

UetersFederal Advisory Committee Act
Clean Air Act Advisory Committee
Mobile Sources Technical Review Subcommittee

Co-Chairs: Michael Walsh and Robert Sawyer Designated Federal Official : Gregory
Green

Minutes of the Subcommittee's Meeting on October 16, 2002
Dearborn, Michigan

Introduction and Opening Remarks

Bob Sawyer (University of California at Berkeley) called the meeting to order at 9:00 a.m. and welcomed attendees. Packets were distributed to members and observers that included the meeting's agenda, handouts of presentations, a welcome message and background information for observers, the meeting evaluation form, information on the members of the Subcommittee, an MSTRS Workgroup organization chart, reports from the Workgroups, recent MSTRS listserver messages, and a meeting calendar. Meeting information will be made available through the Subcommittee website, at http://www.epa.gov/air/caaac/mobile_sources.html.

Dr. Sawyer reviewed business items for the meeting. The minutes for the June 12, 2002 meeting were accepted without revisions.

Dr. Sawyer announced the departure of Gregory Green as Designated Federal Official (DFO) and Cheryl Hogan as Alternate DFO. Suzanne Rudzinski has been appointed as the new DFO, to be effective by the date of the next Subcommittee meeting. A replacement for Ms. Hogan will be announced when that appointment is made. Dr. Sawyer thanked Ms. Hogan for a superb job in coordinating Subcommittee meetings. He noted that the personnel changes provide the Subcommittee an opportune time to take a fresh look at the Subcommittee's direction and activities and to consider how to most effectively interact with EPA.

Dr. Sawyer noted that Ms. Rudzinski has returned to the U.S. EPA after a stint at DOE and that she now heads the Transportation and Regional Programs Division. Ms. Rudzinski introduced herself and solicited suggestions for topics for upcoming meetings.

General Discussion

John Cabiniss (AIAM) asked whether the MSTRS ("Subcommittee") has been contacted to take part in the CAAAC ("Committee") meeting to be held later this month in Washington, DC. Dr. Sawyer and Ms. Hogan are not aware of any recent communications regarding participation in the Committee meetings. Dr. Sawyer agreed that the Subcommittee should be proactive in this matter. Kelly Brown (Ford) said the CAAAC is typically involved in stationary source issues, with meetings chaired by Jeff Holmstead (U.S. EPA Assistant Administrator for Air and

Radiation). Tom Cackette (CARB) suggested that the decrease in involvement of the Subcommittee is likely only a problem of logistics, noting that the other subcommittees meet at the same time as the full Committee and are generally allotted 10 or 15 minutes each. He added that Paul Rasmussen (the DFO for the Committee) would like a closer relationship between the Committee and the MSTRS.

Presentations on Fuel Cell Technology

- Tom Cackette (CARB) gave the presentation, "California Fuel Cell Partnership" (CaFCP). The partnership aims to achieve four main goals: (1) Demonstrate vehicle technology by operating and testing the vehicles under real-world conditions in California; (2) Demonstrate the viability of alternative fuel infrastructure technology, including hydrogen and methanol stations; (3) Explore the path to commercialization, from identifying potential problems to developing solutions; and (4) Increase public awareness and enhance public opinion about fuel cell electric vehicles, preparing the market for commercialization. He identified several means of demonstrating the potential for fuel cell-powered vehicles. Among highlights of 2001 activities are the opening of a headquarters facility, public outreach events, release of a fuel scenarios study (hydrogen, methanol, gasoline, and ethanol), and placement of approximately 20 cars on the road. Future activities include a 2-year in-service demonstration of fuel cell buses at 3 transit agencies, with delivery of buses expected in 2004. The CaFCP web site is <http://www.fuelcellpartnership.org>.

Both Honda and Toyota plan a small fleet in California, with vehicles also in Japan. The plan is to test small groups of vehicles in controlled fleet operations with their associated fuel infrastructures. Current vehicle production numbers are in the single digits, but vehicle numbers will increase to the teens in the future.

Bob Schaefer (BP Global Fuels Technology) asked about the cost of the CaFCP demonstration buses. Mr. Cackette replied that the cost will be approximately \$3 million in units of three, or perhaps 10 times the cost of a conventional bus, adding that bus manufacturers won't be able to absorb all the R&D costs if only one bus is purchased at a time.

Dr. Tim Johnson (Corning) asked how the California program compares to similar international programs with respect to size and budget. Mr. Cackette said California's program is unique because all sectors of government are involved. There is a high level of interest in the CaFCP, and organization principals (including those in Germany and Japan) always attend meetings and contribute their experiences. The budget is perhaps \$3 million per year to administer the program. A staff of 6 is paid by fees from the government, and member partners add funds to the project.

