

FEDERAL ADVISORY COMMITTEE ACT  
CLEAN AIR ACT ADVISORY COMMITTEE  
**MOBILE SOURCES TECHNICAL REVIEW  
SUBCOMMITTEE**

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CO-CHAIRS: MICHAEL WALSH AND SUZANNE RUDZINSKI

DESIGNATED FEDERAL OFFICIAL: SUZANNE RUDZINSKI

Minutes of the Subcommittee's Meeting on June 11, 2003  
Alexandria, Virginia  
**SECOND DRAFT** July 10, 2003

### **Registration**

Registration began at 8:30 a.m. Meeting attendees received a packet of information, including the meeting agenda; handouts of presentations; minutes from the February 2003 Mobile Sources Technical Review Subcommittee (MSTRS), Air Toxics Workgroup, and Modeling Workgroup meetings; the Air Toxics Workgroup's final report; a welcome message and background information for observers; the meeting evaluation form; information on the members of the Subcommittee; a meeting calendar; a restaurant list; and a MSTRS Workgroup organization chart. A list of attendees is included as Appendix A. Presentations are included as Appendix B. Presentations will also be available on the MSTRS website.

### **Introductions and Announcements**

Mike Walsh (co-chair, consultant) called the meeting to order at 9:00 a.m., and members and observers introduced themselves. The Subcommittee presented a plaque to Bob Sawyer (University of California at Berkeley) in appreciation for his work. Dr. Sawyer, the former co-chair, is leaving the Subcommittee to move to London. Margo Oge (Director of the Office of Transportation and Air Quality [OTAQ], EPA), gave a tribute to Dr. Sawyer. She met him when EPA decided to work more closely with California on transportation issues. She was advised to work with Dr. Sawyer, who proved to be very knowledgeable about both the policy and technical issues with mobile sources.

Mr. Walsh discussed a few business items. Don Clay (Koch Industries, Inc.) and Vicki Patton (Natural Resource Defense Council) were introduced as new Subcommittee members. Ms. Patton was unable to attend, however. The minutes from the February 11, 2003 MSTRS meeting were approved with no comments or revisions from the group.

## **OTAQ Priorities and Accomplishments**

Ms. Oge gave a summary of OTAQ priorities and accomplishments to date. On June 10, 2003, she attended the nonroad public hearing in New York; she will go to Chicago and then Los Angeles to attend the other public hearings this week. The rule has received tremendous support from the public, environmental groups, and the administration. This is the first EPA rule where the EPA and Office of Management and Budget collaborated on the rule at the beginning of the process. This rule will proceed after Governor Whitman leaves the EPA, and should be finalized by Spring 2004. Karl Simon (EPA) added that this is the last major regulation in a series for cleaner mobile sources. This fall the tier II cleaner gasoline vehicles will be on the market. Tom Cackette (California Air Resources Board [CARB]) commented that California already has over 140,000 clean vehicles on the road, and will ratchet that number up in the fall.

Ms. Oge commented that EPA is continuing to monitor the on-road diesel rule. EPA is writing the second status report, and it will be finalized by the end of the year. Members of her staff are traveling through Europe and Japan to collect information on the status of highway diesel rules and their implementation.

Ms. Oge commented on the Clean School Bus Initiative and the Diesel Retrofit Program. The Retrofit program has 100,000 vehicles retrofitted or committed to retrofit. California has committed resources to the program, and Texas is evaluating the use of State funds for diesel retrofit. Mr. Walsh asked about evaluating the diesel retrofit program. Ms. Oge responded that the fleet owners will report to the EPA.

Under the Clean School Bus Initiative, there are approximately 460,000 school buses. Of these, 90% are diesel, and one third have no emission controls. The EPA initiative is to replace all pre-1991 buses and retrofit the 1991 and post-1991 buses with emissions controls. EPA would also like to reduce the idling of school buses. EPA has offered \$5 million in grants to further the program, and the Energy Bill includes provisions for local and State governments to reduce school bus emissions.

The Smart Way Transport Partnership is a voluntary program with 13 charter members (including Federal Express, Nike, and Coca-Cola) that supports reducing particulate matter (PM), carbon dioxide (CO<sub>2</sub>) and oxides of nitrogen (NO<sub>x</sub>) emissions from the transportation sector. The goal of the program is to reduce CO<sub>2</sub> emissions by 18 million metric tons by 2020. Suzanne Rudzinski (EPA/OTAQ) is the contact. A current issue for this group is establishing the baseline. Fuel efficiency data for heavy-duty trucks and locomotives are not currently available. There is also a need for modeling tools to evaluate the program.

Tim Johnson (Corning) commented that in New York, the Power Authority made money available for school bus retrofits, but there were no takers. He emphasized the need for a grass roots education effort. Manufacturers and consumers alike may see retrofits as a liability, even if money is available. Ms. Oge said a few months ago EPA announced grants of \$500,000 for school bus retrofits, and they received 35-40 proposals totaling \$8 million. Mr. Cackette

mentioned that California has \$10 million available for retrofits. He agreed that the agency needs to promote the retrofit program. The public will readily accept new buses, but many are skeptical of retrofitting older buses. Steve Flint (NY Dept of Environmental Conservation) clarified that the buses mentioned by Tim Johnson are in New York City and are operated by contract operations that operate on slim profit margins. They could not afford to have the buses out of service for any period of time. Mr. Johnson asked if the buses could be retrofitted during the summer months, but Mr. Flint replied that buses were used for summer programs as well. Ms. Oge said they hope to announce the availability of the \$5 million this week, with the funds available in September 2003 (before the next MSTRS meeting). Ms. Rudzinski will provide an update at the next meeting on how these programs are being implemented and what the States are doing.

Andy Ginsburg (Oregon Department of Environmental Quality) said that in Oregon, school bus manufacturers want to be sure that ultra-low sulfur diesel (ULSD) will be continuously available before they commit to retrofitting their buses. Partnerships need to be formed with the fuel industry to ensure ULSD will be available.

Joseph Norbeck (University of California - Riverside) said the public is confused about whether these programs will work and if they are worth the expense. He suggested that EPA develop a strong technically defensible document that discusses all of the options for school buses, including alternative fuels (like natural gas) and retrofits. The document should include a discussion of the evolution of the technology and be written for non-technical school administrators. Mr. Walsh suggested the document include some summaries of real world experiences. John Johnson (Michigan Technological University) said the durability and reliability issues need to be spelled out to address consumer uncertainty. There is a lot of emissions information available, but CARB and EPA need to provide additional information on durability and reliability. For example, how many buses have survived 100,000 miles? How much down-time can bus operators expect while retrofits are installed? This information could be difficult to compile because it is proprietary. Ms. Oge said there is a lot of available information, especially from Europe. EPA needs to bring the information together. EPA can sanitize some of the confidential business information. Mr. Flint said New York has been using low sulfur diesel retrofits since September 2000 and they are quite forthcoming with the durability and reliability data. Ms. Oge said that a lot of diesel engine enforcement cases have been settled and there is a significant amount of data available.

