

In This Edition:

- X CARB Sets Stage for Greenhouse Gas Regulations at Workshop on Staff's Draft Technology and Cost Assessment (page 2)**
- X With Great Fanfare, Governor Schwarzenegger Announces Hydrogen Highway – Says Hydrogen-Fueled Vehicles that Will Clean the Air Are Needed Because of “Hundreds of Billions of Dollars Per Year” in Air Pollution Health Damage (page 15)**
- X CARB Releases Staff Proposal on First Phase of On-Board Diagnostics System (OBD) Requirements for 2007 and Later Vehicles – Second Phase (for 2010 and Later Vehicles) Will Be Promulgated Next Year (page 17)**
- X CARB Holds Second Workshop Fuels-Related Activities – Presents Draft Regulations on RFG3 Implementation Issues and Again Raises Possibility of an RFG4 Specification (page 21)**
- X CARB Holds First Meeting of Biodiesel Workgroup; Staff is Relying on Advocacy Groups to Write Specifications and Proposing Informal Verification of Emissions Effects (page 27)**
- X CARB Hears Staff Report on Feasibility of Electrification of Small Offroad Engines (SOREs) – Staff Does Not Recommend Forced Electrification Program, but Plans to Continue Monitoring Development of Electric Lawnmower Technology (page 32)**
- X CARB Hears Results of Collaborative Study of CNG and Diesel Transit Bus Emissions – CNG Benefits from Oxidation Catalysts, But Additional Improvements to Lube Oil Distribution Systems Are Still Needed (page 37)**

- X CARB Holds Workshop on ATCM to Limit Idling of In-Use Commercial Heavy-Duty Diesel Engines (page 41)**
- X California Environmental Policy Council Approves Use of Lubrizol's PuriNOx Alternative Diesel Emulsion Fuel, Amendments to California Diesel Fuel Regulation (page 44)**
- X CARB Holds Meeting of Maritime Air Quality Technical Working Group, Emphasis is on Controlling Emissions from Auxiliary Engines Used on Oceangoing Vessels (page 51)**
- X CARB Staff Hosts U.S. Maritime Administration Workshop on Ship Emissions Reduction Technologies (page 58)**
- X CARB Staff Asks for Additional Information on Supplemental ZEV Incentives (page 61)**
- X California Takes Brunt of New EPA Eight-Hour Ozone Nonattainment Designations and Implementation Requirements, Being the Only State with Areas Designated Serious or Severe (page 62)**
- X Legislative Update (page 65)**
- X Rulemaking Calendar (page 82)**

Workshop on Greenhouse Gas Regulations

On April 20, 2004, the staff of the California Air Resources Board (CARB) held a workshop regarding its report released on April 1 entitled, "Draft Technology and Cost Assessment for Proposed Regulations to Reduce Vehicle Climate Change Emissions Pursuant to Assembly Bill 1493." As stated in the introduction to the report, it provides the staff's estimates of the technologies that can be used to "achieve the maximum feasible and cost-effective reduction in greenhouse gas emissions from motor vehicles." The report will likely form the basis for a regulatory proposal being developed by CARB staff that is scheduled to be presented to the Board for consideration at a public hearing later this year.

As described in more detail below, the Draft Technology and Cost Assessment and the comments made by CARB staff at the workshop indicate that the groundwork is being laid for a regulation requiring a 20% reduction in greenhouse gas emissions in the 2009–2012 timeframe. The CARB staff is taking the position that reductions of this magnitude can be achieved without reducing vehicle weight, without compromising vehicle performance, and without increasing the price of new vehicles more than the value of the fuel cost savings that could be realized within 5 years of operation.

Introduction to the Workshop Presentations

The workshop, held in the Central Valley Auditorium of the California EPA building in Sacramento, was attended by approximately 75 people. Following opening comments by CARB Executive Officer Catherine Witherspoon and Chuck Shulock, Steve Albu of the Mobile Source Division provided an overview of the report. He explained that much of the CARB report is based on another report* published last month by the Northeast States Center for a Clean Air Future (NESCCAF), a “sister” organization to the Northeast States for Coordinated Air Use Management (NESCAUM), which is an affiliation of state air pollution control agencies located in the northeastern U.S. †

The CARB report summarizes the NESCCAF report, explaining that it examines the potential for reducing carbon dioxide (CO₂), nitrous oxide (N₂O), methane (CH₄), and hydrofluorocarbon (HFC) emissions from the 2002 model year passenger car and light-duty truck fleet by estimating the effects of various combinations of technology change on each of five different vehicles: a small car, a large car, a minivan, a small truck, and a large truck. Each of the five vehicles was supposedly selected to be representative of typical 2003 models in terms of engine type, number of cylinders, transmission type, engine power and displacement, and curb weight. The technologies addressed in the report are divided into four categories: (1) engine, drivetrain, and other vehicle modifications; (2) mobile air conditioning system; (3) alternative fuel vehicles; and (4) exhaust catalyst improvement.

NESCCAF Study Panel

Following Albu’s overview, a panel of people involved in the preparation of the NESCCAF report made presentations. The presenters included NESCCAF Executive Director Kenneth Colburn, Steve Brueckner from AVL Powertrain Engineering, Kevin McMahon from the Martec Group, and Dan Meszler from Meszler Engineering Services.

* “Reducing Greenhouse Gas Emissions from Light-Duty Motor Vehicles,” Northeast States Center for a Clean Air Future, March 2004. <http://bronze.nescaum.org/committees/mobile/rpt040316ghglighduty.pdf>

† Unlike NESCAUM, NESCCAF’s membership includes organizations that are not air pollution control agencies.

AVL - The most detailed presentation by this panel was made by Steve Brueckner, who explained what AVL did to evaluate the potential carbon dioxide emissions reductions of various alternative technologies using a vehicle simulation model named “CRUISE.” In concept, vehicle simulation models can accurately estimate the combined effect of combinations of technological change without the errors introduced by making the simplistic assumption that the effect of multiple technology changes are additive or multiplicative. However, questions raised following Brueckner’s presentation made it apparent that some of the model results were “adjusted” to match published values. For example, the transmission shift logic used in the modeling did not come from real vehicles but was instead adjusted to make the model output appear more reasonable. It is unclear how these “adjustments” affected AVLs results.

Using the modeling results for small cars as an example, Brueckner summarized the carbon dioxide reductions for individual technologies as follows:

dual cam phasers (DCP).....	3%
discrete variable valve lift (DVVL)	4%
continuous VVL (CVVL)	5%
camless valve actuation (CVA), electrohydraulic.....	11%
turbocharging	6%
gasoline direct injection stoichiometric (GDI-S)	0%
5-speed automatic (5AT)	2%
6-speed automatic (6AT)	3%
6-speed automatic manual (AMT)	8%
continuously variable transmission (CVT)	4%
42-volt integrated starter generator start stop (ISG-SS).....	7%
42-volt ISG motor assist (MA)	10%
electric power steering (EPS).....	1%
improved alternator (ImpAlt).....	1%
variable displacement AC compressor (VDC).....	10%

He also presented results for combinations of technologies, which included the following:

DCP, DVVL, 5AT	3%
DCP, CVVL, AMT, 42v ISG-SS	21%
DCP, turbo, GDI-S, AMT	21%

As described in more detail below, the first combination listed above was considered the 2009 baseline case.

Brueckner’s presentation did not address the 54% reduction in carbon dioxide emissions (117% increase in fuel economy) that the CARB report assumed to be achievable with the use of “advanced hybrid-electric vehicles.” (A footnote in the report indicates that this level of performance is based on “internal ARB analysis.”) In response to a question

from the audience, Brueckner acknowledged that this level of reduction exceeds what AVL has seen in previous attempts to model “fully integrated” hybrid vehicles.*

Martec Group - Kevin McMahon briefly summarized the cost estimates contained in the NESCCAF report that were prepared by the Martec Group, Inc. CARB’s report claims Martec’s analysis “involved a detailed investigation of all of the components involved in implementing them in baseline vehicles” and that “The level of detail in the cost analysis again raises the bar relative to any other cost study that we have seen to date.” However, McMahon’s presentation made it clear that Martec did not address many elements of cost, including research, development, engineering, warranty, plant, tooling, assembly, manufacturer overhead, profit, dealer margin, and accelerated amortization of capital investment. Instead of constructing “bottom up” cost estimates as implied in the CARB report, McMahon’s presentation made it clear that a universal 40% markup factor was used by the NESCCAF staff to account for all of the categories of cost that were ignored. In response to a question from the audience, McMahon said that the 40% markup was not a recommendation made by Martec.

It was clear from McMahon’s presentation that most of the cost information was based on discussions with vendors to the automotive industry, rather than manufacturers themselves. His presentation made only a vague reference to the manner in which the 2009 baseline forecast of technologies was made. The NESCCAF report claimed that the forecast was developed based on “detailed market research into Original Equipment Manufacturer (OEM) product plans and developed a database of estimated 2009 vehicle platforms under baseline conditions.”

Both the hard copy handouts and the visual aids used by McMahon were very difficult to read but they appeared to be identical to appendices contained in the NESCCAF report. Examples of the costs for individual technologies applied to small cars were as follow:

DCP.....	\$70
DVVL.....	\$120
CVA, electrohydraulic	\$575
GDI-S	\$135
variable geometry turbocharging	\$400
5AT	\$100
6AT	\$50
CVT.....	\$150
AMT.....	“neutral”
42v ISG launch assist.....	\$800 excludes battery
EPS.....	\$20
ImpAlt	\$40

* Appendix A to the report lists this same 54% number as representative of what is currently being achieved by the Toyota Prius. How CARB came to this conclusion is a mystery because it is not possible that the Toyota Prius has 117% better fuel economy than a non-hybrid vehicle of comparable size and performance. More realistic analyses of the Prius indicate that its hybrid drivetrain improves fuel economy by only half of what CARB claims.

In the NESCCAF report, all of the above costs were marked up by 40% to account for the elements of cost not accounted for by Martec. The most significant difference between the small-car cost estimates and the estimates for larger vehicles was the “downsizing credit” assigned for turbocharging. Vehicles with V-6 engines were assumed to experience cost reductions of up to \$700 associated with the ability to switch in 4-cylinder engines of the same horsepower when turbocharging is applied. This made the net cost of turbocharging a cost savings of up to \$300. No explanation was offered to support the assumption that most current production involves the use of a supposedly higher cost approach while providing the same level of consumer satisfaction. In addition, there was no explanation provided regarding other questionable elements of Martec’s cost estimates, such as projecting 6-speed automatic transmissions to cost less than 5-speed automatics and projecting automatically shifted manual transmissions (AMTs) to have zero cost increase compared to 4-speed automatics.

Meszler Engineering - Dan Meszler made a presentation describing his analysis of mobile air conditioning for NESCCAF. His comments were focused on “indirect” emissions from AC systems, i.e., the carbon dioxide emitted as a result of the compressor load on the engine.* His conclusion was that variable displacement compressors could reduce the energy requirements by 50%. During the question and answer period, Ward Atkinson disputed the credit given to variable displacement compressors and said that the same reduction could be achieved with a fixed displacement compressor if it is externally controlled. Meszler did not address the cost analysis he did for the NESCCAF report.†

* The NESCCAF report and the CARB report contain additional detail regarding the “direct” emissions of greenhouse gases from AC systems. As the reports point out, all current production vehicles use HFC-134a (or “R134a”) as the refrigerant. This material is a fluorinated hydrocarbon with a global warming potential of 1,300. Release of this material to the atmosphere occurs as a result of system leaks, motor vehicle accidents, improper system servicing, and vehicle scrappage. In addition to the “indirect” emissions associated with compressor energy demand, there are two other approaches for reducing greenhouse gas emissions associated with air conditioning systems: (1) refrigerant leak reduction; and (2) use of alternative refrigerants with lower global warming potential. The reports estimate that so-called “enhanced” HFC-134a systems can reduce leakage by 20-60%. A 91-99+% reduction in direct emissions from A/C systems is associated with the use of alternative refrigerants. HFC-152a has a global warming potential, based on CARB’s methodology, of 120, 91% lower than HFC-134a. HFC-152a has slightly superior performance to HFC-134a; however, HFC-152a is flammable, raising a concern about safety risk. To reduce the safety risk, CARB claims that HFC-152a can be used with a “secondary loop” system, isolating it from the passenger compartment. High-pressure systems using carbon dioxide as the refrigerant can reduce direct emissions by more than 99%.