Dr. Sawyer cited a published assessment that made long-term projections for the high cost of fuel cells. He asked if this was a reasonable assessment and added that, while the report was optimistic, uncertainty lies in the refueling issue. Mr. Cackette responded that fuel cell vehicles will be successful when costs are comparable to conventional cars. Their range is hundreds of miles, unlike electric vehicles. Although the refueling issue is a challenge, there are currently no technological barriers for refueling. An initial investment must be made before refueling issues will be resolved. In the long term there may be better storage systems than high pressure.

Steve Flint (NYSDEC) asked whether CARB is considering permitting and air quality issues in connection with onsite fuel reforming (conversion of hydrocarbon fuel to hydrogen gas) and hydrogen storage. Mr. Cackette responded that there are no technical barriers to onsite reforming.

Tim Johnson asked about societal benefits of fuel cell vehicles, such as production costs and benefits to the consumer. Mr. Cackette said environmental benefits, risks, and challenges have been summarized in the study report available on the website. Greenhouse gas emissions depend on how the fuel is made. Electrolysis may not be worthwhile, using so much electricity. Other ways show benefits. He noted that the fuel cells vehicles themselves are 3 times as efficient as gas-powered vehicles. Mr. Cackette confirmed that it is part of the CaFCP charter to move past theoretical energy balances, etc., to actual experience, but that it's a little hard to accomplish at this stage, with a mere handful of people at refueling stations.

- Bill Swift (Argonne National Laboratory) gave the presentation "Overview of U.S. DOE Energy Efficiency and Renewable Energy (EERE) Fuel Cell Program." For more information on this program, see <http://www.eren.doe.gov/hydrogen/>. He summarized the organization of EERE, discussed the FreedomCAR partnership, and presented R&D information for fuel cell and hydrogen development. The most critical challenges surrounding fuel cells are durability and cost. Startup time in fuel cell cars is approximately 10 minutes, which is a drawback to the vehicles. The current budget for fuel cell R&D is approximately half of the \$150 million budget allotted to the FreedomCAR project. However, DOE has held numerous workshops on fuel cells and hopes to raise more funds.

Coralie Cooper (NESCAUM) asked if life cycle emissions will be evaluated as part of fuel cell research. Mr. Swift replied that he didn't know of plans to evaluate these emissions, but emissions from integrated systems are being evaluated. Joe Norbeck (UC-Riverside) recommended that Mr. Swift's group include a life cycle analysis in their plan. He added that this advice is based on experience, as his organization had submitted a proposal to the National Science Foundation for fuel cell R&D, but the proposal didn't get past review and was rejected on the basis that DOE handled funding of fuel cell projects. Dr. Norbeck would like to see coordination early on between NSF, DOE, and DOD, as there seems to

be a lack of communication. He asked where NREL (National Renewable Energy Laboratory) fit into the structure. Mr. Swift replied that a major effort in hydrogen research is going on in NREL, but there are funding constraints because the \$150 million budget includes all programs.

Mr. Cackette commented that DOE was active in gas reforming in their partnership with California, and he asked what has evolved in the past 5 years at DOE with respect to challenges and successes resulting from that research. Mr. Swift replied that advancements were made, but vehicle startup time and fuel economy/fuel processing issues remain. Fuel processing is more difficult than expected, and it can affect durability of the fuel cell by generating sulfur and carbon monoxide, both of which are poisons for fuel cells. An increase in durability of fuel cells is necessary, since a life of 5,000 hours is still a stretch. On-board hydrogen storage seems the most plausible scenario. Dr. Sawyer said if the long-term goal is appropriately energy independence, then on-board reforming does not make sense. He also asked if DOE had explored coal as a source of hydrogen. Mr. Swift replied that they have considered coal and have also considered nuclear thermal cracking of water or using off-peak electricity, to create hydrogen as a form of energy storage.

Mr. Cackette noted that DOE's budget was split between costs of the power plant and fuel infrastructure. Mr. Swift confirmed that fuel infrastructure will be funded hand in hand with vehicle development.

Tim Johnson asked what the DOE report said about greenhouse gases, the energy balance, and well-to-wheel fuel economy compared to more conventional vehicles. Mr. Swift replied that the report did not compare these factors, but he could suggest other reports that compared them, and they conclude that fuel cells do have an edge over conventional technologies in terms of greenhouse emission issues. Tim Johnson commented that many reports are available (GM, IT, etc.), and they seem to say that, relative to hydroelectric vehicles, only marginal benefits apply to hydrogen fuel cells for well-to-wheel energy consumption and greenhouse gases--except if the source of hydrogen is nuclear or solar hydrolysis of water. He asked if DOE planned to consolidate these reports and make a universal judgment. He commented that very little work has been done on hydrolysis. Mr. Swift replied that solar hydrolysis was part of the hydrogen program, but he does not know its extent. DOE is working on all renewable energy, including water, biomass, and solar.