Mr. Walsh suggested forming a Workgroup to address retrofit issues, including alternative fuels and retrofit hardware. Mr. Norbeck asked that the Workgroup be called "Reductions in School Bus Emissions" rather than "School Bus Retrofits." He asked that the group be sensitive to the rivalry between the alternative fuels solution and the retrofits.

Ms. Oge is interested in how to attract the localities. Mr. Clay suggested working through local Parent/Teacher Associations (PTA). He believes it may be more effective to work with parents on the health effects issue than working with the school board on the cost issues.

Mr. Ginsburg asked about the coverage of marine engines in the nonroad diesel rule. Ms. Oge responded that the marine engines are a different type of engine. Next year, when EPA finalizes the nonroad rule, they will also publish an advanced notice of proposed rulemaking (ANPR) for locomotives and marine engines, with the expectation of a final rule in 2007. EPA is currently proposing to lower the fuel sulfur standard for these engines to 500 ppm by 2007. The locomotive/marine engine proposal differs from the nonroad rule, in which sulfur levels must be reduced to 500 ppm by 2007, and reduced to 15 ppm by 2010. EPA is asking for public comment on the proposed sulfur levels for locomotives and marine engines. This fuel proposal results in significant emissions reductions from locomotives and marine engines.

### **Report from the Air Toxics Workgroup**

Coralie Cooper (NESCAUM) presented the summary of the final report from the Mobile Sources Air Toxics Workgroup. A copy of the final report is included in the handouts. She reviewed the Workgroup charter, which is to define mobile source air toxic emissions sampling and analytical protocols for the 21 air toxics identified in the Air Toxics rule. The Workgroup looked at sampling and analysis protocols but did not evaluate duty cycles. Mr. Walsh recommended that the final report should flag duty cycle testing as a remaining issue.

Ms. Cooper reviewed the list of 21 mobile source air toxics and the status of existing methods. The Workgroup developed recommendations on volatile organic compounds (VOC), aldehyde, and ketone sampling and analysis protocols; they will reference CARB Methods 102/103 for the nine VOCs and Method 1004 for aldehydes and ketones. The Workgroup also recommends existing 40 CFR Part 86 for total PM. Additional development may be necessary for a method to assess particle-bound diesel exhaust organic gases. A variety of methods are used to sample and analyze metals, dioxins, furans, and polycyclic organic matter (POM), and the Workgroup makes no recommendations on these compounds. Additional recommendations from the Workgroup include the development of new analytical methods through a cooperative effort by CARB, EPA, and laboratories to ensure consistency in sampling and analysis methods. EPA should determine the cost, extent, and practical usefulness of proposed analytical methods prior to establishment of those procedures. The need for new sampling and analysis methods should be based on a risk analysis of the ambient toxics levels needed to create significant health effects.

Mr. Walsh asked if the group discussed recommendations for measuring ultra-fine PM. Ms. Cooper replied that the group decided to exclude that compound, as there were already enough pollutants under consideration.

Bob Schaefer (BP) asked if the methodology database could provide input to EPA to tighten current air toxic emissions standards. He asked if a timeline existed for a review of the standards. Ms. Cooper responded that there are no existing air toxic standards for mobile sources beyond formaldehyde and PM, and the Workgroup was formed to recommend methods for measuring other pollutants.

## Energy Legislation: Panel Discussion

Michael Whatley (Senate Committee on Environment and Public Works [EPW]) discussed the fuels legislation component of the Energy Bill. He discussed the ethanol package, which is a global fuels package put together by farmers, the American Petroleum Institute (API), and the American Lung Association (ALA). This package would repeal the oxygenate requirements, phase down methyl tert-butyl ether (MTBE, an oxygenating additive in reformulated gasoline) over a 4-year period, and has a 5 billion gallon renewable fuels requirement by 2012. The bill also includes provisions for biofuels, and tax credits for renewable fuels. This package was passed by the Senate but did not make it to House. The House has a similar fuels package but without the 4-year MTBE phase down.

The new package has the same three components with some additional smaller provisions including a requirement for using alternative fuels in dual fuel cars. The President has reiterated his desire to improve the economy, which will require passage of energy legislation. An optimistic time frame for this legislation is to have the legislation drafted after the July recess, a vote in the Senate at the end of July, and the bill coming out of Conference in the Spring of 2004. Ms. Oge asked if the fuels legislation could survive without the Energy Bill. Mr. Whatley is optimistic that the fuels legislation could survive.

Mr. Schaefer asked if the 5 billion gallons is “as produced” or “as sold.” Mr. Whatley replied that the Bill requires fuel supplies to have 5 billion gallons and directs the EPA to develop rules to meet that requirement. Peter Lidiak (API) added that in the Senate version, the language “introduced into commerce or sold” applies to gasoline.

Mr. Walsh asked for a definition of renewable fuels. Mr. Whatley replied that renewable fuels include ethanol, biodiesel, and cellulosic ethanol. Ken Colburn (NESCAUM) said the Senate only knows of those three types of renewable fuel, but they are open to other definitions of renewable fuel. Mr. Norbeck clarified that the legal definition of biodiesel is fuel derived from soybeans. In written comments to the minutes, Mr. Lidiak stated that the above statement as written here is not correct as other sources, rape seed for instance, would qualify as biodiesel. Fuel derived from the entire soy plant, called Fischer-Tropsch diesel, does not qualify as biodiesel and will not receive tax credits for its use. Fuel derived from the entire soy plant, called Fischer-Tropsch diesel (FTD), does not qualify as biodiesel and will not receive tax credits for its use. Again in written comments, Mr. Lidiak stated that FTD results from gas to liquid processes (not some conversion of plant matter). Mr. Walsh added that once the Bill passes, EPA will develop the regulations to include provisions for allowing Fischer-Tropsch diesel to receive tax credits.

Ms. Oge asked if climate provisions are included in the Energy Bill. Mr. Whatley said there is no climate provision in the bill at this time. There are two proposed amendments on the floor, but neither package is likely to pass. The Burns-Stevens amendment calls for a mandatory registry of carbon emissions and establishes a Senate-confirmed office in the White House. The Leiberman-McCain amendment has a bigger registry. There is a carbon ceiling for utilities and

large industry. Transportation fuels have a two-stage reduction, which will require 2000 emission levels by 2010, and will phase down to 1990 levels by 2016. Credits can be used from other sectors. Fifteen percent of the reduction requirements can be satisfied with offsets.

Mr. Clay asked about the ethanol liability issues. Mr. Whatley replied that the House has product liability relief for prospective producers of MTBE, ETBE, and ethanol. The Senate just has the ethanol liability language.

Mr. Tim Johnson asked about other environmental provisions in the Energy Bill, including the School Bus Initiative. Mr. Whatley does not believe EPW would have jurisdiction for the School Bus Initiative, since it is not directly based on the Clean Air Act (CAA). Ms. Oge asked about the idling provisions. Mr. Whatley said they would have to come out from under the CAA and come under either Transportation or Commerce authority. EPW jurisdiction is based on relevant provisions of the CAA, and hydrogen fuel is not included. Mr. Lashof said the Surface Transportation Act is coming up for reauthorization and could be a relevant piece of legislation for the School Bus initiative.

