehicle owners. Tom Cackette added that these data may be difficult to obtain from OBDII-equipped vehicles because repairs are paid for under the vehicle's warranty. Thus, vehicle owners may not know the costs.

Implementing many of the workgroup's recommendations will require a substantial amount of resources. Mr. Lorang doesn't believe that all the recommendations contained in the report will move forward. However, there are many practical recommendations that EPA is acting on or planning to act on. Janet Hathaway, NRDC, stated her interest in providing information to consumers regarding vehicle attributes to influence their purchasing decisions and perhaps to reward vehicle manufacturers for producing cars that meet certain criteria. The workgroup report does not address this strategy. Mr. Lorang replied that this is an area of interest within OMS that the Agency is getting ready to discuss. EPA's responses will be discussed in more detail at the In-Use Deterioration Workgroup meeting that follows.

REPORT ON ACTIVITIES OF THE IN-USE DETERIORATION WORKGROUP SINCE JANUARY 1997 - Bob Slott, Consultant

Mr. Slott briefed the subcommittee on the activities of the In-use Deterioration Workgroup over the past four months and summarized the presentations delivered to the Workgroup findings. The workgroup has been addressing issues related to limitations on IM240 data, future emissions data delivery needs, California data related to in-use deterioration, OBDII, and economic incentives.

Regarding IM240 data, Mr. Slott discussed the following emissions-related limitations:

- Inconsistent preconditioning of vehicles;
- Uncertainties in fast pass/fast fail algorithms used during testing;
- Ambient temperature effects that can lead to disproportionately high CO readings; and
- Oxygenated fuel effects on CO readings.

Problems and limitations in recording IM240 data include:

- Age of vehicle (purchase date) is not reported;
- Frequent odometer turnover problems, where only five digits are recorded; and
- Potential for occurrence of data transcription errors when data are written by hand and then entered into a computer.

The workgroup also has been working on a possible fuel sulfur recommendation. John Kowalczyk, Oregon, has prepared a summary and analysis of the information that the Workgroup has reviewed to date regarding this issue. The workgroup will address the recommendation at its meeting on April 17th.

An action item to be undertaken before the next subcommittee meeting is to develop an implementation team that will address the OBDII substitution recommendation. Ms. Oge stated that EPA needs to issue guidance to the states in the near future on how to evaluate OBDII at testing stations. The

Agency has limited resources and expertise to accomplish this task, however. Other stakeholders, including the automakers and the State of California, are currently collecting OBD-related data. Ms. Oge suggested that the OBDII team put together by the workgroup be comprised of representatives of these organizations that are collecting OBDII information. This will leverage resources and expertise that in the short term will help EPA issue guidance and in the long term will enable the Agency to evaluate the success of these programs.

The workgroup's objective is to get a final report of activities to date to the full subcommittee, before the next subcommittee meeting, for comment. That version will not differ substantially from the current version, with the possible exception of an additional recommendation on fuel sulfur content.

Sam Leonard, GM, stated his belief that the chart contained in a previous workgroup report should be included in the final Workgroup report delivered to the full subcommittee. The chart presents exhaust HC data points from manufacturers' tests and EPA FTP tests on 1990-93 vehicles with various mileages and compares that with MOBILE and EMFAC predictions of in-use vehicle deterioration. Ms. Oge responded that the report is meant to focus qualitatively on the data that are available rather than shed light on actual deterioration factors. The current data are not complete. Including this chart may give the subcommittee the impression that these data are representative. The workgroup will discuss the content of the final report at the next workgroup meeting.

EPA STATUS AND PLAN FOR COMPLETING THE REASSESSMENT OF IN-USE DETERIORATION - Phil Lorang, EPA

Mr. Lorang presented on EPA's internal activity regarding in-use emissions deterioration. EPA has analyzed several emissions data sets and concluded it is time to reassess in-use deterioration. The focus has been primarily on exhaust emissions of Tier 0 fuel-injected cars and has been limited to assessment of available FTP and IM240 data. EPA would like to resolve the in-use issue soon because it is upstream of many other MOBILE6 revision steps. The in-use effort should be formally peer reviewed prior to MOBILE6 completion. The final version of MOBILE6 is scheduled for release in June 1998.