Dr. Norbeck commented that emissions numbers should be compared to conventional vehicles. Tim Johnson said that in Europe, carbon monoxide levels will decrease to 140 grams per kilometer (g/km) in 2008, and 120 g/km in 2012. If a hydrogen fuel cell vehicle gets 120 g/mile, assumed to be a well-to-wheel number, that would be a significant achievement; hybrid vehicles have not yet reached these levels.

- Joe McDonald (U.S. EPA) gave the presentation “EPA Fuel Cell Activities.” He discussed EPA’s role in fuel cell vehicle development, including vehicle testing at NVFEL (National Vehicle and Fuel Emissions Laboratory), test procedures, and partnership opportunities.

Mr. Flint asked about the safety of testing hydrogen fuel cell equipment. Safety issues do differ because of the flammability of the hydrogen fuel. With larger vehicles, the issue is how to fuel, especially with prototypes which don't have all the safety features. It is impossible to refuel completely for dynamometer (dyno) tests. If the vehicle can complete an entire test cycle on less than 400 standard ft³ (scf) of fuel, they are refueled off-board from cylinder storage in an evacuated area with an explosion-proof blower and breakaway extensions to the vehicle. For large vehicles, hydrogen is stored outside the facility. Also for safety, Mr. McDonald's team monitors electrical current at the fuel cell and at the battery.

Mr. Schaefer asked if an interagency group existed to coordinate different fuel cell studies. EPA holds informal monthly briefings at the staff level with DOE, initially with Ed Wahl and the FreedomCAR group, but now also with Steve Chalk. Mr. McDonald would like to see a more formal structure. EPA is also working with DOE and DOT through CaFCP. Mr. McDonald added that the importance of the CaFCP cannot be overstated, with virtually every player in the area of fuel cells involved.

Mr. Schaefer asked if it is true that homeowner policies may not cover homes with hydrogen-fueled vehicles in their garages because of the potential fire hazard. This concern would be a basic barrier to fuel cell success. Mr. McDonald had not heard of this issue but commented that fire codes across jurisdictions would need to be unified. Air Products has a hydrogen safe-handling education program and might be able to answer this question.

Dr. John Johnson (Michigan Technical University) commented that EPA's NVFEL may not be up to par in testing fuel cell vehicles. The lab is hard pressed for funding for heavy-duty and light-duty vehicles, especially in light of the upcoming heavy-duty rules. Mr. McDonald disagreed, saying that equipment is already in place to measure ultra-low emissions. The lab also found an inexpensive way to add fuel cell testing to the existing site. Fuel cell cycles are in a different part of the budget. The lab is continually upgrading and has a new CVS system to include all optional and required testing equipment for the upcoming rules.

Dr. Sawyer asked if upstream emissions had regulatory implications. Mr. McDonald said he would look into any implications in an integrated way for future policy tools.

- Eldert Bontekoe (U.S. EPA) gave the presentation “Fuel Cell Emission and Fuel Economy Compliance.” He reviewed the legal and certification testing requirements for all types of

fuel cell vehicles, including direct hydrogen, reformer, and auxiliary power unit (APU) vehicles.

Dr. Sawyer asked if fuel economy testing for the sticker rating is measured while vehicles use heaters and air conditioners. Mr. Bontekoe replied that the tests are equivalent for all vehicles, and they are run without heater or air conditioner. They have run additional tests to see the effect of air conditioning. However, they are restricted as to what goes into the fuel economy label or the CAFÉ (Corporate Average Fuel Economy) compilation, and those numbers do not take into account any effects of air conditioning. However, EPA wants to be aware of any effects.

Mike Rodgers (Georgia Institute of Technology, Air Quality Laboratory) asked if there was a way to classify fuel economy in multiple feedstocks for reformer vehicles.

Mr. Bontekoe replied that they would like to account for all fuels, all sources of energy, but they have not established any way to account for multiple feedstocks at this time.

Mr. Rodgers asked whether they go back to hydrogen fuel economy or to liquid fuel.

Mr. Bontekoe replied that they apply whichever fuel economy is appropriate.

Tim Johnson asked when Mr. Bontekoe anticipates testing or certifying a fuel cell reformer. Along the same line, Dr. Sawyer asked about grid-connected hybrids.

Mr. Bontekoe replied that there was no existing timeline for these tests.