Mr. Lashof gave a presentation entitled “Dangerous Addiction: Ending America’s Oil Dependence.” Mr. Lashof provided an overview of America’s oil consumption in terms of supply, national security, economic security, and environmental security. He presented an action plan and discussed the Energy Bill provisions in terms of its impact on oil dependence. He discussed vehicle fuel economy, advanced technology vehicles, and renewable fuels. He presented several policy scenarios contrasting hydrogen powered fuel cell vehicles, versus smart growth and more stringent CAFE standards.

Mr. Lashof emphasized that reducing dependence on oil would also reduce emissions at the refineries. Of the 10 million tons of smog-forming pollution, 800,000 tons are upstream of vehicles. He also emphasized that additional jobs and safety analyses as part of the CAFE decision criteria are not needed because these analyses are already being conducted, and other analyses would open the standards up to additional litigation.

Senator Landrieu recently introduced a provision in the Energy Bill that the President develop a plan to save 1 million barrels of oil per day by 2013. There are other measures that could be used to reduce oil consumption (beside CAFE standards) including increasing replacement tire rolling resistance efficiency and reducing idling.

Mr. Walsh asked if EPA will be able to give different credits to different fuels based on carbon benefits. Mr. Whatley replied that there is no attempt to obtain a net-carbon gain. Mr. Lashof commented that the Boxer amendment boosts cellulosic ethanol consumption by giving it a 2.5:1 credit if it is used in place of gasoline, versus a credit of 1.5:1 for using ethanol in place of gasoline. Mr. Lidiak clarified that both credit offsets apply to cellulosic ethanol. The Boxer amendment raised the offset from 1.5:1 to 2.5:1, while corn-based fuel ethanol is still at 1:1.

Mr. Lashof commented that the Renewable Fuels Standard (RFS) could recognize that some processes are more efficient than others. Consumer-based tax provisions are different in the House and Senate versions of the Energy Bill. The House bill has an inappropriate tax credit for diesel fuel vehicles. Mr. Tim Johnson interjected that the credits are appropriate because the fleet average emissions will not increase. Mr. Lashof replied that there is no average for PM emissions, and the purpose of the tax credit is to improve the technology. Mr. Johnson argued that the light-duty diesel standards are very tight (about half of the European standard that has not passed yet), and light-duty diesel is an emerging technology in the United States. In addition, gasoline/electric hybrids are quickly overtaking the market when compared to diesel vehicles. Mr. Lashof responded that the concept of the credit is at issue. He supports using the tax credit to push development of new technology as opposed to increasing fuel efficiency.

Mr. Lidiak gave a presentation entitled “Fuels Provisions In National Energy Legislation.” Mr. Lidiak reviewed the fuel oxygen content requirements of the Clean Air Act and how those requirements were being met with MTBE and ethanol. Individual States have begun banning the use of MTBE because it has been found in drinking water. However, States have been unable to get out from under the 2 percent requirement despite the problems with MTBE. API supports a national phase-down of MTBE as opposed to the State-by-State bans. API has been working on repealing the oxygen requirement. They believe a 4-year time frame is appropriate for an MTBE phasedown-to ensure no supply problems. API also supports the renewable fuels standard in the context of these other changes. Mr. Clay commented that the cost for taxpayers is a big number, which is not included in Mr. Lidiak’s cost analysis. Mr. Lidiak replied that there are provisions incorporated that address subsidies.

Mr. Colburn gave a presentation entitled “Enacting a Renewable Fuels Standard: Economic, Energy, and Environmental Implications.” Mr. Colburn provided additional background information on the development of the MTBE problem. The Energy Information Administration (EIA) is estimating that the Northeast would use three times as much ethanol under the status quo as it would under the proposed RFS. NESCAUM sees the renewable fuel standard as a better solution, providing both environmental and economic benefits. Mr. Colburn spoke about some of the differences in the House and Senate versions of the fuels legislation. Because Congress did not require the use of MTBE, he sees giving it liability coverage retroactively -- as the House version does -- as a dangerous precedent.

Mr. Flint asked about these "Safe Harbor" provisions. Mr. Colburn responded that it protects MTBE manufacturers and gasoline blenders against certain claims that MTBE is a "defective" product. It leaves open “failure to warn” and the use of federal environmental laws for clean-up. If manufacturers have Safe Harbor liability protection, States could be left holding the bag for clean up and remediation costs.

Mr. Ginsburg commented that he thought the oxygenate requirement was to promote more complete combustion, and asked how emissions reductions could keep from backsliding if that requirement were eliminated. Mr. Lashof replied that some refiners would still use additives. Mr. Ginsburg asked if RFS is a fuel requirement for only the Northeast, or if other areas could opt in. Mr. Colburn said attainment areas could not opt-in. Mr. Tim Johnson asked if other

additives will have ground-water issues; e.g., if ethanol could dissolve compounds that then ended up contaminating the water. Mr. Colburn responded that ethanol is more miscible than MTBE, but microorganisms in the soil readily consume it. A possible concern is if microorganisms eat the ethanol, that could keep them from consuming benzene and other plume constituents as rapidly, however. Mr. Tim Johnson asked if there are differences in the air quality from MTBE versus ethanol. Mr. Colburn responded that there is a concern about the potential for increased NO<sub>x</sub> emissions from ethanol, but it can be managed, perhaps through a performance standard for emissions from gasoline combustion. Mr. Walsh asked about a recent court case where a State banned MTBE. Mr. Lidiak responded that a circuit court upheld the ban in California.

### **EPA's Nonroad Diesel Rule**

Mr. Simon gave a presentation entitled "EPA's Proposal for Nonroad Diesel Engines & Fuel." During the development of the rule, the first priority was to not change any schedule or requirements of the 2007 on-road heavy duty diesel standard. Mr. Simon reviewed the scope of the proposal. He also outlined a study that is being conducted on equipment operators' exposure to nonroad diesel emissions. There is not enough data to draw statistical conclusions as of yet, but qualitative analyses show the nonroad rule is an excellent step in improving equipment operators' health. He emphasized that EPA does not have the authority to regulate the sulfur content of home heating fuels, and the States are looking at this issue.

Mr. Tim Johnson asked Mr. Simon to elaborate on early credits for retrofit diesels. Mr. Simon replied that nonroad retrofits can be built into the averaging, banking, and trading (ABT) program. For example, if a company retrofits 1,000 engines, they can generate credits towards compliance with the standard. Mr. Johnson commented that since there is a 20 percent discount to allow for calculation factors, he is concerned about the ability to generate credits.

Mr. Johnson asked if any negative comments were received at the nonroad rule public hearing. Mr. Simon replied that there is some concern about fuel supply, but otherwise the public just wants the rule to be implemented faster.

Mr. Johnson asked about the exposure study conducted on equipment operators, and if data were compared with OSHA standards. Ms. Cooper replied that OSHA has very high standards. She will get that information to Mr. Johnson. Mr. Johnson commented that OSHA and the labor unions could be called upon to support the nonroad rule.