Mr. Lorang summarized the data sources that EPA has reviewed and their limitations. The data sources fall into one of three groups: EPA FTP data, industry FTP data, and state IM240 data. Qualitative conclusions to date are:

- EPA and industry FTP data are similar;
- API high-mileage FTP data are similar to EMFAC;
- Lower zero-mile levels for 1990+ vs 1980s model year cars;
- There is less deterioration, particularly beyond 50,000 miles, than estimated in MOBILE5;
- Evidence so far does not support the presence of a strong upward kink in emissions at 50,000 miles;
- MOBILE5 without the kink is similar to EMFAC.

EPA prefers to study Ohio IM240 data for a non-I/M case. Mr. Lorang discussed several issues with the Ohio data that EPA needs to consider. If these issues can be resolved, the reassessment plan is as follows:

- Use Ohio IM240 data (with cycle adjustment) to represent deterioration in hot stabilized emissions;
- Use EPA and industry FTP data to develop emission factors for cold start and hot start emissions, possibly with re-weighting factors, and to determine all zero-mile estimates;
- Weight hot stabilized, cold start, and hot start to estimate FTP deterioration;
- Retain most of MOBILE5's approach to I/M test performance and repair effects; and
- Upon completion, verify consistency of resulting model with IM240 data in Arizona, Wisconsin, and Colorado.

EPA also has a fallback approach if certain issues can not be resolved.

Mr. Lorang presented the following schedule through the end of October for this effort:

- By the end of June, finish the analysis and put it in written form. Incorporate Workgroup comments to the extent possible.
- At the July 16th subcommittee meeting, present findings. The subcommittee will charge the Workgroup to review and prepare a statement on it.
- From July 17th - September 15th, EPA will distribute the draft document to states, MOBILE6 stakeholders, and academic reviewers. The workgroup gets a more in-depth briefing from EPA and prepares comments. All comments are due by September 15th.
- From September 16th - October 14th, EPA prepares a response to the comments.
- At the October 15th subcommittee meeting, the subcommittee hears the workgroup report, EPA's response and changes, and creates its own statement and adopts it for formal transmission to the parent committee.
- By October 31st, EPA releases a final document, addressing any additional comments from the subcommittee and stakeholder and peer review comments.
- At a date to be determined, the parent committee receives the subcommittee statement and possibly makes a statement directly to EPA.

SUBCOMMITTEE REPORT TO CAAAC - Bob Sawyer, Co-Chair

The subcommittee will revise the previous version of the subcommittee report, drafted approximately six months ago, to reflect recent work. The Executive Summary will be revised to reflect findings by the workgroups. These revised documents will be presented to the parent CAAAC.

MEETING WRAP-UP

Mr. Lorang reported that the full parent committee is chartered through October 1998. The workgroups may complete their activities before this date.

Bob Sawyer adjourned the meeting.

Mobile Sources Technical Review Subcommittee Meeting
Key Bridge Marriott Hotel - Arlington, Virginia
April 16, 1997
List of Members or Member Alternates Attending

Gordon Allardyce	Chrysler	(810) 576-8053
Doug Berens	Ford	(313) 594-2914
Bruce Bertelsen	Manufacturers of Emissions Controls	(202) 296-4797
Tom Cackette	CARB	(916) 322-3226
Gregory Dana	Assoc. of International Automobile Manufacturers	(703) 525-7788
John Fisher	Detroit Diesel	(313) 592-7276
Richard Gibbs	New York Dept. of Environmental Conservation	(518) 485-8913
Janet Hathaway	NRDC	(415) 777-0220
John Johnson	Michigan Technological University	(906) 487-2576
Bob Jorgensen	Cummins	(812) 377-3101
John Kowalczyk	Oregon	(503) 229-6459
Sam Leonard	General Motors	(313) 556-7710
Virginia McConnell	Resources for the Future	(202) 328-5122
David Merrion	Detroit Diesel	(313) 592-7276
Roger Orteca	Chrysler	(810) 576-8066
Margo Oge	EPA Office of Mobile Sources	(202) 260-7645
Patrick Raher	Hogan and Hartson	(202) 637-5600
Robert Sawyer	UC-Berkeley, Co-chair	(510) 642-5573
Robert Slott	Consultant	(713) 241-3413