Dr. Norbeck noted that the recommendation on fuel cell issues (for example, well-to-wheel fuel economy, where the hydrogen comes from and the associated environmental impact, procedures used to certify vehicles) should be to seek coordination, maybe through an overarching committee, between such players as DOE, EPA, DOD, and NSF.

- Mike Schwarz (Ford) gave the presentation “Fuel Cells at Ford and the Path to Commercialization.” He noted that the market is currently driven by low-cost gasoline, but Ford is preparing itself for hydrogen to be the fuel of the future. He identified four challenges: (1) product cost (dollars per kilowatt, \$/kW) and development cost; (2) customer acceptance; (3) hydrogen storage; and (4) infrastructure. For research demonstration in 2010, the projected cost is \$45/kW, and the FreedomCAR goal for 2015 is \$30/kW. Ford believes the main benefits of fuel cell vehicles are societal. A cost of \$45/kW compares to today’s gasoline price, and a cost of \$30/kW is competitive with diesel.

Mr. Schwarz discussed Ford’s 2004 production program for its Ford Focus. The fuel cell is 38 inches long with a 2-foot diameter, holding 4 kg of fuel at 5000 pounds per square inch (psi). A kilogram of this fuel is approximately equal to a gallon of gas. This vehicle program is in an early stage, using a vehicle already developed, and fuel economy is around 50 miles per kilogram (mi/kg) with a 200-mile range.

To address fuel cell challenges, Ford is engaged in core fuel cell technology development, vehicle programs, and coordination with government agencies. The hydrogen industry cannot create the infrastructure, and it is nice to see the DOE FreedomCAR (in which Ford is a partner) moving in this direction. Ford sees a critical need for the problem-solving partnerships with government agencies, because they bring all the players together in a problem-solving context rather than a regulatory one. A very active public sector is necessary to meet the ultimate goals of hydrogen transportation. There are many reasons for optimism about fuel cells, including all the effort among sectors. However, strong policy direction to be independent of petroleum is needed, not just customer pull.

Tim Johnson said some marketing projections for hydrogen fuel cell technology are on the order of 10-15% penetration in 2015 or 2020. He asked whether those levels of penetration approach the efficiencies of volume that could get the cost down to \$15/kW, and he asked whether production costs can be made low enough to make the technology feasible without incentives at the 10% penetration level. Mr. Schwarz said a projection of 9-10% penetration in 2020 is optimistic, and production costs must be reduced over the next 10-15 years, because the public can't be expected to fund a 30-year effort.

Dr. Norbeck asked whether the \$30-45/kW is for the fuel cell, and John Johnson asked whether the dollar comparison should consider a system cost, not just the power plant. Mr. Schwarz replied that Ford's cost comparison includes the power train and its fuel cell system, including hydrogen storage (which is relatively insignificant).

Tim Johnson asked about structural benefits of a fuel cell vehicle. Mr. Schwarz said today's system is very big and heavy, due to air management, fans, humidity, and thermal controls, but the system will get simpler and lighter as technology advances.

Dr. Sawyer asked whether the industrial investment in fuel cell related R&D is a lot more than DOE's \$75 million. Mr. Schwarz said it is a great deal more but did not have an exact figure. The point, he said, is that even a \$150 million annual budget is small.

Dr. Sawyer asked if the real role of government is infrastructure development.

Mr. Schwarz said no, government should also take a collaborative approach to research on the vehicle technology aspects that remain high-risk and far-term.

Update from the Clean Diesel Independent Review Panel

- Dr. Sawyer updated the Subcommittee on the work done by the Clean Diesel Independent Review Panel ("Panel"). This Panel was created to independently review the status of technology required to implement the 2007/2010 heavy-duty diesel regulatory program, including the ultra low sulfur diesel (ULSD) fuel rule. The Panel represents a wide group of organizations, including the engine manufacturers, the after-treatment suppliers, States, the oil industry (very broadly, covering big refiners, some distributors, and smaller refiners), and the academic community. The Panel heard presentations from the oil

industry, engine and vehicle manufacturers, and emission control technology manufacturers. The Panel was assigned the problem of assessing progress made to date on meeting this group of standards. They were charged to answer four specific questions grouped into two broader categories: questions dealing with emission control and engine technology, and those dealing with the oil refining industry. A number of other issues also arose during this process, which Panel members agreed were not in the direct charter. It is impressive that Dan Greenbaum, president of the Health Effects Institute and the chair of this panel, was able to produce a single report rather than a number of minority reports, through what was a contentious process. This report will be formally presented to the CAAAC at the end of this month, but Dr. Sawyer believes it is already posted on the web.