Mr. Norbeck commented on the difference in duty cycles between on-road and nonroad engines, and the fact that there are infinite combinations of duty cycles for nonroad engines. He asked if different test procedures will be developed to measure nonroad engine emissions. Mr. Simon replied that a new procedure is being developed, and the rule includes not-to-exceed standards in lieu of standards for every feasible duty cycle. Mr. Simon agreed that it would be impossible to generate standards for every possible duty cycle. Mr. Walsh commented that the not-to-exceed standards were the key to the nonroad rule's success.



Mr. John Johnson commented that the cost numbers associated with implementing the fuel standard for NO<sub>x</sub> and PM seem low. This may make a difference in the cost/benefit analysis. Mr. Simon replied that those numbers represented the costs after the program has been completely phased in, not the initial costs when the program is first implemented. Mr. Cackette commented that the cost estimate for the mature technology is much different than initial costs. Mr. Simon noted that the benefits of the rule outweigh the costs by so much that this cost difference is inconsequential. Mr. Tim Johnson added that incremental costs against the current standards do not reflect costs associated with tier 4 vehicles.

Mr. Ginsburg asked if the ABT programs in the on- and nonroad rules could be interchanged. Mr. Simon replied that they could not. Mr. Ginsburg also asked if rulemakers were still considering including locomotive and marine engines in the nonroad rule. Mr. Simon replied that it was unlikely, since there are no emissions analyses available on those engines.

Mr. Ginsburg referenced a Workgroup formed in the MSTRS a couple of years ago to address potential nonroad standards. He asked Mr. Simon to explain the differences between the Workgroup's recommendations and the current proposal. Mr. Simon replied that the current proposal is more aggressive than the Workgroup's recommendations. Mr. Walsh added that the Workgroup recommended a market-based approach instead of a regulatory standard, as well as a longer time frame to implement the nonroad rule.

## **Wrap-up**

The next meeting of the MSTRS is scheduled for October 2003 in the Detroit or Ann Arbor area of Michigan. Subcommittee members discussed what to include on the agenda. Mr. Walsh asked if Ms. Cooper had submitted the Air Toxics Workgroup's final report to the Clean Air Act Advisory Committee (CAAAC, parent committee to the MSTRS). He suggested waiting until after the October Subcommittee meeting to submit the paper to the CAAAC so Subcommittee members would have a chance to examine it.

Participants also recommended examining the diesel retrofit program more closely, and possibly forming a Workgroup to study the issues. Ms. Cooper suggested keeping the focus of the Workgroup broad, and not restrict the topic to school bus retrofits. Mr. Tim Johnson recommended giving EPA feedback on how incentives will play into the nonroad rule. Mr. Walsh suggested that EPA compile a list of incentive programs along with a full scope of action. Ms. Rudzinski recommended discussing social marketing issues of voluntary programs, and how to change behaviors without regulatory action. She also suggested separating the social marketing issues from the technical retrofit issues.

Mr. Cackette commented that a large number of engines will be difficult to retrofit with aftermarket exhaust systems, and asked about economic advantages to modernizing these engines. Mr. Walsh asked Mr. Cackette to present information on this topic at the next Subcommittee meeting. Mr. Cackette agreed, saying that a number of voluntary and regulatory programs have been implemented in California.

Mr. Ginsburg expressed interest in hearing from the oil refineries. He is interested in the state of ULSD production, and if it is on track for the on-road rule implementation. He would like to know when ULSD will be available in different parts of the country, since the retrofit program hinges on ULSD availability. Mr. Walsh commented that a Clean Diesel Independent Review Panel FACA examined some refinery issues last year, and EPA is completing another status report now. Perhaps a presentation could be given at the next meeting.

The meeting adjourned at 1:00 p.m.

**APPENDIX A: LIST OF ATTENDEES**

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**MOBILE SOURCES TECHNICAL REVIEW**  
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CO-CHAIRS: MICHAEL WALSH AND SUZANNE RUDZINSKI

DESIGNATED FEDERAL OFFICIAL: SUZANNE RUDZINSKI

Attendees of the Subcommittee's Meeting on June 11, 2003  
 Alexandria, Virginia

**Members, Alternates, and Speakers**

Name	Organization
Suzanne Rudzinski (co-chair, DFO)	EPA
Mike Walsh, co-chair	consultant
Robert Brown	Ford Motor Co.
John Cabaniss	AIAM, Inc.
Tom Cackette	CARB
Don Clay	Koch Industries, Inc.
Ken Colburn*	NESCAUM
Coralie Cooper*	NESCAUM
Steve Flint	New York State DEC
Jerry Gallagher	J. Gallagher & Associates
Andy Ginsburg	Oregon DEQ
John Johnson	Michigan Technological University
Tim Johnson	Corning, Inc.
Dan Lashof*	NRDC
Peter Lidiak*	API
Joseph Norbeck	University of California, Riverside
Margo Oge	EPA
Antonio Santos, sub for Bruce Bertleson	MECA
Bob Schaefer	BP
Robert Sawyer*	University of California, Berkeley

**Members, Alternates, and Speakers**

<b>Name</b>	<b>Organization</b>
Karl Simon*	EPA
Michael Whatley*	Senate EPW

\*speaker

**Observers**

<b>Name</b>	<b>Organization</b>
Casimer Andary	Alliance of Automobile Manufacturers
Richard Barrett	Colorado Department of Health & Environment
Darrin Bartram	Baker & Hostetler
Donna Boysen	M.J. Bradley & Associates
Susan Collet	Toyota
Harry Diegel	Ford
Roger Fairchild	Esquire, P.C.
Charles N. Freed	Consultant
Ed Gardetto	EPA
Doug Greenhaus	NADA
Sara Hayes	Ozone Transport Commission
Jennifer Hosking	J.T. Hosking Assoc.
Glen Kedzie	American Trucking Association
Robert Larson	EPA
Doug Lawson	NREL
Gita Marthy	Hogan & Hartson
Hiroshi Nishida	Japan Automobile Standards Internationalization Center
David Raney	Honda
Keisuke "Kei" Sano	Toyota

### Observers

<b>Name</b>	<b>Organization</b>
Christopher Saricks	Argonne National Laboratory
Ellen Shapiro	Alliance of Automobile Manufacturers
Tom Snyder	Argonne National Laboratory
Idy Usoro	Toyota
Andy Vaichekauskas	Mitsubishi R&D
Brett Walter	Morrison & Foerster
Josh Zahn	AgSource, Inc.

### Members of the Press

<b>Name</b>	<b>Organization</b>
Pamela Najor	BNA, Inc.
Darren Samuelson	Greenwire

### Staff

Kathy Boyer	EC/R, Inc.
Stephen Edgerton	EC/R, Inc.
Barry Garelick (alternate DFO)	EPA
Rebecca Battye	EC/R, Inc.