† Meszler estimated the increased cost of a variable displacement compressor and plumbing with reduced leakage at \$40. CO₂ systems were estimated to cost an additional \$20 for the cost associated with the upgrades needed to deal with the higher system pressure required. Cabin leak sensors and engine compartment evacuation valves are estimated to add an additional \$22.50 for both HFC-152a and CO₂ systems. Alternatively, \$50 was assumed for adding a secondary loop, which supposedly eliminates the need for leak detection/evacuation valves. Whether these costs are intended to represent the increased cost to manufacturers or the increase in retail price is not clear. It should be noted that the appendix to the NESCCAF report specifically states that none of the fixed costs (e.g., engineering, tooling) have been addressed. The source of the cost estimates is not disclosed, except to say that efforts have been made to correct inconsistencies in the estimates by “previous researchers” that are available from “public references.”

Following his discussion of AC issues, Meszler summarized how the input from AVL, Martec, and Meszler was combined by NESCCAF staff. He summarized the conclusions regarding the reductions that could be achieved and made the point that most of the scenarios evaluated were estimated to have a net economic benefit to the vehicle owner over the life of the vehicle.

CARB Findings

Carbon Dioxide - Following the NESCCAF panel, Steve Albu made a presentation summarizing the tables in the CARB report that present the estimated carbon dioxide emissions reductions and cost for various combinations of technologies. The tables he presented were substantially revised, however, from the tables in the April 1 report. Albu said that errors in the original tables had been identified by Sierra Research. Copies of revised tables were made available at the beginning of the workshop. Some of the revised tables are available in Albu's workshop presentation materials.* The revised cost of individual technologies is not available in this presentation but is reproduced on the following page as Table III-1 from the revised CARB report. In general, the revisions made by CARB staff lead to higher estimates for the costs of individual technologies.

In the "Potential Carbon Dioxide Emissions Reductions from Small Car" table (Table II-5, reproduced on page 9), Albu concentrated on two different technology combinations:

1. Discrete variable valve lift (DVVL), dual cam phasers (DCP), automatically shifted manual transmission (AMT), electric power steering (EPS), and improved alternator (ImpAlt); and
2. Gasoline direct injection at stoichiometric (GDI-S), DCP, turbocharger, AMT, EPS, and ImpAlt.

Based on footnotes in the table, the net fuel economy benefit reported for these combinations of technologies includes a 2% reduction in carbon dioxide due to the assumed use of a variable displacement air conditioning compressor and a 5% reduction in carbon dioxide based on assumed changes in tires, aerodynamic drag, torque converter, engine friction, and shift logic. (The 2% reduction assumed for variable displacement AC compressors was based on Meszler's analysis; however, there was no detailed analysis presented in either the NESCCAF report or the CARB report justifying the 5% reduction assumed for the other measures.)

This first combination was estimated to reduce carbon dioxide by 19.9%, which represents a 24.8% increase in fuel economy. Cost for this combination was listed as \$157, which was apparently the increase in retail price over the projected 2009 baseline

* This presentation is available at <http://www.arb.ca.gov/cc/symposium/042004/albu.pdf>

Table III-1. Estimated Cost of Individual Technologies

Technologies	Vehicle Class				
	Small car	Large car	Minivan	Small truck	Large truck
	Retail Price Equivalent (\$)				
Intake Cam Phasing	49	98	49	98	49
Exhaust Cam Phasing	49	98	49	98	49
Dual Cam Phasing (DCP)	98	196	388	196	409
Coupled Cam Phasing (CCP)	70	161	49	161	49
Discrete Variable Valve Lift (DVVL,ICP)	154	259	210	259	259
Discrete Variable Valve Lift (DVVL,DCP)	203	357	549	357	619
Discrete Variable Valve Lift (DVVL,CCP)	175	322	210	322	259
Continuous Variable Valve Lift (CVVL,ICP)	259	483	626	483	764
Continuous Variable Valve Lift (CVVL,DCP)	280	581	773	581	911
Continuous Variable Valve Lift (CVVL,CCP)	308	546	626	546	764
Electromagnetic Camless Valve Actuation (emCVA)	676	764	1078	764	1274
Electrohydraulic Camless Valve Actuation (ehCVA)	564	637	882	637	1078
Turbocharging (Turbo)	560	(150)	490	(150)	-
Cylinder Deactivation (DeAct)	-	183	183	183	217
Cylinder Deactivation (DeAct,DVVL)	-	266	266	266	325
Cylinder Deactivation (DeAct,DVVL,ICP)	-	364	315	364	374
Cylinder Deactivation (DeAct,DVVL,DCP)	-	462	635	462	524
Cylinder Deactivation (DeAct,DVVL,CCP)	-	427	315	427	374
Variable Charge Motion (CBR)					
Gasoline Direct Injection - Stoichiometric (GDI-S)	189	259	259	259	294
Gasoline Direct Injection - Lean-Burn Stratified (GDI-L)	728	959	1043	1057	1554
Gasoline Homogeneous Compression Ignition (gHCCI)	560	840	840	-	-
Diesel – HSDI	2100	1225	2152	1260	2943
Diesel – Advanced Multi-Mode	1323	735	1310	568	1791
4-Speed Automatic Transmission	0	0	0	0	0
5-Speed Automatic	140	140	140	140	140
6-Speed Automatic	70	105	105	105	112
6-Speed Automated Manual	0	0	0	0	0
Continuously Variable Transmission (CVT)	210	245	245	245	-
12-volt 2kW BAS (Start Stop)	280	-	-	-	-
42-Volt 10 kW ISG (Start Stop)	609	609	609	609	659
42-Volt 10 kW ISG (Motor Assist)	902	902	902	902	902
Electric Power Steering (EPS)	20	39	39	39	-
Electro-Hydraulic Power Steering (E-HPS)	-	-	-	-	60
Improved Alternator (Higher efficiency)	56	56	56	56	56
Electric Water Pump (EWP)	70	70	70	70	70
Improved AC	88	88	88	88	88

vehicle. As shown in the table, the 2009 baseline vehicle was assumed to use DVVL, DCP, and an A5 transmission. The cost for the baseline technology package was listed as \$308 compared to a 2002 baseline. In the revised Table III-1 distributed at the workshop, the sum of the individual costs for DVVL, DCP, and A5 is reported to be \$441. It therefore appears that some use of these technologies may have been assumed in the 2002 baseline vehicle.

The \$157 incremental cost for DVVL, DCP, AMT, EPS, and ImpAlt along with the miscellaneous other improvements should be the cost of these technologies minus the \$308 price increase assumed for the 2009 baseline vehicle. Compared to a 2002 baseline,

Table II-5. Potential Carbon Dioxide Emissions Reductions from Small Car (NESCCAF, 2004)

Small Car	Combined Technology Packages	CO ₂ (g/mi)	Potential CO ₂ reduction from 2002 baseline	Retail Price Equivalent 2002	Potential CO ₂ reduction from 2009 baseline	Retail Price Equivalent 2009
Near Term 2009-2012	DVVL,DCP,A5 (2009 baseline)	284	-2.6%	\$308	0%	\$0
	DCP,CVT,EPS,ImpAlt	270	-7.6%	\$570	-5.1%	\$262
	DCP,A4,EPS,ImpAlt	269	-7.6%	\$360	-5.2%	\$52
	DCP,A5,EPS,ImpAlt	260	-10.7%	\$494	-8.3%	\$186
	DCP,A6	260	-10.8%	\$346	-8.4%	\$38
	DVVL,DCP,AMT,EPS,ImpAlt	233	-19.9%	\$465	-17.8%	\$157
	GDI-S,DCP,Turbo,AMT,EPS, ImpAlt	215	-26.4%	\$1128	-24.4%	\$820
Mid Term 2013-2015	gHCCI,DVVL,ICP,AMT,EPS,ImpAlt	229	-21.6%	\$673	-19.6%	\$365
	CVVL,DCP,AMT,ISG-SS,EPS, ImpAlt	216	-25.7%	\$1387	-23.8%	\$1079
	gHCCI,DVVL,ICP,AMT,ISG, EPS,eACC	204	-29.9%	\$1570	-28.1%	\$1262
Long Term 2015-	dHCCI,AMT,ISG,EPS,eACC	217	-25.5%	\$2536	-23.5%	\$2228
	ModHEV	213	-26.9%	\$1937	-25.0%	\$1629
	HSDI,AdvHEV	147	-49.5%	\$5117	-48.2%	\$4809
	AdvHEV	138	-52.6%	\$3017	-51.4%	\$2709
<i>Notes: Costs are included here to place the technology benefits in context. Costs and their derivation are discussed in greater detail in section III; Reductions for all scenarios except the baseline include benefits listed in Table II-4 and benefits from improved air conditioning systems from NESCCAF (2004).</i>						

the increase would be \$465. We calculate the net cost change based on individual component prices is +\$203 for DVVL, \$0 for AMT, \$20 for EPS, \$56 for ImpAlt, \$62.50 for AC system changes (without a secondary loop), and \$125 for miscellaneous other improvements (reduced aero drag, etc.). This sums to \$466.50, which is fairly close to the number reported by CARB.

The second system for small cars that Albu highlighted was estimated to achieve a 26.4% reduction in carbon dioxide (35.9% increase in fuel economy) for a cost of \$820 over the 2009 baseline, which is \$663 higher than the first combination. However, this increase in price is not consistent with the addition of a \$560 turbocharging system and a \$189 GDI-S system and the deletion of a \$203 DVVL system (which is a net change of only \$546).

In responding to a question from the audience, Albu acknowledged that it is not possible to duplicate the numbers in the summary tables without knowing the assumptions CARB staff made when combining technologies. All of the assumptions are apparently contained in a spreadsheet that CARB has not yet been willing to release.

After reviewing the “near-term” technologies for the other vehicle categories, Albu’s overall conclusion was that “CO₂ reductions of 14–24% compared to the 2009 baseline” are available using “off-the-shelf” technology, with a payback period of 0–5 years. For the long-term technologies, the revised tables showed 48–51% reductions in CO₂ (+100% in fuel economy) could be achieved with advanced hybrid vehicles for a cost increase of \$2,709–\$3,965, depending on the vehicle class. The graphs he showed indicated that advanced hybrids would pay for themselves in reduced fuel cost over the life of the vehicle. (Following Albu’s comments, Nic Lutsey from the University of California, Davis, made a brief presentation explaining the net present value calculations that were used to account for the fuel cost savings from vehicles with lower greenhouse gas emissions.)

Albu’s conclusions mirror the text of the April 1 report, which says that various combinations of technologies are capable of “providing significant reductions in emissions at favorable costs” and “Nearly all technology combinations modeled provided reductions in lifetime operating costs that exceeded the retail price of the technology.” , Unlike the April 1 report, however, Albu’s presentation did not focus on the adjustments to the cost estimates contained in the NESCCAF report made by CARB.

Not being satisfied with some of the NESCCAF cost estimates, CARB took the estimates for “emerging technologies” and adjusted them downward by 30% to account for “unforeseen innovations in design and manufacturing.” The report claims such reductions are analogous to those that occurred with emission control systems for LEVs (which were primarily related to advancements in the effectiveness of catalytic converters). The report also claims this assumption is “conservative” because “ARB estimates themselves tend to be high when high volume production is achieved.”

The report also indicates that CARB reduced Martec’s estimates for the cost of converting from overhead valve (OHV) to overhead cam engines by \$250–300 to account for what CARB claims is the increased cost of switching to an aluminum block contained in Martec’s estimates although no information was provided to support this claim. Finally, CARB used its own, lower estimates for hybrid system costs without providing any details whatsoever regarding the basis for the costs assumed (i.e., \$441 for the addition of a 42-volt, 10 kW integrated starter generator system). The single area where CARB made an upwards adjustment to Martec’s cost estimates was in the case of cylinder deactivation systems—CARB added \$50 to Martec’s estimate to account for a system to control driveline noise.

CARB’s \$441 estimate for a mild hybrid system is substantially lower than estimates for similar systems published by other researchers. For example, EEA’s 2001 analysis for the National Academy of Sciences estimated the incremental costs for a mild hybrid system at approximately \$700. Some manufacturers have reported costs more than double this level for similar systems.

CARB Presentation on 134a Emissions – Following Albu’s summary of the potential for carbon dioxide emissions reductions, Dr. Alberto Ayala made a presentation entitled,

“HFC-134a Direct Emissions from Vehicle Air Conditioning Systems.” Ayala described a “mass balance” analysis that CARB has done to estimate lifetime emissions. Data used in the analysis came from maintenance records for 12,000 vehicles in nine fleets; surveys of 966 vehicle owners; and an end-of-life recovery estimate based on a survey of dismantlers and discussions with U.S. EPA. His conclusion was that the average light-duty vehicle emits 1.4 kg of HFC-134a over its life. He said this was equivalent to 9 g/mi of carbon dioxide, assuming an average lifetime of 200,000 miles per vehicle.