Dr. Sawyer observed that relatively few data were presented to the Panel, because the data are proprietary. For instance, no data were presented on heavy-duty trucks with the NO_x adsorption catalyst. Tim Johnson said the level of detail was appropriate for the current stage. The state of the technologies includes a lot of qualitative judgement because there is still a year of laboratory work ahead, in which manufacturers will decide which technologies are viable. The tone of the report was optimistic and tried to reflect that time remained for technological challenges to be solved.

Mr. Schaefer remarked that part of the oil industry's concern is not that the fuel cannot be made, but rather the challenge to maintain the integrity of that fuel's quality through a long chain of distribution channels. This concern is not a showstopper today but it needs to be addressed or it could become one. Distribution problems could be further compounded with the upcoming off-road rule, which will be proposed in early 2003.

Dr. Sawyer commented that there are no standards yet for measuring sulfur in the fuel. Mr. Schaefer noted that the test method specified in the highway rule for certification has very poor precision. This is not a good situation for fuel producers or enforcement personnel. Either the test method's precision has to be improved, or a different test method should be used.

Dr. Sawyer concluded that the MSTRS may be asked to address some of the Panel issues, such as concerns with fuel contamination during distribution, sulfur measurement, and integration of emission control systems into vehicles.

Presentations on Biodiesel

- Deborah Adler (U.S. EPA) gave the presentation "Introduction to Biodiesel." She provided an overview of the types and properties of biodiesel and some of the benefits and challenges of using biodiesel as an alternative fuel, as a substitute for petroleum diesel, or as an additive. She also described current policies surrounding biodiesel use.

Ms. Adler explained that biodiesel is a domestic renewable fuel made from vegetable and animal fats and oils. Most common sources are soybean oil (in surplus as a by-product of soybean meal production) or animal fats (used restaurant grease). To make biodiesel, ethanol or methanol is combined with the oil or fat to form esters. Biodiesel as an alternative fuel is 100% esters, called “B100.” As an additive, B2 typically contains 2% esters. As a substitute for petroleum diesel, the most typical biodiesel is B20, a mixture of petroleum diesel fuel with 20% esters. The Energy Bill will outline requirements for blending biodiesel with petroleum diesel.

Dr. Sawyer asked if ethanol was added to diesel to make biodiesel. Ms. Adler explained that oxydiesel was a result of that process, which is a different product. Dr. Norbeck asked about the definition of biodiesel, whether biodiesel produced from Fischer-Tropsch diesel (derived from natural gas) would be subsidized. Ms. Adler replied that the terminology is still not well defined, but that Fischer-Tropsch diesel using a soybean product, which is considered a renewable fuel, could be defined as an alternative fuel. There is currently no policy to address biodiesel subsidies. David Korotney (U.S. EPA) added that biodiesel as defined in the context of registration is methyl esters, so a Fischer-Tropsch subsidy for soybean oil would not fall under the registration. Steve Howell (National Biodiesel Board) added that ASTM defines biodiesel as a methyl ester of long-chain fatty acids, meeting a certain set of physical and chemical properties, so Fischer-Tropsch diesel would not be classified as biodiesel, per se, but it would be considered a biologically derived alternative fuel.

Tim Johnson asked about European experiences with biodiesel. Ms. Adler said the European Commission has come out with a very positive, aggressive Action Plan toward use of alternative fuels and promoting biofuels, but it is being considered by the European Parliament and not yet ratified by members of the European Community. Widespread use may still be far in the future.

Tim Johnson asked what biomass input would be needed to convert the entire fleet to biodiesel. Ms. Adler replied that the Department of Agriculture has assured EPA that production capacity is not an issue in the U.S., since there is currently a surplus of soybean product. The only challenge that may arise will be a result of corn and soybean crops sharing the same fields. Ms. Adler added that this less a concern with biodiesel than with ethanol.

- David Korotney (U.S. EPA) gave the presentation “EPA Analysis of the Exhaust Emission Impacts of Biodiesel.” EPA produced a technical report that provides a comprehensive analysis of emission impacts of biodiesel. The report is available at <http://www.epa.gov/otaq/models/biodsl.htm>. Mr. Korotney summarized the analysis methods, test cycle manipulations, and impacts of different types of biodiesel on PM, NO_x, CO, and HC emissions. The basic emission effects from their study were consistent with other research.

John Johnson asked about curve-fitting the original data. Mr. Korotney replied that the complete data analysis is available in the technical report. John Johnson commented that the distribution of data points is highest at 20% (B20 fuel). Mr. Korotney said 40% of the biodiesel data in their database are at 20%, another 40% of data are at 100%, and the other 20% of data are scattered. This is better than if 80% of the data were at 20%, trying to fit a curve all the way up to 100%.

Dr. Sawyer asked why biodiesel made from animal fat had lower emissions. Mr. Korotney did not know but said the cetane number was statistically different for plant oil and animal fat.