## **APPENDIX B: PRESENTATIONS**

## Mobile Source Air Toxics Workgroup

Summary of the Final Report  
to the Mobile Source Technical  
Review Subcommittee

Coralie Cooper  
NESCAUM  
June 11, 2003

### Charter of the Workgroup

- Define mobile source air toxic emissions sampling and analytical protocols for the 21 mobile source air toxics identified in the March 2001 rule
- For gasoline and diesel, light and heavy-duty nonroad and highway engines
- Compounds include: VOCs, ketones, aldehydes, diesel PM and diesel exhaust organic gasses, metals, POM, dioxins, furans
- Not tasked with evaluating testing cycles

### Existing Methods

- EPA method exists for formaldehyde
- California Air Resources Board has methods for C2 – C12 hydrocarbons (methods 1002/1003) as well as a method for aldehydes and ketones (1004)
- National laboratories and independent testing facilities use a variety of methods, some derived from stationary source methods

## Overview

- Review of workgroup charter
- Recommendations

### List of 21 MSATs

Acetaldehyde	Dioxin/Furans	MTBE
Acrolein	Ethylbenzene	Naphthalene
Arsenic Compounds	Formaldehyde	Nickel Compounds
Benzene	n-Hexane	Polycyclic Organic Matter (POM) (sum of 7 PAHs)
1,3-Butadiene	Lead Compounds	Styrene
Chromium Compounds	Manganese Compounds	Toluene
Diesel Particulate Matter (PM) + Diesel Exhaust Organic Gases (DEOG)	Mercury Compounds	Xylene

### Workgroup Review of Existing Methods

- Review of existing sampling and analysis methods for the 21 MSATs
- VOCs
  - Agreement reached on VOC sampling and analysis protocols.
- Aldehydes and Ketones
  - Agreement reached on sampling and analysis protocols.



## Recommendations: C2-C12 Hydrocarbons

- Most testing laboratories and industry use the ARB 1002/1003 methods
- 1002/1003 provide sampling and analysis procedures for 9 of the 21 MSATs
- ARB Methods 1002/1003
  - ARB recently (2002) updated their methods to improve sample efficiency and increase analytical accuracy.
  - Workgroup agreed that the ARB methods are used consistently and that the methods are rigorous and thus recommend them to EPA

## Recommendations: Diesel PM

- MSAT defines diesel PM as "diesel particulate matter" and "diesel exhaust organic gases"
- Group recommends, for now, existing 40 CFR Part 86 method for total PM
- Additional development may be necessary for a method to assess particle bound diesel exhaust organic gases
- Could include investigation into organic carbon/elemental carbon and the soluble organic fraction analysis

## Recommendations: Aldehydes and Ketones

- As with the method for C2 – C12 hydrocarbons, ARB method for aldehydes and ketones is a well established, frequently used method
- ARB recently updated their aldehyde and ketone method (called method 1004) in 2002 to increase sample efficiency and analytical accuracy
- EPA formaldehyde method references ARB method

## Recommendations: metals, dioxins, furans, POM

- A variety of methods are used to sample and analyze metals, dioxins, furans, and polycyclic organic matter (POM)
- Based largely on stationary source methods
- Stationary source methods may not be appropriate for mobile sources. For example, sample concentration may be too different for collection and analytical techniques to be transferable to mobile sources
- The workgroup makes no recommendation on these compounds given the variety and variability of methods currently used

## Stationary Source Methods Used for MSATs

MSAT	Stationary Source Sample Collection Method	Analytical Method
As	EPA Method 60, ARB Method 436	ICP-AES, ICP-MS, GF-AAS, DA-AAS, XRF
Cr	EPA Method 60, ARB Method 436	ICP-AES, ICP-MS, GF-AAS, DA-AAS, XRF
Pb	EPA Method 60, ARB Method 436	ICP-AES, ICP-MS, GF-AAS, DA-AAS, XRF
Mn	EPA Method 60, ARB Method 436	ICP-AES, ICP-MS, GF-AAS, DA-AAS, XRF
Hg	EPA Method 60, ARB Method 436	CV-AAS
Ni	EPA Method 60, ARB Method 436	ICP-AES, ICP-MS, GF-AAS, DA-AAS, XRF
POM	EPA Modified Method 10 or 23A, ARB Method 429	HPLC-UV, HPLC-FLD, HRGC-HRMS
PCDD/F <sub>9</sub>	EPA Method 23A, ARB Method 428	HRGC-HRMS

## Additional Recommendations

- Development of new analytical methods should be carried out in cooperation with ARB, EPA, and national and private sector laboratories to ensure consistency in sampling and analysis methods
- EPA should determine the cost, extent, and practical usefulness of proposed analytical methods prior to establishment of those procedures
- The need for new sampling and analysis methods should be based on a risk analysis of the ambient toxics levels needed to create significant health effects



## DANGEROUS ADDICTION

### Ending America's Oil Dependence

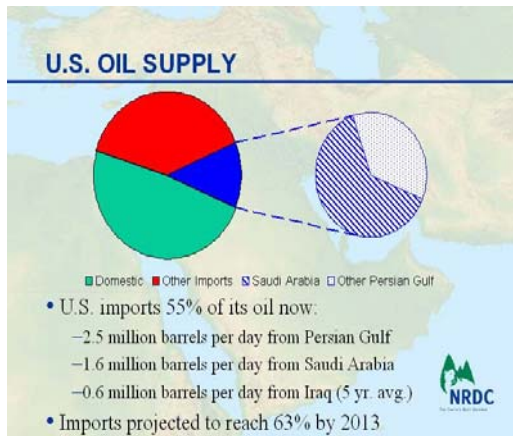
**Daniel Lashof**  
June 11, 2008

Report Authors  
David Doniger, NRDC  
David Friedman, UCS  
Roland Hwang, NRDC  
Daniel Lashof, NRDC  
Jason Mark, UCS



## OVERVIEW

- America's oil dependence endangers our security, our economy, and our environment
- Inefficiency of America's passenger vehicles is the root cause
- We can cut 2020 passenger vehicle fuel use in half, using American know-how to make better vehicles and better fuels
- Pending energy legislation could increase, rather than decrease, our oil dependence



## NATIONAL SECURITY

- U.S. uses 25% of world oil production
  - Has 3% of world oil reserves
  - Arctic Refuge would add just 0.3%
- 65 percent of world reserves are in the Persian Gulf
- There is no way to drill our way to energy security



## ECONOMIC SECURITY

- Over \$100 billion spent on oil imports per year
  - \$380 per person, per year
  - Projected to increase over 50 percent by 2020 (DOE)
- \$1.2 trillion transferred to oil producing countries over past 30 years
- Total economic impact on U.S. economy of \$3.4 trillion, including price shocks and wealth transfer



## ENVIRONMENTAL SECURITY

Passenger vehicles are responsible for:

- 1.3 billion tonnes of CO<sub>2</sub> – projected to increase to 2 billion tonnes by 2020
- 10 Million tons of smog-forming pollution
- 400,000 tons of toxics (benzene-equivalent)
- 1.5 million gallons of oil spilled in U.S. waters in 2000



## OIL SECURITY ACTION PLAN

- Improve the **fuel economy** of cars and light trucks to 40 mpg by 2012 and 55 mpg by 2020
- Encourage gasoline-electric **hybrid vehicles**, which get double the mileage of today's cars
- Expanded use of **non-petroleum fuels**, such as cellulosic ethanol (made from crop wastes – not corn)
- Hydrogen powered **fuel-cell vehicles** -- 100,000 vehicles on the road by 2010; 2.5 million by 2020
- “**Smart growth**” instead of sprawl -- increase transportation choices and make communities more livable