TIAX Alternative Fuels Study

Stefan Unnasch, with TIAX, LLC, made a presentation describing the alternative fuels analysis that TIAX apparently performed under contract. Unnasch explained that certain fuels receive credit for having lower “upstream” greenhouse gas emissions, i.e., emissions associated with resource extraction, refining, and transportation.

Although it wasn’t covered in his slides, Unnasch claimed hydrogen could be sold at retail for \$2.32 per kilogram (roughly equivalent to the energy content of one gallon of gasoline). In response to questions from the audience, he acknowledged that this did not include road taxes (equivalent to \$0.36 per gallon). The \$2.32/kg estimate is in the same range as an estimate Unnasch made three years ago when developing estimates of hydrogen cost for the California Fuel Cell Partnership. While it is possible to manufacture and compress hydrogen for less than \$2/kg, our review of the available literature indicates that the infrastructure costs associated with storage and transport are larger than the cost of producing the fuel. Although storage can be minimized and transportation eliminated by locating decentralized production facilities at refueling outlets, there are other costs that have to be addressed. In Unnasch’s previous work, he assumed that hydrogen production, storage, and dispensing facilities could be located at existing gasoline stations with no greater effect on operations than is associated with adding a dispenser for methanol. However, OSHA regulations require that hydrogen tanks be above ground. The space required for the aboveground storage tanks combined with the minimum stand-off distances specified in the fire codes will substantially impact existing operations. Either the “opportunity cost” associated with the impact on station operations has to be addressed or the cost of establishing independent hydrogen outlets has to be used. Unnasch ignored that reality. He also assumed that hydrogen production and dispensing facilities could be added to existing gasoline stations with no effect on staffing requirements. In fact, the total operating and maintenance costs he assumed, including property tax, were less per hydrogen dispenser than per gasoline dispenser.

CARB Summary of Alternative Fuels Analysis

Following the TIAX presentation, CARB Mobile Source Division staff member Eileen Tutt made comments on the TIAX analysis. She also took the opportunity to comment on the Governor’s press conference on the subject of the “hydrogen highway” that she attended earlier in the morning. Tutt told the audience that “It was a very exciting event.”

She said “The Governor’s vision will help pull all alternative fuels ahead” and added, “the journey is just as important as the destination,” whatever that means.

Tutt said that TIAX’s analysis shows that LPG and CNG would provide greenhouse gas emissions reductions of 30%, primarily due to lower upstream emissions. She also said that both of these gaseous fuels would have lower lifetime consumer cost. In the case of CNG, Tutt said the \$3,600 higher retail price would be offset by lifetime fuel costs so that the net present value to consumers would be a savings of \$6,039. LPG vehicles were estimated to have a higher retail price of \$700 and produce a lifetime net present value of cost of -\$3,342. The estimates for CNG and LPG did not appear to account for the effect of increased demand on the price of these fuels. Tutt said that hybrid-electric vehicles with a 20-mile all-electric range would reduce carbon dioxide by 50%, but that marketability and cost were “issues.”

Other Presentations

Honeywell – Dr. S.M. Shahed made a presentation on the potential for reducing carbon dioxide emissions through the use of turbocharging. Using data from European vehicles, Shahed showed graphs of carbon dioxide emissions vs. engine power rating for turbocharged and naturally aspirated vehicles. Although there was substantial scatter in the data, he showed that a regression line fit through the data for the turbocharged vehicles was 5–12% lower, depending on the model years included. His analysis is flawed, however, in that it failed to account for differences in vehicle weight and power-to-weight ratio that are likely to exist. Shahed also said that comparisons of turbocharged vs. naturally aspirated engines by “world class experts” indicate a carbon dioxide reduction of 15–21% is available through the use of turbocharging combined with engine resizing for constant performance. He repeatedly referred to engine resizing as “right sizing.”

By using turbocharging to achieve equivalent power with a 35–40% reduction in engine displacement, Shahed said that manufacturers could achieve a direct cost reduction of \$700 that would offset the \$400 cost of a variable geometry turbocharger, intercooler, associated plumbing, and miscellaneous engine upgrades. He said the net result would be a \$300 cost savings with 15–20% lower carbon dioxide emissions.

Sturman Industries – The husband and wife team of Eddie and Carol Sturman made a lengthy presentation describing the hydraulic valve actuation technology their company has developed. It was somewhat difficult to determine how much of the presentation was fact and how much was fiction because it was clear that the Sturmans did not understand the combustion and emissions formation process. In concept, hydraulic valve actuation could provide a flexible means of achieving variable valve lift and timing that could be used to reduce engine pumping losses and improve fuel economy/reduce carbon dioxide emissions. However, the Sturmans made outrageous claims for being able to eliminate the use of catalytic converters with their valve actuation technology. Eddie Sturman said, “We don’t think you need aftertreatment if you do it right to begin with.” There were

oscilloscope traces shown that purported to show variable valve lift and timing being achieved, but the presentation lacked data showing the effect on emissions and fuel economy. The credibility of the presentation was further eroded by their claim that electromagnetic fields generated by electric and hybrid-electric cars “may be the pollution of the future.”

Clean Air Performance Professionals – Charlie Peters, a Smog Check station owner who frequently participates in hearings and workshops related to the motor vehicle inspection and maintenance program, told the audience that he “just found out about this meeting yesterday” and wanted to talk about some technology that hasn’t been considered. He said the best approach to reducing greenhouse gases would be to improve the Smog Check program, change the requirements regarding the use of oxygenate in gasoline, and remove the CAFE credit for the production of flexible fuel vehicles capable of running on E85 fuel. He said the oxygenate requirements were a “welfare program for refiners” and that elimination of the credit for flexible fuel vehicles would require real fuel economy improvements that would reduce carbon dioxide emissions.

As Peters’ presentation became somewhat rambling, Chuck Shulock interrupted and said that his presentation was really not on topic. Peters responded by saying that what he was suggesting would reduce fuel consumption by 20% and “if that’s not applicable then I’ll sit down and shut up.” Peters left the podium and walked out of the room.

Union of Concerned Scientists (UCS) – Louise Bedsworth summarized a recently released report by UCS claiming carbon dioxide emissions reductions similar to those estimated by the CARB staff can be achieved in a cost-effective manner. She said that 20% reductions are possible with “today’s technology” and 40% reductions are possible with “advanced technology.” The report is based on the cost estimate produced two years ago by EEA and David Greene combined with modeling done using the Modal Energy and Emissions Model (a simplified vehicle simulation model that doesn’t use engine maps).

Natural Resources Defense Council (NRDC) – Roland Hwang made a presentation entitled, “Reducing Global Warming Pollution from Mobile Air Conditioning.” The thrust of his presentation was that mobile AC systems are responsible for 8% of total motor vehicle greenhouse gas emissions. He claimed that substantial reductions in both direct and indirect emissions could be achieved in a cost-effective manner through the use of enhanced HFC-134a systems, replacement of HFC-134a with HFC-152a, and the use of variable displacement compressors. He made the point that the replacement of HFC-134a would have benefits outside of CARB’s control because it would ultimately reduce emissions associated with the servicing of HFC-134a systems by individual motorists who do not use recycling equipment. His final slide asked the question of whether the mobile air conditioning industry was going to be “part of the solution or part of the problem.”

Analysis

Based on the Draft Technology and Cost Assessment and the comments made by CARB staff at the workshop, the groundwork is being laid for a proposal that will require greenhouse gas emissions to be reduced by about 20% in the 2009-2012 timeframe. The CARB staff is taking the position that reductions of this magnitude can be achieved without reducing vehicle weight, without compromising performance, and without increasing the price of new vehicles more than the net present value of the fuel cost savings within five years of vehicle operation.

The parallels between the ill-fated ZEV mandate and the greenhouse gas control program are significant. The ZEV mandate was characterized as being critical to the control of air pollution. In fact, even the theoretical benefits of electric vehicles were insignificant and the real effect of forcing 10% of light-duty vehicle production to be electric would have resulted in adverse air quality impacts due to the slowing of fleet turnover caused by the higher vehicle prices needed to subsidize electric vehicle production. A panel of experts chartered by CARB eventually concluded that the \$1,250 cost premium for full-function electric vehicles that the CARB staff used to support the adoption of the mandate was low by a factor of more than ten.

As with the ZEV mandate, the claimed benefits of greenhouse gas emissions regulations are being exaggerated by CARB staff. CARB has attempted to create the impression that greenhouse gas regulations will cause meaningful reductions in ambient temperature, which will not only reduce ambient ozone levels, but also prevent “catastrophic natural disasters.” However, federal CAFE regulations allow manufacturers to sell vehicles with lower fuel economy in other states if they are required to sell vehicles with higher fuel economy in California, which is likely to net out any change in global emissions. In addition, we estimate that even if all U.S. vehicles achieved 100% higher fuel economy, the effect on ambient temperatures would be insignificant (perhaps in the range of -0.02°C).

The NESCCAF cost analysis that CARB is endorsing may be as problematic as was the cost estimate for the ZEV mandate. It assumes that vehicle manufacturers could already be producing vehicles with significantly higher fuel economy and significantly lower cost while simultaneously preserving all of the other attributes of current vehicles. The report provides no basis, however, for supporting Martec’s assumption that vehicle manufacturers and consumers are currently spending more than they need to produce and operate vehicles. The conclusion that greenhouse gas regulations could be cost-effective is based largely on the assumption that government regulations are needed to force vehicle manufacturers and consumers to behave rationally. The NESCCAF analysis also assumes that consumers will highly value vehicles with improved fuel economy and willingly pay for any technology that pays for itself over the life of the vehicle assuming a 5% discount rate. Finally, the NESCAFF analysis totally ignores the “rebound effect” that results in increased vehicle travel when the fuel cost per mile of travel is reduced, which will tend to offset the claimed fuel savings and increase the actual costs to

consumers. In addition, the increased VMT associated with the rebound effect will increase emissions of ozone precursors and potentially lead to degraded air quality.

Despite the failure of the ZEV mandate, CARB says it was a great success based on the false claim that it led to the development of hybrid electric vehicles with near-zero emissions. It remains to be seen how the agency will claim that its “climate change” program will provide any positive environmental impacts. What is apparent so far, based on CARB’s efforts to develop greenhouse gas regulations pursuant to AB 1493, is that symbolism continues to be more important than substance—which may be exactly what the proponents of AB 1493 intended.

Governor Announces “Hydrogen Highway”

On April 20, Governor Schwarzenegger announced the “California Hydrogen Highways Network” and signed an Executive Order creating a public and private partnership to build a Hydrogen Highway in California by 2010. At a ceremony at the University of California, Davis, he christened Station #1 on the California Hydrogen Highway by fueling a hydrogen fuel cell vehicle at the pump. As shown in photo below, he was joined by UC Davis Chancellor Larry Vanderhoef and members of his cabinet CalEPA Secretary Terry Tamminen, Resources Secretary Mike Chrisman, and Business, Transportation and Housing Secretary Sunny McPeak. (Tamminen is the person sitting second from the right in front of the Fuel Cell Bus.)



Governor Schwarzenegger Announces the Hydrogen Highway

According to the press release issued by the Governor's office:

The California Hydrogen Highway Network initiative is a down payment on securing California's future in the areas of air quality, public health, energy security, and national security. . . . The goal of the California Hydrogen Highway Network initiative is to support and catalyze a rapid transition to clean hydrogen transportation economy in California.

CalEPA Secretary Tamminen is quoted as saying, "To expedite the transition of our transportation system away from petroleum fuels, towards hydrogen fuel and vehicles, experts point to the crucial need for a hydrogen fueling infrastructure and the necessary leadership to make it a reality." The Administration's "Field of Dreams" philosophy is apparently "If we build it, they will come."

The goal of the program is "An early network of only 150 to 200 hydrogen-fueling stations throughout the State," which the press release says "would make hydrogen fuel available to the vast majority of Californians" by 2010. According to the press release, the estimated cost is only \$90 million and the "majority" of the required investment will come from "energy companies, automakers, high-tech firms, and other companies." Since no mention was made of the cost of the hydrogen to be dispensed from these stations, it is unclear whether the Governor also expects these companies to subsidize that cost as well. According to local press coverage, the Governor said that he expects automakers to put a half-million hydrogen-fueled vehicles on the road by 2010.

In remarks delivered at the ceremony, Schwarzenegger said that hydrogen-fueled vehicles "will clean the air and get rid of the smog that is hanging over our cities." As justification for the establishment of a hydrogen refueling infrastructure, the text of the Executive Order signed by the Governor states that "health problems caused by air pollution result in direct and indirect costs of hundreds of billions of dollars per year in California."