Dr. Sawyer asked if the animal fat used in biodiesel was a waste product from restaurants, etc. Mr. Korotney assumes that for the test programs, EPA is careful about where the animal fat comes from, not just getting it from some restaurant floor. In practice, Mr. Korotney said, the sources of animal fat probably are from waste.

Mr. Rodgers noted that 40% of the data are at 100% neat fuel and 40% of the data are at 20% biodiesel, and he said this violates one of the basic rules of linear regression on homoskedasticity of the datasets. He means that a linear regression is guaranteed if there are only two areas with data in them. Mr. Korotney disagreed, saying they did what they could with the data they had. He suggested they could additionally perform a linear regression using only the data not specific to 100% or 20% biodiesel, and see if there is curvature there. One conclusion that might be drawn is that they need to obtain data at 50% and 70% biodiesel. Mr. Korotney also said they could examine the data just for 100% biodiesel and similarly just for 20% biodiesel, not doing a regression analysis but rather looking at the average effects to see how close those are to what the regression curve predicts.

- Steve Howell (National Biodiesel Board) gave the presentation “Biodiesel Tier 1 and Tier 2 Health Effects.” The program tested regulated, toxic, and reactive HC emissions. The speciation papers are available at <http://www.biodiesel.org>. Mr. Howell gave an overview of the test procedure, including engines and fuels used, emissions results, and health effects for Tier 1 and Tier 2. He also discussed biodiesel use in fuel cells. As an aside, Mr. Howell noted that a fuel of less than 100% biodiesel should be referred to as a “biodiesel blend.”

John Johnson observed that the test data show an increase in soluble fraction due to particles with higher percentage biodiesel fuel. Mr. Howell said the increase in the soluble fraction of particulates is the result of the higher vapor pressure and higher boiling point of biodiesel.

A question was asked about the effect of oxygen content on hydrocarbon emissions. However, biodiesel does not contain aromatic hydrocarbons, so oxygen would not decrease emissions. Dr. Norbeck asked if PAH emissions were from the solid organic fraction or the gas phase. Mr. Howell replied that they were from the gas phase, but biodiesel has much lower particulate emissions than petroleum diesel.

An issue arose about fuel injection. Biodiesel does not compress as well as petroleum diesel, so injection occurs sooner. All engine injection is controlled electronically, however. Future analyses should compare the tradeoff between reductions in PM emissions and increases in NOx emissions.

A Subcommittee member asked if properties in biodiesel could benefit NOx adsorbers and other control technology. Mr. Howell replied that this had not yet been tested. There are several intrinsic benefits to biodiesel: the organic fraction will be easier to eliminate, PM emissions are lower than in petroleum diesel, and the hydrocarbons are fatty acid chains, not aromatic hydrocarbons. Tim Johnson commented that biodiesel may negatively affect regeneration in NOx adsorbers.

Tim Johnson asked about the smell of biodiesel. Mr. Howell replied that odor differences were marked between bio- and petroleum diesel. Biodiesel exhaust smells similar to french fries or popcorn, and the liquid smells like soybean oil. The shelf life of biodiesel depends on the additives; it can last 6 months without them, or up to 2 years with them. Mr. Howell added that many people (with a special mention of Volkswagen owners) prefer biodiesel because of its better smell.

- Keith Ciampa (World Energy) gave the presentation “Advantages of Biodiesel Use for Emissions Reductions and Regulatory Compliance.” He gave a brief history of biodiesel and policies that may be affected by its use. He also explained how biodiesel is made and outlined the benefits and challenges associated with its use.

Mr. Ciampa circulated a vial of biodiesel fuel around the room. Related to a question about animal fat as a waste product, Mr. Ciampa explained that restaurant waste oil used to be used in animal feed, but the awareness of Mad Cow Disease in Europe caused that market to evaporate. Because restaurants must now pay for collection and disposal of waste oil, many instead pour the oils into the sewer, causing problems.

Mr. Ciampa noted that in mobile sources, tests show that NOx emissions increase with biodiesel use. However, in boiler and home heating applications, they find that NOx emissions go down. A study of 100 homes in Newburgh, NY, is demonstrating this NOx reduction.

Mr. Ciampa discussed incentives for biodiesel use. Hawaii and Texas have a zero excise tax on the renewable portion of fuel purchases. The Energy Bill currently being

considered includes four provisions to benefit biodiesel use: (1) a provision for a break on Federal excise tax; (2) biodiesel would be an eligible fuel for the renewable fuel standard; (3) a lifting of the limit on the number of Energy Policy Act credits; and (4) a mandate that Federal fleets' cost of biodiesel fuel would be competitive with diesel fuel.