## ENERGY BILL PROVISIONS: OIL DEPENDENCE UP OR DOWN?

- Dual-fuel vehicle loophole extension (Senate)
- Litigation bait—additional CAFE decision criteria (Senate)
- Landrieu Oil Savings Amendment (Senate)
  - 1 Million Barrels/Day by 2013
- Renewable fuels standard—transition to biomass?
  - Boxer amendment gives ethanol from crop waste a 2.5:1 bonus
- Fuel cell R&D, but no assurance of deployment
  - Over \$3 billion authorized (Senate)
  - Dorgan amendment establishes goals



## ENERGY BILL PROVISIONS: OIL DEPENDENCE UP OR DOWN?

- Tax provisions:
  - \$7.4 billion for oil and gas;
  - \$2.3 billion for advanced technology vehicles
- Advanced technology vehicle tax credits—heading for a train wreck in conference?
  - Hybrid credit in Senate
  - Diesel credit in House



Union of Concerned Scientists Oil Savings Estimates

	NHTSA	Feinstein-Snowe	Estimated McCain	Durbin
	1.5 mpg increase for light trucks by 2007	Close light truck loophole by 2011	34 mpg by 2015	Passenger Vehicles 40 mpg, Pickups 27.5 mpg by 2015
daily savings (mbd, 2010)	0.13	0.18	0.40	0.62
daily savings (mbd, 2015)	0.25	0.65	1.30	1.79
daily savings (mbd, 2020)	0.34	1.06	2.26	3.06
cumulative savings (bil gal, '05-'10)	5.9	4.8	15.3	25.8
cumulative savings (bil gal, '05-'12)	10.9	14.6	34.3	53.9

## VEHICLE FUEL ECONOMY

CAFE Standards to 40 mpg in 2012, 55 mpg in 2020:

- Saves nearly 2 million barrels per day in 2012, *more than current imports from Saudi Arabia*
- Saves nearly 5 million barrels per day in 2020, *almost twice current imports from the Persian Gulf*
- Consumer buying a 40 mpg car in 2012 would enjoy net savings of \$2,200 over life of the vehicle



## ADVANCED TECHNOLOGY VEHICLES

- Performance-based consumer tax credit of up to \$4,000 for hybrid gasoline-electric vehicles
- Tax credit of up to \$8,000 for fuel-cell vehicles
- Accelerate ramp up to mass production
- Hybrids could dominate market by 2020



## RENEWABLE FUELS

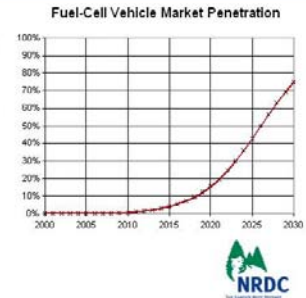
- Fund pilot plants to produce ethanol from crop wastes and other biomass
- Ramp up renewable fuel content to 5 billion gallons by 2012
- Save 400,000 barrels/day in 2020
- Achieve 5% cut in CO<sub>2</sub> emissions per gallon of motor fuel in 2020
- Cut CO<sub>2</sub> emissions by 75 million tonnes



## HYDROGEN-POWERED FUEL-CELL VEHICLES

Ramp up production to 100,000 vehicles in 2010, 2.5 million in 2020

- Saves nearly 2.5 million barrels of oil per day in 2030
- Cuts CO<sub>2</sub> by more than 240 million tonnes in 2030

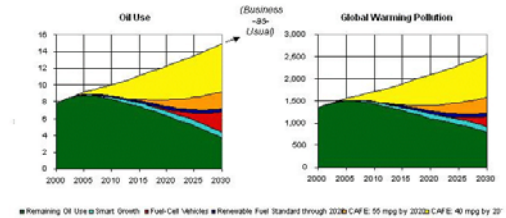


## SMART GROWTH

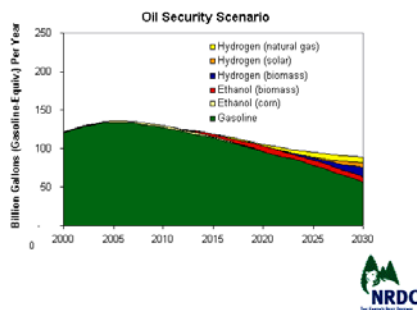
- Next generation federal transportation bill – transit, light rail and transit-oriented development support
- Equalize tax benefits for transit and parking
- Location-efficient mortgages – better financing for homes near transit
- Pay-at-the-pump insurance



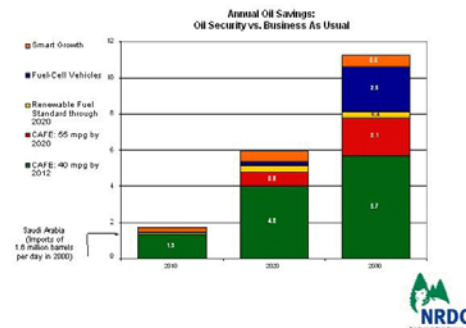
## RESULTS



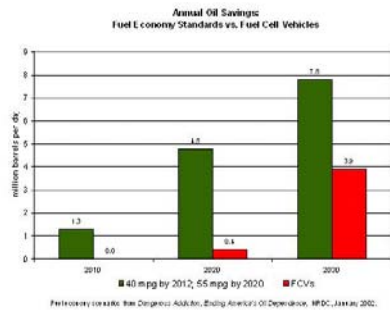
## FUEL USE BY U.S. PASSENGER VEHICLES



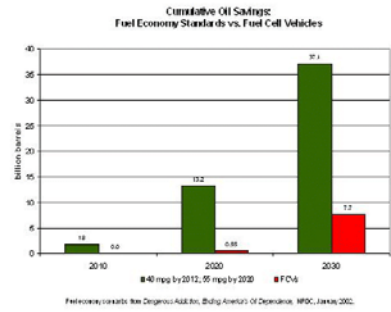
## OIL SAVINGS BY POLICY



## ANNUAL OIL SAVINGS: MPG v. FCV



## CUMULATIVE OIL SAVINGS: MPG v. FCV

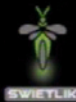


### The Detroit Project

"40 Mile Dream Vehicle" :30  
DPRO-0032

05.02.03

©2003 The Detroit Project



## FOR MORE INFORMATION

[WWW.NRDC.ORG](http://WWW.NRDC.ORG)



## Fuels Provisions In National Energy Legislation



### Which Means...

By volume, a 20 gallon tank of RFG usually has...