The Executive Order directs numerous state agencies to work together to "plan and build a network of hydrogen fueling stations along these roadways and in the urban centers that they connect, so that by 2010, every Californian will have access to hydrogen fuel, with a significant and increasing percentage produced from clean, renewable sources". It also directs CalEPA to assume principal responsibility for the development of a "California Hydrogen Economy Blueprint Plan" by January 1, 2005.

Analysis

It appears that the Governor is serious about wanting to do something significant about air pollution and energy independence. However, the level of hyperbole and misrepresentation of the facts associated with California's latest crusade to end the use of petroleum fuel has reached staggering new heights. One has to wonder where the Governor is getting advice on this issue; apparently from people who believe the dramatic

improvement in California's air quality during the last 30 years has left us with residual health damage of hundreds of billions of dollars per year! According to the Bureau of the Census, California's 2003 population was about 34 million. Assuming "hundreds of billions" means at least 200 billion, that's \$6,000 per year in health damage for every man, woman, and child in the state. Reasonably scholarly estimates of the damage done by air pollution in the past are orders of magnitude below the preposterous number contained in the Governor's press release.

In addition to overstating the economic damage associated with air pollution, it's clear that someone has also misled the Governor regarding the emissions reduction potential of hydrogen-fueled vehicles, which, in addition to being prohibitively expensive, offer no meaningful reduction in emissions compared to the cleanest gasoline-fueled vehicles that are already in production. Even if they were significantly cleaner, the prospects for having a half-million hydrogen-fueled vehicles on the road by 2010 are essentially zero. Boondoggles like the "Hydrogen Highway" divert funds and attention from programs that could achieve real emission reductions. For example, at \$1,000 per vehicle, the same \$90 million could be used to scrap 90,000 of the highest emitting vehicles in the state.

It will be interesting to see who gets saddled with the blame when it becomes clear that the "hydrogen highway" has provided no greater air quality benefits to California than would the "yellow brick road" from the Wizard of Oz. Since the Governor seems to be a pretty good politician, our bets are that the blame will fall on either the petroleum industry or the auto industry, if not both.

CARB Releases OBD Staff Proposal for 2007 and Later Heavy-Duty Engines

On April 2, the staff of the California Air Resources Board (CARB) released its proposal for engine manufacturer diagnostic system (EMD)* requirements for 2007 and subsequent model year heavy-duty (HD) engines. At the last workshop on this item, held in October 2003, staff announced it would split its heavy-duty on-board diagnostics (OBD) proposal into two separate rulemaking efforts—the first of which would go into effect with the 2007 model year, and the second with the 2010 model year. The EMD proposal is therefore the first phase of what will ultimately be the implementation of second-generation OBD (OBD II) systems for all heavy-duty gasoline and Diesel vehicles over 14,000 pounds gross vehicle weight rating (GVWR), similar to the OBD II systems that have been required since the 1996 model year for light- and medium-duty vehicles. According to the staff report, EMD will require that 2007 model year and later vehicles

* The CARB staff states that it is referring to its current proposal as a requirement for "engine manufacturer diagnostic systems" rather than OBD systems because it feels that the proposed requirements do "not approach the capabilities and sophistication of the OBD systems used on current light duty vehicles." Therefore, the staff is reserving the term "OBD" for its second, more comprehensive round of rulemaking in this area.

be equipped with systems that monitor the fuel system, exhaust gas recirculation (EGR) system, the PM trap, and emission-related electronic components. It does not require manufacturers to tie those monitors to the emission standards, however, nor does it establish a standardized format of specific information required to be output by the system. The staff intends to implement the second phase of the heavy-duty OBD program next year, by promulgating a separate regulation that will address the emission control technologies needed to meet the 2010 and later emission standards, as well as requirements that will assist mechanics with repairs and facilitate implementation of heavy-duty OBD checks in inspection programs.

The current EMD proposal is scheduled for presentation to the Board at the May hearing. Its development was chronicled in the September and October 2003 issues of *CVS News*; no major changes have been made to the proposal since the October 2003 workshop.

Staff Proposal

According to the staff, the development and implementation of OBD systems on heavy-duty vehicles is necessary to provide assurance of in-use compliance with the aftertreatment-forcing 2007 and later HD emission standards. Both CARB and the U.S. Environmental Protection Agency (EPA) have longstanding regulations in place that require OBD systems on light- and medium-duty vehicles (i.e., through 14,000 lbs.); this proposal would essentially extend those general requirements to all on-road motor vehicles other than motorcycles. According to the staff report, CARB has worked extensively with industry to develop this “first step” toward the development of an effective OBD system for heavy-duty vehicles. Furthermore, the staff believes that this proposal allows sufficient lead time for the development of EMD systems by the 2007 model year, when emission standards become more stringent and particulate filters become standard equipment for heavy-duty Diesel vehicles.

As noted above, the proposed EMD regulation would require functional monitoring of the fuel system, EGR system, PM trap, and any emission-related electronic component. As an example, the staff report says that for components that provide input to the on-board computer, the EMD system would be required to monitor for out-of-range values (e.g., open- or short-circuit malfunctions) and input values that are not reasonable based on other available information (e.g., sensor readings that are stuck at a particular value or are biased significantly from the correct value). Regarding output components, the EMD system would be required to monitor for proper function, such as a valve that opens and closes as commanded by the system. Monitoring of aftertreatment other than PM traps (such as catalysts or NOx adsorbers) will not be required by the EMD system, because widespread use of these devices is not expected until after the 2007 model year. However, manufacturers who plan to implement selective catalytic reduction systems (SCR) in 2007 are required under federal regulations to show that the system will operate correctly (i.e., that there is sufficient availability of urea, and that adequate anti-tampering measures have been taken). More complete procedures to maintain system integrity will

be included in the more comprehensive OBD II requirements for 2010 and later model year vehicles, which the staff is already at work on and which will be proposed to the Board sometime in 2005.

General Monitoring Requirements – The staff report includes general descriptions of the requirements for monitoring four separate systems. The EMD system will be required to illuminate a malfunction indicator light (MIL) when it detects an emission-related problem, which will alert the vehicle operator that a repair or other corrective action is required. The staff is allowing manufacturers to use either a dedicated warning light, or an existing warning light as the MIL. And, although the EMD system would be required to output diagnostic information for use by repair technicians, the proposal does not include requirements for content or format of that information.

The four specific requirements included in the EMD proposal are briefly summarized below.

1. **Fuel System Monitoring:** According to the staff report, by 2007, most manufacturers will be utilizing one of the new high-pressure fuel distribution systems, such as the current “common-rail” fuel injection system that can control fuel pressure independent of engine speed. These high-pressure systems allow for greater precision regarding the amount of fuel injected and injection timing, which in turn allows for greater optimization of engine performance and emission control. In developing monitoring requirements for this system, the CARB staff has targeted the identification of malfunctions that would prevent correct control of the fuel pressure system. For example, an engine equipped with feedback control of the EMD system would be required to register a malfunction when the fuel system has used up all of its allowed adjustments but has still failed to reach the target fuel pressure.
2. **EGR System Monitoring:** The EMD system would be required to register an EGR system malfunction when the system is unable to either increase or decrease EGR flow. The staff report states that this technology has already been successfully demonstrated in medium-duty applications.
3. **PM Trap Monitoring:** In establishing monitoring requirements for PM traps, the CARB staff report has focused on soot loading and trap regeneration. According to the staff, in order to optimize trap regeneration the control system for the regeneration system is likely to utilize both pressure and temperature sensors to model soot loading and other properties. The staff is proposing that the EMD system will register a malfunction when the backpressure exceeds the manufacturer’s specified limits, when the PM substrate is completely destroyed or missing, or if the trap assembly is replaced with a straight pipe. The proposal does not include any malfunction criterion associated with temperature monitoring.

4. **Emission-Related Electronic Component Monitoring:** These provisions require monitoring of “any” emission-related component, including those that the manufacturer determines to be related to either emissions or to the function of the EMD diagnostic strategy. According to the staff report, components that fall into this category include temperature and pressure sensors, idle speed control systems, glow plugs, wait-to-start lamps, and automatic transmission solenoid controls. The EMD system will be required to detect malfunctions such as open- or short-circuits and sensor readings that are inappropriately high or low, rather than simply out of range of the sensor. In addition, the staff is proposing that output components be monitored where it is feasible, which would ensure that a component has properly executed the command from the on-board computer.

Certification Requirements – The staff will require manufacturers to submit separate applications for each EMD system, which must include (1) a description of the functional operation of the EMD system, and (2) a listing of all electronic powertrain input and output signals (including those not monitored by the EMD system). Signals monitored by the EMD system must be specifically identified. Certification fees were not addressed in the EMD proposal, but will presumably be included in the second phase of this OBD regulation next year.

Costs and Benefits – According to the staff report, both the hardware and the software costs associated with this rulemaking were already accounted for in estimates of the cost of compliance with the 2007 standards. Regarding benefits, the staff claims that the EMD requirements will not result in any additional reductions above those associated with meeting the 2007 standards but rather will assure that those benefits are achieved in-use. Consequently, the staff did not perform a cost-effectiveness calculation specific to the EMD proposal, and the current staff report simply restates the 2007 figures (\$0.42 per pound of NO_x plus non-methane hydrocarbon and \$3.42 per pound of PM for all heavy-duty vehicles).

Analysis

As noted in previous articles on this subject, the staff’s assumption that this rulemaking will not result in any additional costs above those estimated for the 2007 standards is obviously false and it is not at all clear what the magnitude of the emission benefits associated with EMD systems (as opposed to those from the 2007 standards) will be.

Based on the separation of this rulemaking into two parts, it appears that CARB staff has decided that it is best to get the less controversial provisions of its proposal on the books as regulations and then deal with the more controversial aspects in the second phase of its rule development. Presumably the most immediate concerns raised by engine manufacturers have been addressed, while other major complaints heard at past workshops (e.g., that CARB is attempting to short-circuit the EPA rulemaking process by

adopting its OBD rule before the EPA rule is proposed), will almost certainly be debated again at the May 20 hearing. Regardless, we have little doubt that the Board will adopt the staff proposal in something close to its current form.

CARB Holds Second Workshop on Regulatory and Non-Regulatory Fuels Activities

On April 12, 2004, the California Air Resources Board (CARB) held the second in a series of “once a month” workshops (as a CARB staff member put it) to discuss regulatory and non-regulatory fuels activities. The topics included implementation issues for California Phase 3 reformulated gasoline (RFG3) and Diesel fuel lubricity requirements; as well as potential regulatory activities in several areas (gasoline regulations, Diesel fuel, hydrogen, biodiesel).

The topics were the same as those discussed in the first fuels meeting of the year, held on February 25.* The staff has made progress in some areas, since draft regulatory language regarding the RFG3 implementation issues was made available.

Background

The CARB staff, specifically the Stationary Source Division (SSD) staff, is working on fuels-related activities in 2004 for several different reasons. First, the State Implementation Plan (SIP), adopted by the Board in October 2003, calls for deposit-control additives for DF and low-sulfur DF for heavy-duty on-road, off-road, and stationary engines. In that SIP, CARB also committed to study the feasibility of further gasoline regulations, including reductions in sulfur, benzene, and volatility levels. Second, there are RFG3 implementation issues related to ethanol blending. Third, the staff is concerned about the lubricity of low-sulfur DF, the possible need for deposit control additives when lower-emission Diesel engines are introduced in a few years, and the effects of Diesel engine lubricating oil on engine emissions and aftertreatment devices. The staff is also looking into “updates” to the so-called clean fuel outlets program, primarily in the context of promoting the use of hydrogen. Finally, the staff is studying several issues related to the use of biodiesel.

Staff Presentations and Discussions

Present at the meeting were representatives of the auto industry, engine manufacturers, petroleum refiners, pipeline companies, the trucking industry, and makers of fuel additives and alternative fuels. Also present were State of California personnel

* Please see the March 2004 issue of *CVS News* for a report on the February 25 meeting.

representing CARB, the California Energy Commission (CEC), and the Office of Environmental Health Hazard Assessment (OEHHA).

Steve Brisby, Manager of the Fuels Section within the Criteria Pollutants Branch of SSD, quickly reviewed the agenda, which was divided broadly between implementation issues and potential regulatory activities. After brief comments by Criteria Pollutants Branch Chief Dean Simeroth, Tom Jennings of the legal staff began the staff presentation.