Tim Johnson asked whether incentives were required to subsidize biodiesel production and where production money will come from. Mr. Ciampa replied that subsidies could be reduced due to biodiesel, since every 70 million gallons returns \$225 million to the U.S. farm economy. Tim Johnson asked if exclusive biodiesel production would cause a surplus of solid soy product. Mr. Ciampa said that there is such a surplus of soy oil that creating a solid surplus (meal) is far into the future.

Tim Johnson commented that biodiesel seemed to be an attractive alternative as far as reduced emissions, and the government will benefit from its use even if biodiesel production is subsidized, because farm subsidies will be reduced. He asked how much biodiesel production could be ramped up in the future. Mr. Ciampa replied that biodiesel could comprise 3-5% of the diesel market in 2016, but the challenge is to balance capacity and price.

Tim Tindall (Detroit Diesel Corp.) asked if there were plans to mitigate the increase in NOx emissions from biodiesel fuel. Mr. Korotney said there is work being done by NREL on mitigating NOx, but there is no magic bullet to eliminate the problem.

Mr. Flint commented on the price of biodiesel. The cost of production of biodiesel is \$1.50 per gallon, most of that is for the soy oil itself, and this is while there is a surplus of soy oil. When there is a demand for the product and no surplus of soy oil, the price may increase in the future. Mr. Ciampa replied that an increase in demand is good up to a point, increasing yield from acreage, but agreed that at some point an economic balance will kick in and the price for biodiesel fuel would be driven up.

Mr. Flint also commented on the excess of soy oil being produced, and he asked whether it makes sense to take claim for CO₂ reductions as a result of growing soybeans.

Mr. Howell noted that soybean oil right now is not being burned back to the atmosphere, but biodiesel will displace petroleum fuel that is being burned. Dr. Norbeck asked what percentage of the plant is soy oil. Relating to the question of CO₂ per acre production, Dr. Norbeck asked whether enough acreage could be converted to fuel to have a significant impact. Mr. Ciampa can refer interested parties to information sources in this area.

- Joe Suchecki (Engine Manufacturers Association) gave the presentation "Some Considerations Regarding Biodiesel Fuels." He presented issues surrounding biodiesel use, such as fuel quality, technical and public policy considerations, performance, storage, warranties, and emissions.

A Subcommittee member asked whether engine warranties are voided when biodiesel is used. Mr. Suchecki replied that it may or may not be the case, but the decision is up to individual engine manufacturers and not EMA.

Mr. Flint asked whether EMA sees the same concern of the manufacturers regarding biodiesel for non-road vehicles as for automobiles. Mr. Suchecki confirmed that EMA is concerned, and that some studies being done by John Deere may show differences between on-road and non-road biodiesel use.

Updates from Workgroups

- An update was given by Trish Koman (U.S. EPA) from the Air Toxics Workgroup. They are continuing support for CARB methods and equivalent air toxics measurement techniques.
- Dennis Johnson (U.S. EPA) gave an update on the Heavy-Duty In-Use Testing Workgroup. At the previous Workgroup meeting, an Opacity Testing Task Group and an Alternative Options Task Group were formed; these task groups have made progress. The Alternative Options Task Group has been renamed the Advanced Diesel Testing Options task group. Another task group has been formed to examine modeling issues, specifically what information is needed for MOBILE6, to enable States to take credit for I/M-type (inspection and maintenance) programs. Mr. Arman Tanman (U.S. EPA) will be taking over Mr. Johnson's position as co-chair of this Workgroup.

Wrap-Up

Dr. Sawyer gave closing remarks. The 2003 meeting dates for the Subcommittee are February 12, June 11, and October 15. With Ms. Rudzinski, Mike Walsh, and Margo Oge (U.S. EPA), Dr. Sawyer will discuss what the Subcommittee might focus on next. Dr. Sawyer noted that Ms. Oge has expressed her concern about longer-term issues now. The sense is that as the light- and heavy-duty regulatory programs mature and the emission standards are tightening, the issue remains as to how to keep the fleets clean in use (as they age). Greenhouse gas emissions are also a concern. Taking the long view, EPA sees greenhouse gas emissions as an area in which work is appropriate, and Ms. Oge would like the Subcommittee to contribute to formulating long-term plans.

Dr. Sawyer asked for suggestions for topics for the next Subcommittee meeting.

- Dr. Sawyer suggested that it would be timely to hear about on-board diagnostics (OBD), because we are 6 years or more into a fleet equipped with OBD and more data are now available.