- a little over a gallon of ethanol, or
- a little over two gallons of MTBE

No flexibility, must put oxygenate in each gallon wherever RFG is sold

### MTBE Began To Show Up In Drinking Water

- Taste and odor makes water undrinkable
- High visibility cases in:
  - Santa Monica
  - Lake Tahoe
  - Long Island



### The Clean Air Act says...

Oxygen content.- The oxygen content of the reformulated gasoline (RFG) shall equal or exceed 2.0 percent by weight



### MTBE vs. Ethanol

- MTBE ships as part of fuel through pipeline
- Ethanol is mixed with fuel near consumption point
- MTBE generally consumed on the coasts and Texas
- Ethanol generally used in Midwest

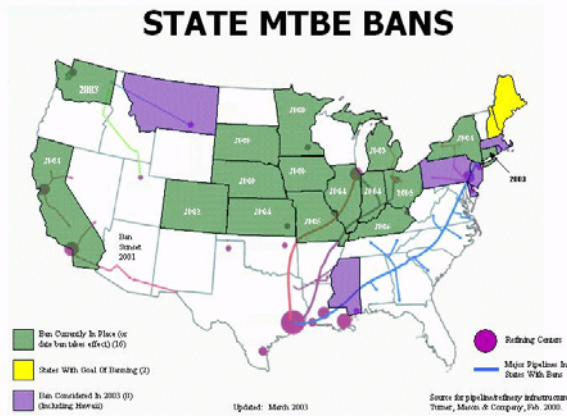
MTBE is a good, cost-effective fuel component, except...

### MTBE In the Spotlight

**EPA Blue Ribbon Panel Recommends Phase Down and Repeal of Oxygenate Mandate (API concurs with recommendation)**

**60 Minutes Elevates Issue in 2000**

**States start banning its use**



## States Where Ban Means Change

- California
- New York
- Connecticut

RFG Oxy Requirement Means Ethanol Mandate



## NECESSARY FUELS CHANGES

- > Repeal of the Federal RFG oxygen requirement
- > National program to significantly reduce the use of MTBE
- > Maintain the environmental benefits of clean fuels programs
- > Do not penalize industry for following will of Congress
- > Respond to demands for renewable fuels in most efficient and beneficial ways = RFS w/ABT Program

## Provisions Supported By An Array of Interest Groups

- Major Refiners
- Agricultural interests
- Ethanol producers
- NE states air officials
- Environmental NGOs

### Status of Major Points

	Senate	House
Oxy Repeal	Yes	Yes
RFS	5 bgy in 2012	5 bgy in 2015
MTBE Phasedown	Yes	No
Anti-backsliding	Yes	Yes
Safe Harbor	Yes	Yes
Banking & Trading	Yes	Yes

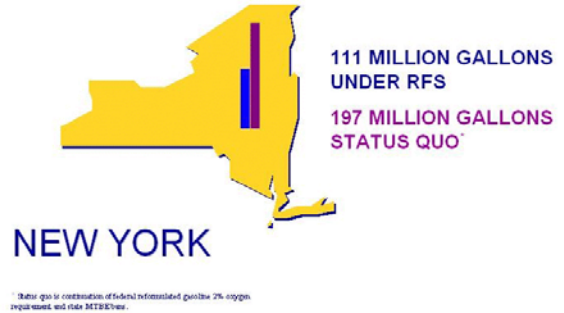
## What A Difference

An Oxy Repeal Makes

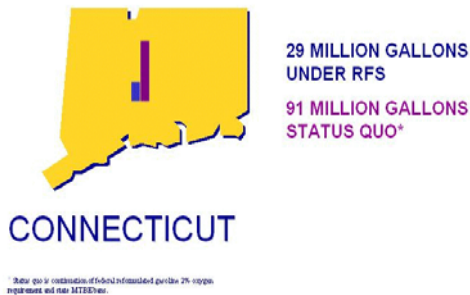
## 2005 Ethanol Volumes Under RFS *versus* Status Quo



## 2005 Ethanol Volumes Under RFS *versus* Status Quo



## 2005 Ethanol Volumes Under RFS *versus* Status Quo



## COST OF A RENEWABLE FUELS STANDARD

- U.S. Energy Information Administration (EIA) concluded that— compared with status quo — would be negligible: one-half to one-cent per gallon
- EIA indicated cost could be even less when banking/trading provisions are factored in
- Mathpro analysis showed the cost of the RFS (with 2% repeal) would be 0.2 cents per gallon less than status quo

## CONCLUSION

- Congress needs to repeal the 2% RFG oxygen content requirement
- National MTBE phasedown preferable to uncoordinated state bans
- Existing environmental benefits must be protected
- The use of renewable fuels seems certain -- need to assure a flexible, cost-effective use



## Enacting a Renewable Fuels Standard: Economic, Energy, and Environmental Implications

Mobile Sources Technical Review Subcommittee  
Clean Air Act Advisory Committee  
June 11, 2003



Ken Colburn  
NESCAUM  
kcolburn@nescaum.org

### MtBE: How Did We Get Here? (2)

- MtBE highly mobile & persistent; significant groundwater contamination found after 1997
- MtBE now one of the most widely detected contaminants in Northeast drinking water
- Not just LUSTs (leaking pipelines, spills, two-cycle engines, accidents, stormwater runoff, etc.)
- Intense public concern over smell, taste, carcinogenicity
- CAA 2% "oxygen mandate" constrains states
  - MtBE-or-ethanol for practical purposes
  - Waivers difficult and/or politically impossible
  - States condemned to contaminate water?

### RFS Addresses Northeast Concerns Well (1)

- Environmental:
  - 2% CAA oxygen mandate lifted
  - MtBE phased out & banned
  - No backsliding on actual air quality gains to date
  - Clarifies state authority; enables OTC-wide fuel
- Economic:
  - Volume: RFS = 1/3 of ethanol required by 2% CAA oxygen mandate
  - Price & Supply: Refiner/distributor flexibility on when and where ethanol is blended
  - Lead time and fuel fungibility (vs. "boutique" fuels) far better than state-by-state action

### MtBE: How Did We Get Here? (1)

- Oxygenate used since 1970s to enhance octane after lead removed; average concentration 2-3%
- Cleaner burning reformulated gasoline (RFG) introduced in 1995; average concentration 11%
- Due to ozone nonattainment SIP requirements, Northeast gasoline now ~75% RFG
- Substantial air quality benefits
  - EPA: 27.4% VOC, 6.8% NOx, 24% benzene, 21.5% toxics, etc.
  - Actual results even better, e.g., ~27-35% toxics

### Bottom Line Status Quo

- "Just Say No" to MtBE is not an option under current law
- Stick:
  - State MtBE bans with CAA 2% oxygen mandate
  - EIA estimates as much as three times more ethanol will be used in Northeast under status quo
  - Status quo would force summertime ethanol use
  - Or, continued contamination of drinking water supplies
- Carrot:
  - RFS is a relatively gentle, market-based approach

### RFS Addresses Northeast Concerns Well (2)

- Environmental:
  - Greenhouse Gases (GHG):
    - Cellulosic-based ethanol reduces GHG up to 100% compared to gasoline (Argonne)
    - Corn-based ethanol blend (E-10) reduces GHG by 12-19%
- Economic:
  - Cellulosic ethanol spurred by RFS (1.5:1 credit)
  - Northeast feedstocks could support 50 15-MGPY plants; with associated renewable power => ~11,000 jobs
  - Rural boost: market for paper sludge, low-grade wood (chips), agricultural & municipal waste
  - Potential to improve domestic energy supply & security

### Concerns Regarding RFS Legislation

- Careful implementation needed due to RVP (volatility; co-mingling)
- Minor technical fixes may be appropriate:
  - Refinery-by-refinery toxics baselines
  - Possible change to waiver processing language
  - Would welcome fate and transport study
- Potential Deal Killers:
  - Liability "Safe Harbor" for MtBE
  - No ban on the use of MtBE in gasoline