Implementation Issues

Phase 3 RFG - Jennings handed out draft regulatory language intended to increase flexibility for refiners and distributors in handling and blending ethanol-blended gasoline, then discussed the issues they are intended to address. The three primary issues, as presented by Jennings, are blending transmix into CARBOB,^{*} blending finished gasoline into CARBOB, and documentation of ethanol transfer. He noted that the two blending issues concern the inadvertent blending of small amounts, which will be addressed through protocols added to existing regulations. He added that the draft regulations[†] are preliminary, and are being presented in order to elicit comment from stakeholders.

The current regulations, Jennings said, include enforcement protocols for blending transmix with finished gasoline, but none for blending transmix into CARBOB. This is now an issue, he explained, because ethanol is blended into CARBOB to make the final finished gasoline at a later point in the supply chain. The draft language on transmix blending says only that CARB may enter into a written protocol with “any person” to identify conditions under which the person may lawfully blend transmix into CARBOB, and that the person must agree to be bound by the terms of the protocol. On the other hand, the proposed draft language for blending finished gasoline into CARBOB terminal tanks is specific. As presented by Jennings (and seen on the website), it defines the operational reasons for doing so (e.g., after calibration of metering equipment) and specifies the maximum oxygen content (0.1 wt%) of the resulting mixture.

The third Phase 3 RFG implementation issue being addressed by CARB is the documentation of ethanol transfer. Current regulations require that importers and producers of ethanol provide, along with the product transfer documents, the name, location, and operator of the ethanol production or denaturing facility. The staff has concerns about the practicality of this requirement, Jennings continued, because of the probability of commingling, both of denatured ethanol and of neat ethanol before it reaches California facilities that add denaturant. As an alternative to the current requirements, he continued, CARB is proposing that the documentation furnished to ethanol purchasers identify California denatured ethanol suppliers, and, if the product was

^{*} Transmix is the mixture that occurs at the interface of different petroleum products during their shipment. CARBOB is California reformulated gasoline blendstock for oxygenate blending.

[†] Available on CARB’s website at <http://www.arb.ca.gov/fuels/gasoline/meeting/2004/mtg2004.htm>.

imported into the state, that the document provided to the ethanol purchaser identify date and time supplied, and state that the supplier maintains a list of the production and denaturing facilities at which the product was produced and denatured.

Discussion - Discussion following Jennings' presentation was nearly nil. One commenter asked that the term, "California gasoline" be replaced with "California gasoline components" in the draft language. Jennings indicated that this could be done.

Diesel Fuel Lubricity - Cherie Rainforth* of the SSD staff said that CARB has taken a two-phase approach to the fuel lubricity issue. Under regulations adopted in July 2003, the Phase 1 standards, aimed at protecting existing equipment, will be phased in over a 90-day period beginning August 1, 2004. She explained that the Phase 1 standard is 520 micron WSD (wear scar diameter) at 60° C on the HFRR (High Frequency Reciprocating Rig) test, and applies to all California vehicular Diesel fuel with the exception of fuel used in locomotives and marine vessels. CARB is also preparing a Phase 2 lubricity standard, Rainforth said, to protect advanced-technology fuel injection systems. This standard would be proposed to the Board in late 2005, she continued, for implementation over a 90-day period beginning June 1, 2006. Rainforth went on to describe the conditions under which CARB would defer its standards to ASTM (American Society for Testing and Materials). In the case of the Phase 1 standard, CARB will defer to ASTM if, in CARB's judgment, the ASTM standard is at least as protective as the CARB standard. For Phase 2, CARB will defer to ASTM if, again in CARB's judgment, the ASTM standard is protective of advanced-technology fuel injection systems. In both cases, an additional condition for CARB's deference is that the state Division of Measurement Standards adopt the ASTM standards.

Rainforth said that balloting by ASTM members on a proposed ASTM lubricity standard, identical to the CARB 2004 standard and with an effective date of January 1, 2005, closed on April 9, 2004. She added that results of the balloting were to be disclosed in a June meeting of the ASTM. Rainforth ended her presentation by noting that the U.S. EPA is also considering a national lubricity regulation to align with the CARB standard.

Discussion - Rainforth was asked whether currently there is a lubricity standard for CARB Diesel fuel, and she replied that California refiners voluntarily meet a minimum standard of 3,000 grams on the SLBOCLE† test. Gina Grey of the Western States Petroleum Association (WSPA), referring to the implementation phase-in time frame for CARB's Phase 1 lubricity standard, asked whether the August 1 date could be delayed. Dean Simeroth, Chief of the Criteria Pollutants Branch within SSD, said that changing the date is "a policy call," but he personally likes the August date. Simeroth then noted that the U.S. Navy has requested in written comments that its tactical vehicles be exempt from the standards under discussion; Jennings said that the staff has recommended exemption from CARB regulations for all military tactical vehicles.

* Formerly Cherie Cotter

† Scuffing Load Ball-On-Cylinder Lubricity Evaluator

Potential Regulatory Activities

RFG Modifications – Steve Brisby began this presentation by noting that the SIP Commitments agreed to by CARB in October 2003, to explore the feasibility of a “Phase 4” RFG specification, came out of the need for additional emission reductions to meet ambient ozone “goals.” He noted that CARB realizes it would be very difficult to meet the sulfur standard (5 ppm), and that the oxygen content requirement (0%) conflicts with federal standards. Still, he said, echoing the message on a slide, the development of advanced emission control technologies may provide an opportunity to “increase synergies” between California gasoline and the new emission control technologies. The staff, he continued, will also consider whether any changes could be made to the RFG regulations that could increase refinery system efficiencies while preserving existing emissions benefits and enforceability. On the last issue, Brisby said that the staff is presenting, for discussion purposes only, the concept of replacing gasoline property flat limits and averaging limits with a new set of caps. The Predictive Model could be used to determine the new caps, he said. Another concept for discussion, he said, is to replace distillation temperature limits with a specific for Driveability Index that has long been sought by the auto industry. Brisby reiterated that these are “strawman” concepts, intended to stimulate comments and questions.

Discussion - The first commenter said that with new emission control technologies a range of property specifications, for instance T50 temperatures, may be more important than caps. Jim Uihlein of BP said that CARB’s proposal may be an interesting exercise, but it is hard to imagine a set of caps that would not reduce flexibility. “That’s why we need the Predictive Model,” he said. Another commenter asked whether CARB was working with the CEC on producibility issues, and Brisby said yes, adding that CARB wants to increase producibility, flexibility, and fungibility for refiners. Dean Simeroth added that the staff is discussing concepts and how to do things better, and thinks that it’s time to reconsider the Predictive Model. “Everything is on the table,” he said.

Marine/Locomotive Diesel Fuel – Erik White, Manager of the Engineering Evaluation Section of the Criteria Pollutants Branch, said that the Board directed the staff to evaluate the potential use of CARB Diesel fuel in intrastate locomotive and marine applications, where it is not currently required. The staff is to consider cost and feasibility of such use, and to consider alternatives that can provide similar emission reduction benefits, he added. At this time the staff is in data-collection mode, White said, and is working with stakeholders to identify and gather information on engines and fuel use, for instance, and has developed a list of potential questions on locomotives for use in a survey. The staff is also contacting marine fuel suppliers to determine types of fuels being distributed, he said. White then presented a tentative schedule for regulation development, in which workshops would be held through October 2004, a staff report would be published in September, and a regulatory proposal made to the Board in November 2004.

Discussion - Roger Gault of the Engine Manufacturers Association (EMA) asked White to define “marine engines,” and White said that CARB considers where an engine is in service, not simply the engine type. He added that in the current discussion only harbor

craft are of interest, with maximum power ratings in the range of 2,000 hp to 2,500 hp. White said it is CARB's intention to get CARB DF into use in harbor craft, as the staff thinks this will yield faster emission reductions, since harbor craft already use Diesel fuel. In addition, he concluded, it's a SIP commitment.

Deposit Control Additives –Rainforth's review of this item was brief. She noted that the SIP requires CARB to consider adopting standards for Diesel engine deposit control additives. Currently, there is no deposit control additive requirement for DF, but the issue may gain significance for new engines designed to meet 2007 emissions standards, she said. Deposit control additives, Rainforth continued, offer the potential for reducing deposits in fuel systems and engines, keeping engines closer to original factory tolerances, and minimizing the deterioration rate of emission levels. Rule development is a long-term matter; as laid out by Rainforth, CARB's schedule calls first for investigation of the effectiveness and cost of such additives, and implementation of any standard would be in the 2010 and later time frame.

Discussion - Loren Beard of DaimlerChrysler asked what CARB's point is in waiting until 2010 for deposit control additives. Simeroth explained that the engines that may be adversely affected by engine deposits are just now being introduced, and that CARB must develop test methods to determine the effects of additives. But if you can show us that such standards are needed sooner, he said, then we'll move the regulation forward. The staff is happy to have private discussions with interested parties on this issue, he said.

Diesel Engine Lubricating Oils – Rainforth also reviewed this item, and the brief presentation elicited no comments or questions. Diesel engine lubricating oils are of interest, she said, because in normal operation they are burned in the engine and their sulfur and ash content can affect both engine-out emissions and the effectiveness of aftertreatment control technology. CARB's only activity in this area is to follow industry efforts to study lubricant effects on aftertreatment devices she said. CARB follows the activities of a joint government/industry working group, the DOE Advanced Petroleum-Based Fuels – Diesel Emissions Control (APBF-DEC) Program. A private consortium in which CARB does not participate is conducting industry-sponsored research at Southwest Research Institute: the Diesel Aftertreatment Sensitivity to Lubricants (DASL)/Non-Thermal Catalyst Deactivation (N-TCD) program. Industry, through the ASTM Heavy Duty Engine Oil Classification Panel, is also developing HD engine oil specifications for use with aftertreatment technology. The specification is expected to require reduced sulfur, phosphorous, and sulfated ash content, and will also address durability issues, Rainforth said. American Petroleum Institute licensing of compliant oils is expected in late 2005 or early 2006, and they will be in the market by the third quarter 2006, she said, adding that CARB hopes these efforts will preclude the need for regulations.

Clean Fuels Outlets - Lesley Crowell of the SSD staff said that the objective of the Clean Fuels Outlet Program is to ensure that clean fuels are available for alternative fueled vehicles "to operate and achieve the emissions benefits attributed from (sic) these vehicles." The key points of the program, she continued, are that it requires certain owners or lessors of gasoline service stations to install alternative fuel outlets when

20,000 vehicles are certified to California LEV standards on a specific fuel. Currently, she said, CARB is considering program updates to ensure that new fuels and vehicle technologies are provided for. In her presentation, Crowell listed “hydrogen fuel cells” and “hybrids” as the new fuel/vehicle technologies that have to be considered, but did not define these terms. (Perhaps her use of “hybrids” refers to hybrid vehicles powered by alternative fuels, e.g., natural gas, but our request for more information was unanswered at this writing.)

Crowell provided no specifics, but spoke in general terms of encouraging the use of alternative fuels in dedicated vehicles as well as in flexible-fueled vehicles, and of bringing a hydrogen infrastructure to fruition. She also talked about “miscellaneous regulation cleanup,” of regulation numbering and grammar, which suggested this will be the staff’s approach to requiring the sweeping changes it seems to feel are necessary. Hydrogen fuel cells and hybrids are coming, Crowell stated, and CARB needs to address the issues associated with them. Short-term and long-term changes are needed, as we don’t want our regulations to hold up progress, she concluded. She provided a tentative schedule that showed a workshop in June and a Board hearing in September 2004.

Discussion - Following Crowell’s presentation, the first comment heard was that alternative fuels form mostly a niche market, and CARB’s regulations have been intended to help fuels that “don’t cut it in the market.” The speaker contrasted that stance with CARB’s position on hydrogen, for which CARB’s vision is that it “can have broad market appeal and stand on its own.” It is disappointing, he said, to see CARB considering a mandate for hydrogen fuel. Simeroth replied that the speaker is “looking too far ahead,” because what the staff is trying to do is improve the regulations, but “we’re unsure of the correct approach, and we’re not in the mandate phase.” The same speaker asked if the staff is exploring concepts that don’t involve mandates, to which Simeroth answered affirmatively, but added that it is hard to write regulations that aren’t mandatory. WSPA’s Grey said that her organization continues to be opposed to this, and a refining company representative said that CARB should let the marketplace decide on motor fuels. We have a problem, he continued, when the government promotes alternative fuels just because they’re alternative fuels. CARB should get back to the air quality business, not the fuel promotion business, he added.