- Ms. Cooper suggested some discussion on the effects of the new PM and ozone NAAQS, as well as more information on the Next Generation Model. NESCAUM is hoping that the new model will contain a stronger component for PM modeling. The MOBILE6.1/PM model is almost ready for release.
- Dr. Norbeck expressed interest in information on secondary aerosols and secondary organics. With ammonium nitrate being the greatest component of PM_{2.5}, we need to better understand it in terms of air quality and in terms of how it is treated in the mobile source models.
- Mr. Rodgers commented that in-use vehicle testing should be better studied as well. Existing tailpipe program commitments will likely end in 2007 or 2008, but at that time 30-40% of the fleet and 87% of the emissions are going to be from vehicles that are not OBDII-equipped. As the two tailpipe standards come in, the contribution of a relatively small number of high-emitting vehicles becomes proportionally much greater. Mr. Rodgers thinks this will be the biggest single issue 6-8 years from now, and he suggested that a new workgroup be formed for reformation and in-use deterioration.

Dr. Sawyer will carry these suggestions forward in his discussions with Ms. Rudzinski, Mr. Walsh, and Ms. Oge. Dr. Sawyer commented this Subcommittee could benefit from increased fuel company representation.

The Subcommittee joined Dr. Norbeck in thanking Ms. Hogan for her service to the Subcommittee--for her hard work in preparing meeting materials, providing good communication through email, and ensuring that the meetings ran smoothly.

The meeting adjourned at approximately 4:00 p.m.

Attachments:

List of attendees (members and alternates; speakers; staff; and observers)

Federal Advisory Committee Act
Clean Air Act Advisory Committee
Mobile Sources Technical Review Subcommittee

Co-Chairs: Michael Walsh and Robert Sawyer Designated Federal Official: Gregory Green

Attendees of the Subcommittee's Meeting on October 16, 2002
Dearborn, Michigan

Members and Alternates

Name	Affiliation
Bob Sawyer, co-chair	University of California at Berkeley
Kelly Brown	Ford Motor Co.
Robert Brown	Ford Motor Co.
John Cabiniss	Association of International Automobile Manufacturers, Inc.
Coralie Cooper	NESCAUM
Steve Flint	New York State DEC
John Johnson	Michigan Technological University
Tim Johnson	Corning, Inc.
alternate for Reg Modlin	DaimlerChrysler
Joseph Norbeck	University of California at Riverside
Mike Rodgers	Georgia Institute of Technology, Air Quality Laboratory
Bob Schaefer	BP Global Fuels Technology
Tim Tindall	Detroit Diesel Corp.

Speakers

Name	Affiliation
Deborah Adler	U.S. EPA
Eldert Bontekoe	U.S. EPA
Tom Cackette	California Air Resources Board
Keith Ciampa	World Energy
Steve Howell	National Biodiesel Board
Dennis Johnson	U.S. EPA
Trish Koman	U.S. EPA
David Korotney	U.S. EPA
Joe McDonald	U.S. EPA
Mike Schwarz	Ford Motor Co.
Joe Suchecki	Engine Manufacturers Association (EMA)
Bill Swift	Argonne National Laboratory

Staff

Name	Affiliation
Kathy Boyer	EC/R, Inc. (EPA contractor)
Ann Deering	EC/R, Inc. (EPA contractor)
Cheryl Hogan	U.S. EPA
Suzanne Rudzinski	U.S. EPA
Lisa Sutton	EC/R, Inc. (EPA contractor)
Trina Vallion	U.S. EPA

Observers

Name	Affiliation
Cass Andary	Alliance
Wendy Barrott	Wayne County DOE
Andy Bastien	Environment Canada
Tom Beierschmitt	Toyota
Michael Block	NESCAUM
Carol Burelle	Environment Canada
Vaughn Burns	DaimlerChrysler
Tim Callahan	Southwest Research Institute (SWRI)
Dominic DiCecco	Ford Motor Co.
Harry Diegel	Ford Motor Co.
Susan Collet	Toyota Technical Center
John German	Honda
Charlie Gorman	ETI
Steve Healy	U.S. EPA
Eve Hou	Texas Commission on Environmental Quality (TCEQ)
Ross Jenkins	Parsons
Stuart Johnson	Volkswagen
Denise Kearns	U.S. EPA
Thomas Lanni	New York State DEC
David Lay	American Petroleum Institute (API)
Bob Maxwell	consultant
Glenn Mitchell	Environmental Systems Products (ESP)
Keisuke Sano	Toyota
Chris Saricks	Argonne National Laboratory

Observers (cont'd)

Name	Affiliation
Lawrence Smith	Southwest Research Institute (SWRI)
Arman Tanman	U.S. EPA
Matt Thornton	NREL
Andy Vaichekauskas	Mitsubishi Motors R&D of America
Marie Valentine	Toyota
John White	U.S. EPA
Xiaona Zhu	student, CE-CERT