# EPA's Proposal for Nonroad Diesel Engines & Fuel



U.S. Environmental Protection Agency  
Office of Transportation and Air Quality

## Briefing Overview

- Scope of the Proposal
- Program Considerations
- Proposal Overview
- Cost Impacts
- Benefits
- Stakeholder Reactions
- Next Steps

1

2

## Scope of the Proposal

- Proposal applies to nonroad diesels of all sizes, from 3 to 3,000 hp
  - Used in a diversity of applications-- construction, farming, mining, industrial
- Proposed fuel provisions apply to fuel used in nonroad diesels, locomotives, and marine engines
  - But not to home heating fuel
  - Nonroad fuel is not currently regulated by EPA
- Proposal addresses serious health and welfare impacts from nonroad diesel fuel and equipment--
  - ozone, fine PM
  - in addition, diesel exhaust is likely to be carcinogenic to humans
- These sources currently contribute 44% of total mobile source diesel PM and 12% of total mobile source NOx nationwide.
  - Their contributions range even higher in many urban areas and will grow in the future.

3

## Program Considerations

- Treat fuels and engines as a system
- Transfer advanced technology from 2007 highway program to nonroad applications
- Provide 6-10 years lead time for fuels and engines (similar to that given in highway program)
- Costs (capital, operating) and resources (engineering, construction)
- No interference in implementation of 2007 highway diesel program

4

## Proposal Overview

- EPA undertook an extensive outreach process with all stakeholders in developing the proposal
- A systems approach of reducing nonroad fuel sulfur levels to enable advanced emission control technology
  - similar to 2007 diesel truck and fuel rule
- 500 ppm maximum sulfur nonroad diesel fuel in 2007
  - based on substantial health benefits from sulfate and PM reductions
- 15 ppm nonroad fuel in 2010
  - to enable engine standards
- Engine standards representing reductions of >95% PM and ~90% NOx
  - Standards phase in starting in 2008, fully phased in by 2014
- Scope and importance of this rulemaking should not be underestimated
  - Effectively accelerating time for introduction of very clean technologies and clean fuel for nonroad engines
  - Adding new and enhanced testing requirements to ensure in-use emissions reductions

5

## Provisions to Reduce Economic Impacts

- Sufficient lead time given to develop and produce advanced emission-control systems.
- Engine manufacturers that are small businesses are given an additional 1 to 3 years to meet standards.
- Small refiners are given 3-4 years of additional lead time.
- Early credits provided to encourage companies to meet requirements early.
- Averaging, Banking, and Trading provisions are maintained in program.
- Additional time is given to equipment manufacturers for small volume products.
- Companies may petition EPA for relief if the burden of the regulations would cause severe economic hardship.

6

## Cost Impacts for Engine & Equipment Manufacturers

- Costs vary with engine size and equipment application.
- For the majority of equipment models the cost of meeting the standards will be ~1-2% compared with typical retail prices.
- Costs could range higher for some equipment (see following typical examples).

	Skid Steer Loader (Bobcat) 33 hp	Backhoe 76 hp	Dozer 175 hp	Off-Highway Truck 1000 hp
Cost of meeting proposed standards	\$760	\$1,210	\$2,590	\$6,780
Typical retail price of this equipment	\$13,500	\$50,000	\$235,000	\$700,000



7

## Benefits

- The program will prevent annually:**
  - 9,600 premature deaths
  - 16,000 nonfatal heart attacks
  - 5,700 cases of chronic bronchitis
  - 8,300 hospital admissions
  - 14,000 annual acute bronchitis attacks in children
  - 260,000 respiratory symptoms in children (related to PM)
  - nearly 1 million lost work days among adults because of their own symptoms
  - 6 million days where adults have to restrict their activities due to respiratory symptoms
- Comparable to benefits of 2007 heavy-duty highway program
- Will also help improve visibility (\$1.9 billion/year benefit)
- Overall, on a dollar basis: \$81 billion/year (in 2030)

9

## Stakeholder Reactions

- Initial reactions have been quite positive overall
  - All stakeholder groups support basic program requirements, timing
- Expect to work through technical issues with stakeholders

11

## Diesel Fuel Refiner, Distributor, & User Impacts



- Average fuel cost (refining, distribution, & lubricity additive): 4.8 c/gal
- Maintenance savings to nonroad equipment operator from cleaner fuel: 3.3
- Net consumer cost of fuel change: 1.5 c/gal

- Fuel costs expected to vary by region of the country (3.0 to 8.9 c/gal)

8

## Benefits Greatly Outweigh Costs

- \$81 billion/year annual benefit greatly outweighs \$1.5 billion/year program cost

Cumulatively (NPV through 2030):

- \$550 billion in benefits vs. \$17 billion costs

- Cost Effectiveness compares favorably with other recent rules:**
  - \$810 per ton NOx+hydrocarbons (2007 highway: \$2100)
  - \$8,700 per ton PM (2007 highway: \$13,600)
  - \$200 per ton SOx

10

## Next Steps

- Public Hearings:**
  - New York June 10
  - Chicago June 12
  - Los Angeles June 17
- Comment period** open until August 20
- Final rule** in Spring 2004
  - Advance notice for new locomotive standards

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# Appendix

## Proposed Engine Standards Program

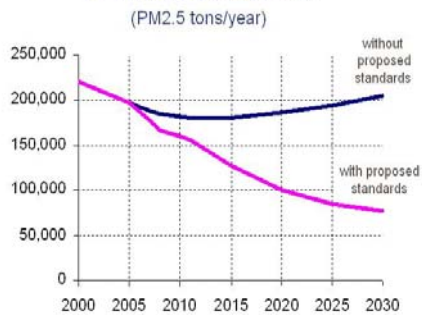
hp	500 ppm NR fuel				15 ppm NR fuel								
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	
<25	Tier 1												
25-75	PM reductions w/oxidation catalyst or engine-based control												
75-175	existing Tier 2				existing Tier 3				PM: 100%	NOx: 50%	50%	100%	
175-750									PM: 100%	NOx: 50%	50%	50%	100%
>750	Tier 1	existing Tier 2								PM & NOx: 50%	50%	50%	100%

Percentages indicate portion of sales required to meet advanced emission control technology standards

13

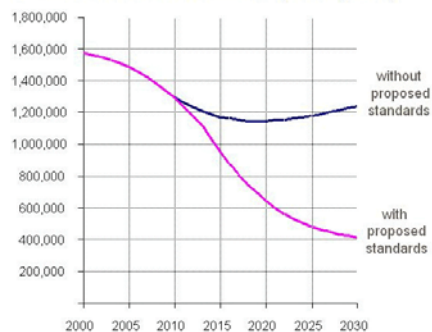
14

### Nationwide PM Reductions From Nonroad Diesels



15

### Nationwide NOx Reductions From Nonroad Diesels (tons/year)



16

### Nonroad Equipment



Tractor 130hp  
Track Dozer 200 hp

Combine 300 hp

Excavator 800 hp

Generator 20 hp

Airport Pushback Tractor 190 hp

17