Biodiesel – Bob Okamoto of the SSD staff reviewed the biodiesel workgroup meeting, which had been held in the morning (April 12). For the fuels workshop audience, he defined biodiesel (methyl and ethyl esters of fatty acids derived from “natural products” such as vegetable oils and animal oils and grease), and mentioned that ASTM D6751 sets specifications for biodiesel as a blending component. Biodiesel may be used in blends with normal DF, he continued, the common blends being 2%, 5%, and 20% biodiesel (B2, B5, and B20, respectively), or as a straight fuel (B100). While biodiesel has slightly lower energy content than the average California Diesel fuel, it has a slightly higher Cetane number and practically nil levels of sulfur and aromatics, Okamoto said. In addition, he said, biodiesel has lower “wells to wheels” greenhouse gas emissions, and generally reduces exhaust emissions of PM, CO, and total hydrocarbons.

Okamoto said that, compared with California Diesel fuel, biodiesel increases NOx emissions by as much as 10% (with B100). Biodiesel NOx emissions vary depending on the feedstock, he said, with the highest NOx emissions coming from soybean-based biodiesel. He added that additives are available to reduce NOx from biodiesel. Other biodiesel issues listed by Okamoto include engine durability and effects on lubricating oil, fuel quality, fuel stability, cold-flow characteristics, and compatibility with seals and other fuel system materials. Okamoto mentioned that legislation (AB 2899) has been introduced to set standards for biodiesel blends up to B20, that the CARB staff is relying on the National Biodiesel Board to develop a comparative emissions testing protocol, and is considering the possible need to conduct multimedia assessments of biodiesel blends.

No comments or questions followed Okamoto's presentation. To close the meeting, Brisby invited written comments on all issues that had been discussed, and tentatively scheduled the next fuels workshop for May 27, 2004. (This was subsequently changed to June 3.)

Analysis

Some of CARB's fuel-related activities are relatively benign and are not expected to cause controversy. For instance, it appears that the draft language that CARB presented at this workshop to address issues related to RFG3 blending and ethanol transfer is acceptable to the refining industry, as there was practically no discussion of it. Also, in the areas of Diesel fuel lubricity and Diesel engine lubricating oils, the staff would appear to be wise in waiting for industry and the ASTM to complete their work towards establishing standards.

Whenever the staff discusses the Phase 4 gasoline issue, it acknowledges that meeting the proposed low-sulfur, zero-oxygenate, low-volatility specification will be costly and difficult, and probably will result in restricted supply. Based on the presentation made at this workshop, the staff's approach to meeting the requirements of the SIP measure forced on CARB in October 2003 appears to be to investigate peripheral issues such as flat limits and averaging limits versus caps, and perhaps revising the Predictive Model.

In the areas of "clean fuels" outlets and biodiesel specifications, the staff's proposals simply reinforce the impression that it is interested in promoting almost any alternative to petroleum-based motor fuels, regardless of the cost or air quality impact.

CARB Holds First Meeting of Biodiesel Workgroup

On April 12, 2004, the California Air Resources Board (CARB) held the first in a series of meetings of its Biodiesel Workgroup, to discuss biodiesel fuel issues related to air pollution. According to the meeting announcement, CARB established the biodiesel

workgroup in response to recommendations made during the February workshop on fuels issues.* The objective of the biodiesel workgroup, as stated in the agenda for the meeting, is to make recommendations on biodiesel specifications, to ensure that California biodiesel provides satisfactory engine durability and performance while protecting public health and the environment.

Based on what was presented and heard in this meeting, it appears that the CARB staff is relying on a biodiesel advocacy group to develop specifications for the product. In addition, it appears that CARB intends to require much less verification of emissions effects and multimedia impacts for biodiesel than it requires for petroleum-based fuels.

Staff Presentation

The CARB staff was led by Gary Yee, Manager of the Industrial Section of the Criteria Pollutants Branch of SSD. Other staff members present included Bob Okamoto, who works under Yee, and Tom Jennings of the legal staff. Present in the audience were representatives of biofuels makers, distributors, retailers, and advocacy groups, fuel additive makers, biodiesel consumers, petroleum refiners, and the auto industry.

The staff presentation began with a statement on the objective of the biodiesel workgroup, which is presented verbatim here:

Recommendations on the need to develop biodiesel specifications to ensure that California biodiesel provides satisfactory diesel engine durability and performance while protecting public health and the environment.

Bob Okamoto of the SSD staff continued the presentation by reviewing existing and proposed fuel specification activities pertaining to biodiesel. Various entities are at work on biodiesel issues and specifications, he said; they include CARB, the American Society for Testing and Materials (ASTM), the Division of Measurement Standards (a state agency concerned with fuel specifications), and the state legislature. Okamoto first discussed ASTM D-6751-03, a standard for biodiesel used as a blending stock, adopted by ASTM in July 2003. He said that the purpose of the ASTM specification was to ensure that biodiesel is of consistent quality. Among the specifications found in ASTM D-6751, Okamoto listed the maximum allowable free fatty acids content, residual glycerol, moisture content, and cold flow properties. Because biodiesel produces higher NOx emissions from engines than does petroleum-based Diesel fuel, and NOx increases as the biodiesel blend level increases, Okamoto added, CARB will permit NOx reduction additives in California biodiesel blends. (As discussed below, there are additives for biodiesel for which NOx emission reductions are claimed.)

* Please see the March 2004 issue of *CVS News* for a report on the fuels workshop of February 25, 2004.

The Division of Measurement Standards (DMS), a unit of the California Department of Food and Agriculture, enforces quality and labeling standards for most petroleum products used in California, Okamoto said, and therefore has the responsibility for defining biodiesel and biodiesel blends. Amendments to the DMS fuel specification regulations* are currently being reviewed by the state Office of Administrative Law, he said. The amendments will include specifications for biodiesel blend stock and resulting biodiesel blends, and will require labeling for fuels with biodiesel content greater than 5%, Okamoto said. (A DMS fuel specification generally simply refers to an ASTM specification.) For neat, i.e., 100%, biodiesel (B100), he continued, there will be no DMS specification until there is a “consensus,” e.g., ASTM, standard, although it will be possible to use B100 as a blend stock or neat using the DMS “developmental fuel” exemption available to captive fleets.

The last item on Okamoto’s list of biodiesel specification activities was California Assembly Bill (AB) 2899.† According to Okamoto’s review, AB 2899 proposes standards for biodiesel and biodiesel blends (referencing ASTM standards) up to 20% biodiesel (B20). The bill includes no specifications for blends higher than B20, he said, but would require that the specific volume concentration be displayed on the dispensing pump. The bill also provides for a voluntary greenhouse gas labeling system for biodiesel fuels, based on analyses to be conducted by the California Energy Commission (CEC).

Okamoto touched briefly on the topic of a multimedia assessment of biodiesel, saying that the staff currently is reviewing existing data on the effect of biodiesel production and use on air, water, and soil, and is reviewing hazardous waste issues as well. The last of his presentation was a brief status report on an interim verification procedure for biodiesel fuels. The purpose of the verification procedure would be to ensure that a biodiesel or biodiesel blend has no adverse effect on engine exhaust emissions, Okamoto said. He added that the staff has been having discussions with the National Biodiesel Board (NBB)‡ to develop a test protocol for a comparative emissions test; the discussion issues include toxic air contaminants, NOx, and the effect of different biodiesel feedstocks on emissions. No details were provided.

Discussion

In general, the staff guided post-presentation comments, questions, and discussions in the order in which the topics had been presented.

* California Code of Regulations, Title 4, Division 9, Chapter 6, Automotive Product Specifications. Curiously, Article 5 is entitled, “Automotive Spark Ignition Engine Fuel Standards,” and includes specifications for Diesel fuel.

† We are following AB 2899 in the Legislative Update section of *CVS News*.

‡ According to its website, the National Biodiesel Board, located in Jefferson City, Missouri, is a comprehensive industry association whose mission is to increase the demand of commercially produced biodiesel in the United States.

Existing and Proposed Specifications - Much of the discussion in this area touched on whether biodiesel specifications needed to differentiate among feedstocks. Kumar Plocher of Yokayo Biofuels said that an Iowa State University study had shown that biodiesel made from animal fats and used cooking oil caused NOx emissions to increase by only 2% over the baseline petroleum Diesel fuel, while biodiesel made from soy caused NOx to increase by more than 10%. CARB's Gary Yee asked for input on how CARB should address NOx increases, and was answered by Steve Howell, technical director of the National Biodiesel Board, who said that NBB is hoping that B20 mixed into CARB Diesel fuel will show "NOx neutrality." He also said that NOx-reducing additives will be tested. (Based on comments made during the workshop and information found on the internet, there are at least two additives that claim to reduce NOx in biodiesel blends. One is described by the manufacturer as a high molecular-weight hydrocarbon polymer that improves fuel spray patterns. The other, again, as described by the manufacturer, is a fuel-borne platinum-cerium catalyst. It is not known whether CARB Diesel fuel was used in the reported tests, or whether the additives would yield similar results with CARB Diesel fuel.)

Multimedia Assessments - Dave Smith of BP, referring to the interim, informal verification process for biodiesel, asked whether the process would include multimedia impact reviews. Yee said that CARB is asking biodiesel applicants to provide any information they may have on multimedia impacts, so the staff would see any "red flags" there might be. He went on to say that because biodiesel has the potential for market growth, CARB encourages stakeholders to participate in multimedia studies and make their data available to the agency. Smith noted that new rules for "normal" Diesel fuels require a multimedia review and a review by the California Environmental Policy Council, and asked whether biodiesel should not get the same review. Yee replied that the staff doesn't think that there will be any adverse impacts from the use of biodiesel. A representative of what she termed a "mom and pop" distributor of biodiesel stated that her customers are interested in using the highest percentage possible of biodiesel, and they want more Diesel vehicles available, so biodiesel should meet the highest standards possible, and that means that multimedia reviews are necessary, she said. Yee responded to this statement by saying that the NBB will weigh all available information, and decide on what is best. (Yee may want to reconsider his plans to let NBB make such decisions. California law, specifically Health and Safety Code Section 43830.8, says that CARB may not adopt any regulation establishing a motor vehicle fuel specification unless the California Environmental Policy Council reviews the regulation, as well as a multimedia evaluation conducted by affected agencies and coordinated by CARB. The evaluation includes external scientific peer review.)

Interim Verification - A representative of GTA Technologies, Inc. (GTAT) said that in tests, his company's Viscon product (a hydrocarbon polymer) has demonstrated PM and NOx emissions reductions of 38% and 20%, respectively, from Diesel engines.* BP's Smith, noting that CARB is setting up an interim or informal verification process for biodiesel, asked whether multimedia impacts of candidate fuels would be required. Yee

* GTA Technologies, Inc. is a specialty chemicals company located in Gainesville, Virginia.

answered that the staff will ask applicants to provide information on multimedia impacts, and note any “red flags.” Because biodiesel has the potential for market growth, Yee continued, we encourage stakeholders to participate in studies and make the data from them available to CARB.

Plocher of Yokayo Biofuels said that biodiesel test results were “encouraging enough,” perhaps, he meant, to make verification testing unnecessary. Yee explained that controlled tests are needed.

Other Issues - Ellen Shapiro, representing the Alliance of Automobile Manufacturers, said that AAM advises consumers to check with their vehicle and engine manufacturers on whether the manufacturer’s warranty has any restrictions on fuels. This comment elicited a handful of responses from “longtime” users of biodiesel who stated that they have not had any problems associated with using the fuel, and other anecdotal tales. A fuel distributor from San Luis Obispo said that three of four biodiesel fuel samples taken in that city failed the Diesel fuel lubricity standard. This statement was countered by another that low-sulfur petroleum-derived Diesel fuel will pose lubricity problems also. Others said that equipment manufacturers John Deere and Kubota have both “signed on” to B100, that is, it was implied, they approve B100 for use in their engines. Howell of the NBB suggested that all biodiesel users should contact their engine manufacturers to find out if they approve B20 blends. Howell went on to say that currently Diesel engines are undergoing major changes, and that “preliminary data” indicate that the PM and NOx effects from using B20 are beneficial for the effectiveness of exhaust aftertreatment.

At the end of the discussion period, Yee said that CARB would welcome specific comments in writing, and that those comments would be incorporated into the agency’s biodiesel strategy. There was no indication of when the next workshop or workgroup meeting would be held.

Analysis

The test data presented and referenced by biodiesel proponents appear to show that biodiesel provides reductions of CO, PM, and total hydrocarbon emissions. That is all well and good, but given that the same data sources also show that biodiesel increases NOx emissions, it is quite irresponsible, if not illegal, for CARB staff to rely on NBB, a biodiesel advocacy organization, to develop the specifications for the fuel, and for CARB to seek to develop regulations that allow informal verification of emissions effects and voluntary multimedia impacts analysis, bypassing the California Environmental Policy Council. This casual approach is not surprising, however, given the agency’s strong bias against petroleum. With the biodiesel regulatory development, CARB continues in its efforts to ease and encourage the entry of non-petroleum fuels into the California marketplace. It will be interesting to see whether the petroleum refining industry can mount protests strong enough to force the agency to adopt biodiesel specifications and requirements that are as stringent as what the petroleum industry must meet for its fuels.

CARB Hears Staff Report on Feasibility of Electrification of SOREs

At the April 22 Hearing, the staff of the California Air Resources Board (CARB) presented its report on the feasibility of the electrification of small offroad engines to the Board.* As this was not a regulatory item, the Board did not vote on the report. The conclusions in the staff report were discussed at length, however, and presentations from several stakeholders were also featured. In general, the staff did not recommend a move toward a requirement for electrification of the small off-road fleet at this time. Further, the staff stated that consumer awareness programs are the most feasible of the strategies it has evaluated, although their implementation will require significant new resources. The Board directed the staff to continue investigating ways to foster the use of electric motors and to keep it apprised of any new technologies that may make electrification of at least part of the fleet more feasible.

Staff Presentation

Following the usual introductions from CARB Chairman Lloyd and Executive Officer Catherine Witherspoon, Jackie Lourenco, manager of the off-road controls section of the Mobile Source Control Division, delivered the staff presentation. She began with brief definitions of SORE engines and equipment, which generally consist of two- or four-stroke engines with outputs of 25 hp (19kW) or less. The majority of SORE engines are used in lawn and garden, and in small industrial applications. Lourenco noted that farm and construction equipment are preempt from CARB regulations, as the U.S. EPA has sole authority to establish emission standards for these engines.† The SORE regulations were most recently amended in September 2003, when the Board approved more stringent exhaust standards and new evaporative emission requirements.

Lourenco then discussed the progress that has already been made to electrify SORE equipment and thereby reduce emissions from this category, particularly residential equipment. Lourenco continued by stating that while 90% of the SORE equipment population is used in residential applications, residential equipment is responsible for only 32% of the estimated 2007 and later HC+NOx emissions. Lourenco then presented a slide showing that as of calendar year 2000, 40% of all residential lawn and garden equipment was already electric powered. The highest concentration of electric equipment (nearly one third) is in the leaf blower/vacuums category. Nearly half of all equipment in the trimmer/edger/brush cutter category is electric, as are nearly one-third of all chainsaws. Other equipment categories for which an electric alternative is currently available include walk-behind mowers, battery-powered tillers and mowers, and riding

* The staff report is available on the CARB website at <http://www.arb.ca.gov/msprog/offroad/sore/sore.htm>

† The 1990 amendments to the federal Clean Air Act preempt California control of emissions from new farm and construction equipment under 175 horsepower.

mowers and tractors. As discussed in greater detail below, the proportion of electric vs. gasoline or Diesel lawnmowers is smaller than that in any of the other lawn and garden equipment categories—a circumstance that automatically makes lawnmowers the most likely target for programs designed to encourage a switch to electric power, said Lourenco. She then presented a series of slides, shown below in Table 1, providing a general side-by-side comparison of the basic differences in price and performance between three key categories of gasoline vs. electric SORE equipment.

Table 1 Comparison of Selected Electric vs. Gasoline SORE Equipment			
Equipment Type	Technology Type	Cost Range	Performance Cutting Path
String Trimmers/ Brush Cutters	Electric Corded	\$20 - \$65	7" – 17"
	Electric Cordless	\$80 - \$145	7" – 17"
	Gasoline-powered	\$55 - \$700	15" – 24"
Hedge Trimmers	Electric Corded	\$25 - \$180	6" – 22"
	Electric Cordless	\$55 - \$90	6" – 22"
	Gasoline-powered	\$140 - \$500	17" – 40"
Typical Lawn Mower	Electric Corded	\$179	Up to 19"
	Electric Cordless	\$440	Up to 19"
	Gasoline-powered	\$250	21" – 48"

Lourenco then summed up the general advantages and disadvantages associated with electric lawn mowers, as compared to gasoline mowers. The disadvantages include a limited range, reduced power, and for cordless models, required charging time, increased weight, and additional expense. The advantages include quiet operation, no refueling, low maintenance, good durability and, of course, zero emissions. Lourenco said the total lifetime* HC+NOx exhaust and evaporative emissions for a comparable pre-2007 and a 2007 or later gasoline-powered mower are about 38 pounds, and 11 pounds, respectively.

Lourenco next briefly outlined seven potential electrification strategies evaluated by the staff. These are discussed below and the results of the CARB staff's evaluation are summarized in Table 2.

1. Residential Electric Purchase Requirement – This strategy was suggested by the South Coast Air Quality Management District (SCAQMD), and would require a specific percentage (30% was suggested) of new residential lawn and garden equipment sold to be electric. This would apply to all lawn and garden equipment, rather than just lawnmowers. Retailers would not be allowed to sell non-electric equipment to

* CARB assumes an average 12-year useful life for lawn mowers.

Table 2 Feasibility of Potential SORE Control Measures			
Potential Control Measure	Feasibility Rating	2010 HC+NO _x Benefit (tpd)	Cost-Effectiveness (\$/lb HC+NO _x)
Residential Electric Requirement	Low	0	\$0
Residential Usage Requirement		3.2 – 10.1	\$14 - \$39
Lower Fleet Average Standard	Medium	0.2	\$4 - \$16
Zero Emission Mandate		0.2	\$4 - \$16
Manufacturer Scrap Program		1.1	\$9
Consumer Awareness	High	1.7	\$10 - \$18
Incentive Programs		1.1	\$9 - \$18

homeowners and other non-commercial users. Staff's evaluation showed that this strategy would be difficult to enforce, and would place an unfair burden on equipment retailers. In addition, staff notes that the percentage of electric lawn and garden equipment sales (as opposed to lawn mower sales) is already over 30 percent.

2. Residential Weekend Usage Restriction – This option would restrict the use of residential lawn mowers on weekend days (when 96% of residential mowing occurs), or on weekend days with predicted high ozone levels. It has been effective in reducing lawn and garden equipment use by 8% in the Bay Area, on a voluntary basis. The assumption is that gasoline mower use would either switch to weekend days, when ozone levels are typically lower, or would be replaced with electric mowers that could be operated without restriction. The staff feels that enforcement of this strategy would be difficult, but that it offers a potentially significant benefit of 3 tons per day for every 10% of owners who switch to electric instead of current gas-powered mowers. Staff's cost-effectiveness rating for this strategy is moderate to poor, however, depending on the type of electric mower purchased.

3. Lower Fleet Average Standard – This strategy would require manufacturers to produce either electric or some combustion engines that are much cleaner than current new engines, in order to meet a lower fleet average standard. Lourenco said the biggest problem with this approach is that it unfairly penalizes those manufacturers that do not currently make electric motors, and might consequently cause some manufacturers to leave the California market entirely. The staff predicts this strategy would result in relatively low emission benefits (< 1 tpd), and would have a moderate cost-effectiveness.

4. Zero Emission Mandate – Similar to the Zero Emission Vehicle (ZEV) mandate for passenger vehicles, this strategy would require a specified percentage of an equipment manufacturer's production of residential lawnmowers to be electric. However, the staff believes that because the majority of manufacturers do not currently make an electric

mower, and because homeowners could easily purchase gas-powered commercial equipment, this strategy would offer a relatively low emission benefit (<1 tpd) with only moderate cost-effectiveness.

5. Manufacturer Scrap Program - This is another strategy suggested by the SCAQMD, which would require engine manufacturers to acquire and scrap used gas powered mowers, equal in number to a given percentage of their new sales. In addition, the District suggested that an individual who scraps an old mower would be given a voucher that could be used toward the purchase of an electric mower. The staff feels that neither strategy guarantees the purchase of an electric mower, unless a zero emission voucher is specified, and rates it as having a low emission benefit (< 1 tpd) with a moderate cost-effectiveness.

6. Consumer Awareness and Information – This strategy would essentially be a statewide version of the voluntary “Spare the Air” program in operation in the Bay Area, which has resulted in an 8% reduction in lawn and garden equipment use in the Bay Area Air District. As discussed in item #2, this is basically a media campaign encouraging a voluntary reduction in activities that cause pollution (such as lawn mowing) on those days when the ozone levels are predicted to be high. Several other air districts also operate similar voluntary programs. The staff believes a statewide program would produce moderate (< 2 tpd) benefits, but that such a media campaign would require significant resources.

7. Incentives, Rebates, Trade-ins – This strategy refers to programs that involve offering vouchers to owners of old gasoline-powered mowers, which can then be used toward the purchase of an electric mower. The staff says these programs are popular, and that the demand is generally greater than the number of vouchers available through current locally administered programs. In addition, the high visibility of such programs is a plus for consumer awareness. The staff also believes, however, that the emission benefits associated with such a program are low (< 1 tpd) and note that it would require a new source of funding.

In conclusion, Lourenco said the staff has determined that all of the above strategies to increase the use of electric lawn mowers offer small emission benefits, and are fairly costly compared to other strategies. Of those strategies considered, the incentive and consumer awareness programs appear to be the most feasible, although they would require significant new financial resources to implement.

Discussion

Following Lourenco’s presentation, Board member Doreen D’Adamo commented that she thought the staff report on this item was missing the “gung-ho ZEV attitude” seen in other CARB rulemaking efforts, and that the report should include more long-term solutions to the problem of lawnmower emissions. She also said that the size and effectiveness of cell phone and portable computer batteries had improved dramatically in

the past few years, and suggested that those improvements may translate to lawnmower applications as well. D'Adamo also said she would like the staff to continue investigating this issue, and report its findings back to the Board. Chairman Lloyd then seconded D'Adamo's request for further staff reports, which were promised within two or three months.

Outdoor Power Equipment Institute, Inc (OPEI) – Ronald Lloyd, representing both the Toro Company and OPEI, said Toro is one of a dozen manufacturers that provide electric equipment to the California market. He reported that sales for electric equipment have dropped over the last few years, and that Toro would no longer carry electric mowers or hedge clippers. According to Lloyd, larger electric equipment such as mowers and hedge trimmers were too small for general acceptance (vs. comparable gasoline models), didn't live up to customer's performance expectations, and cost more than comparable gas equipment. Lloyd said electric lawn mowers are more popular in Europe than in the U.S., because smaller average lot sizes and more available power at residential electrical outlets in Europe make them a more practical choice. Regarding the specific strategies explored in the staff report, Lloyd said neither Toro nor OPEI supports regulations that impose taxes or that force the production or sale of electric products that exceed customer demand. However, Toro and OPEI do support the education process for the conversion to electric power, within the capability of available electric products.

Following Lloyd's remarks, CARB Chairman Lloyd asked about Toro's estimate for the average lifetime of a gasoline mower, which Ronald Lloyd answered would be eight to ten years, assuming good maintenance. Supervisor DeSaulnier then asked whether the fact that California residential lot sizes tend to be smaller, similar to those in Europe, would mean Toro could separate California from the rest of the U.S. market regarding sales of electric equipment. Lloyd replied it could not.

MacLaine Manufacturers – Plant Manager Larry Allen said his company is the largest California-based lawnmower manufacturer. He said MacLaine has offered electric lawnmowers for sale for the last 12 years, but that they are not well suited for customer needs. They have limited mowing times, have problems cutting tougher varieties of grass, have to be replaced every few years, and have ongoing maintenance problems. He said a mandatory electric lawnmower program would be very bad business for his company.

Following MacLaine's comments, Lloyd reminded everyone that this was an informational item and that the Board is not planning to implement a ZEV mandate for lawnmowers, but rather is simply looking for ways to lower SORE emissions.

California Electric Transportation Coalition – Dave Modisette said he had not had time to completely evaluate the staff report for technical content and policy, but that he does not think it adequately assesses the environmental benefit associated with electric equipment use. He also said he feels that manufacturers who make electric equipment should be somehow rewarded, and disagreed with the conclusion that the staff analysis indicates that informational programs are the most best approach currently available. CARB Chair

Lloyd told Modisette that the Board had already directed the staff to work with stakeholders on a white paper to continue investigating the practicality of electric SORE strategies, and that he hoped Modisette would participate in that process.

BIPV Consulting – Steve Heckerth said he designs and builds electric tractors, and essentially presented a sales pitch to the assembled stakeholders. He said tractors are uniquely suited to electric power because electric motors have maximum torque at zero RPMs, and because the extra weight of the batteries which is a problem for light-duty vehicles, is an asset in a tractor.

Following the speakers, Chairman Lloyd commented that the Board's last experience with OPEI was not positive (please see the October 2003 issue of *CVS News* for details), but that he hoped to correct that and establish a good working relationship through the current effort. And, toward that end, Lloyd added that he was encouraged by what he heard during OPEI's testimony.

Analysis

As noted by Board member D'Adamo, CARB staff's lack of a "gung-ho" attitude for mandating the production and sale of electric powered substitutes with inferior performance for products traditionally powered by internal combustion equipment could be viewed as surprising. Unlike other applications, however, such as motor vehicles where CARB's failed ZEV mandate attempted to force development of electric product where none existed, electric products have long been available in the SORE market. Even the CARB staff apparently realizes that electric SORE equipment is being used in the absence of government intervention where it makes economic sense and that there are practical reasons why customers do not buy electric equipment for certain applications. Unfortunately, despite its experience with the ZEV mandate, the Board members still don't seem to understand why trying to force manufacturers to produce and attempt to sell products that consumers have already shown they don't want is a recipe for disaster.

CARB Hears Results of Collaborative Study of CNG and Diesel Transit Bus Emissions

At the April 22 Board meeting, the staff of the California Air Resources Board (CARB) presented the results of a collaborative study of Diesel and CNG transit bus emissions to the Board* as an informational item. This report is one of a series of reports to the Board spawned by CARB's staff's inability to support the conclusion that exhaust emissions

* The report is available on the CARB website at <http://www.arb.ca.gov/research/cng-diesel/cng-diesel.htm>.

from CNG buses were less toxic than Diesel emissions at a December 2000 hearing on “Lower Emission” School Buses (see the January, 2001 issue of *CVS News*). Following emissions testing, CARB was forced to report to the Board, in April 2002 (see the May 2002 issue of *CVS News*), that a trap-equipped Diesel bus had dramatically lower emissions of both particulate matter and toxic compounds. Since then CARB has continued research in the area that appears to have been intended to generate data to reverse the finding that emissions from Diesel buses were of less concern than those from lower CNG buses. This report to the Board summarized all of the data generated to date.

Staff Presentation

Following the usual introductions from CARB Chairman Lloyd and Executive Officer Catherine Witherspoon, Roberto Ayala of CARB’s Research Division delivered the staff presentation. Ayala first acknowledged that this study was a multi-division effort within CARB, as well as a collaborative effort between CARB and other agencies. He presented the matrix shown below in Table 3, which outlines the five different bus configurations that were ultimately tested. The two Diesel configurations included either a Diesel oxidation catalyst (DOC) or a catalyst-based Diesel particulate filter. Two of the three CNG configurations included oxidation catalysts while the third used no aftertreatment devices. According to Ayala, these configurations are typical of those used by the Los Angeles Metropolitan Transit Authority (LAMTA).

Table 3				
CARB CNG vs. Diesel Transit Bus Test Subjects				
Tech Type	Model Year	Engine Make	After-treatment	Fuel
Diesel	1998	DDC-S50	DOC	ULSD
			CB-DPF ^a	
CNG-1	2000	DDC-S50G	None	CNG
			OC	
CNG-2	2001	Cummins-Westport C-Gas Plus	OC	CNG

^a The catalyst-based Diesel particulate filters were manufactured by Johnson-Matthey.

The vehicles were chassis dynamometer-tested at CARB’s heavy-duty emissions testing laboratory in the Los Angeles area, continued Ayala, with a focus on criteria pollutants and selected toxics. Ayala showed a figure that plotted total NO_x emissions (g/mi) against total PM emissions (mg/mi) for the five bus/control technology configurations listed in Table 3. The Diesel bus with the particulate filter showed the lowest total PM emissions, somewhere in the neighborhood of 15 mg/mi for the Diesel bus equipped with a particulate filter vs. 20 mg/mi for the CNG bus with an oxidation catalyst. (The figure

lists “background” PM as 10 mg/mi.) The CNG buses, however, showed significantly lower NO_x emissions than either of the Diesel buses—about 15 g/mi compared to the approximately 30 g/mi for the Diesels. Presumably this was meant to show that the controlled CNG buses compare favorably with a trap-equipped Diesel engine with respect to PM emissions and still have much lower NO_x emissions. Given that the Diesel bus engine was certified to the 4.0 g/bhp-hr NO_x standard, however, it is not at all clear that future CNG engines will have lower NO_x emissions than Diesel buses.

Ayala also presented a slide showing that the composition of Diesel PM is highly dependent on duty cycle, with the fraction of organic to elemental carbon increasing as the aggressiveness of the duty cycle increases. This does not appear to be true, however, for the PM composition associated with either Diesel trap PM or CNG PM, both of which show similar fractions of organic vs. elemental carbon for all duty cycles studied.

In order to throw some cold water on the idea that trap-equipped Diesel engines are superior to CNG engines, Ayala then presented data showing that the ratio of NO₂ to total NO_x from trap-equipped engines is about 50%, in contrast to the value of about 10% that is characteristic of engine-out emissions from Diesels. Ayala said this illustrates that NO₂ slip is a potential problem, and that staff is investigating the possibility of promulgating an NO₂ emissions limit for Diesel engines. Ayala noted that high NO₂ to total NO_x ratios are not a problem with CNG engines, with or without the presence of a catalyst. However, the increase in NO₂ to total NO_x ratio has been raised numerous times and is a relatively minor issue as noted by staff in February of this year (see the March issue of *CVS News*) when it recommended to the Board that it delay a limit on the allowable ratio of NO₂ to total NO_x from retrofit trap-equipped Diesel engines from 2004 to 2007.

Ayala presented several more figures, comparing emissions of total carbonyls, VOCs, polycyclic aromatic hydrocarbons (PAHs), and mutagens, as well as the size distribution of ultrafine (< 100 nanometer) particles, for the five bus configurations tested. All of these figures showed that the trap-equipped Diesel engines have emissions comparable to or lower than those of even the CNG buses equipped with oxidation catalysts.

With respect to mutagenicity testing, Ayala also had to explain why the results for the newest oxidation catalyst equipped CNG bus were far higher than for either the trap-equipped Diesel bus or the older CNG bus with an oxidation catalyst. According to Ayala, staff suspects that lube oil consumption by this engine may be the culprit but cannot definitively prove that conclusion.

Discussion

Following Ayala’s testimony, Dr. Friedman asked the staff whether it had investigated the possibility of listing CNG PM exhaust as a TAC. Ayala replied that there has been no formal investigation, but the staff has “pondered the question” of CNG PM health risks.

Board member McKinnon then asked about the staff's theory regarding lube oil consumption being responsible for some of the unexpectedly high emissions from the newest CNG engine. The staff answered that the "oil management strategy" for a CNG engine is different from that for a Diesel engine and added that Cummins Westport has since re-designed the oil management strategy for this engine, which has successfully reduced its oil consumption. No additional test data were presented, however, to demonstrate that reduced oil consumption had altered the previously observed results.

Next, Board member William Burke asked if the fact that the Board encouraged LAMTA several years ago to buy over 300 CNG buses without oxidation catalysts—buses that this research has shown have high levels of certain regulated and non-regulated pollutants—damages CARB's credibility. Lloyd answered that the important thing to remember is that both CNG and Diesel with the aftertreatment provide significant air quality benefits. He also said that the fact that industry and the South Coast Air Quality Management District (SCAQMD) discovered the high formaldehyde emissions coming from CNG engines, and immediately determined that aftertreatment could address that problem, was a "very positive thing." And, likewise, the identification of NO₂ emissions on the Diesel side means the industry will be looking at various aftertreatments to deal with that. Lloyd said he thinks it is "exciting to see science at work" in these instances, and that the tough stance on natural gas taken by CARB and the SCAQMD has benefited everyone. In particular, Lloyd said, "I think it has benefited the industry, because we have that competition " between CNG and Diesel.

McKinnon then commented that he does not view the CARB study as an opportunity to question past decisions by the Board, and that before clean Diesel was available, CNG was unquestionably the cleaner of the two fuels. He also said that once the lube oil question is resolved, he is confident that CNG will once again be the cleaner of the two fuels, and that he appreciates the staff's work to make sure that all of the Board's decisions are based on the most rigorous science currently available.

South Coast Air Quality Management District – Chung Liu, Deputy Executive Officer for Technology Advancement, said the SCAQMD provided some oxidation catalysts for this study, and thanked CARB for sharing the results. He also noted that he did not see any evidence that CNG is not as effective (presumably with regard to its emission reduction potential) as Diesel.

The District's Health Effects Officer, Jean Ospital, discussed the results from several other related studies. He cited the EC Diesel Study, which he said yielded results very similar to the CARB study, except that it found higher mutagenicity results, which he also said may be attributable to lube oil.* Ospital also discussed the West Virginia University Study,[†] which sought to optimize and demonstrate catalysts for further emissions

* The EC-Diesel Study is an industry and government partnership focusing on the evaluation of an ultra-low sulfur Diesel fuel called Emission Control Diesel, or EC-Diesel, developed by ARCO (a BP company).

[†] This study, by Lubrizol Engine Control Systems (ECS), was funded primarily by the SCAQMD. The ECS team consisted of Environmental Canada and West Virginia University.

reductions from heavy-duty CNG engines. According to Ospital, the results showed that oxidation catalysts removed 99.8% of the CNG exhaust PM, a success rate that he said could not reasonably be expected to be duplicated under real-world conditions.

PG&E – Senior Manager of PG&E’s Clean Air Transportation Program, Sam Altshuler, said CARB should be commended for conducting a study that opened the door for tomorrow’s concerns. He said PG&E recommends further research on PM <1 micron, regarding the impact of using synthetic lube oils and optimizing additive packages for lube oils. Additional research and modeling of the impact of NO₂ is needed, said Altshuler, as well as additional mutagenicity testing.

Analysis

Although CARB staff has conducted a large-scale research program, it has still been unsuccessful, as evidenced by Board member McKinnon’s comments, in reestablishing the politically correct notion that emissions from CNG vehicles are more benign than those from trap-equipped Diesel engines. In addition, the staff failed to note that the one advantage CNG engines have at the moment—lower NO_x emissions—will be eliminated by the use of NO_x aftertreatment devices on Diesel engines to meet the U.S. EPA’s 2007 standards. The silence regarding CARB staff’s plans to adopt a “CNG Risk Reduction Program,” analogous to the previously adopted Diesel Risk Reduction Program that is forcing traps on Diesel engines, was also deafening. This is obviously just another area where CARB is focused more on being politically correct than on improving air quality.

CARB Holds Workshop on ATCM to Limit Idling of In-Use Commercial Heavy-Duty Diesel Engines

On April 28, 2004, the California Air Resources Board (CARB) held another in a series of workshops on a proposed Air Toxic Control Measure (ATCM) to restrict idling of in-use heavy-duty Diesel (HDD) vehicles. The proposed ATCM will limit idling to five minutes per location for all commercial* Diesel-powered heavy-duty vehicles operating in California, and will apply to vehicles registered out of state, and out of country, when they are operating in California. As we have reported previously,[†] the measure is intended to become effective on January 1, 2009 for vehicles with sleeper berths, and upon approval by the Office of Administrative Law (OAL) for all other vehicles. The

* The staff did not define “commercial” in this context, but we presume it has the same meaning used by the California Department of Motor Vehicles, i.e., used to transport persons for hire, compensation, or profit, or designed and used primarily to transport property.

[†] Please see reports on heavy-duty Diesel idling in the January, February, March, and April 2004 issues of *CVS News*.

staff says the delayed implementation for vehicles equipped with sleeper berths is necessary to allow planning and implementation of the necessary infrastructure, for instance, to supply electrification at truck stops.

In an important but unmentioned change from the previous version of the proposal, the measure will now apply to vehicles with Gross Vehicle Weight Ratings (GVWR) greater than 10,000 lbs (down from > 14,000 lbs). During last month's workshop, there were verbal indications that the staff was considering such a change, to provide consistency with the school bus idling regulation, but nothing was said about making the change in the period between workshops.

Staff Presentation

The meeting was conducted by personnel from the Stationary Source Division (SSD), including Michael Tollstrup, Chief of the Project Assessment Branch; John Kato, Manager of the Project Support Section under Tollstrup; and Mike Sutherland and John Gruszecki of their staffs, plus Aron Livingston of the legal staff.

Sutherland began the presentation by saying that, on all issues related to the ATCM, the staff is "actively soliciting input" from stakeholders. He went on to say that CARB has estimated statewide idling emissions—from the affected fleet, while operating in California—at 450 tons per year (tpy) of particulate matter (PM) and 21,700 tpy of NO_x in 2005. This estimate comes from the EMFAC2002 model, Sutherland said. In 2005, the affected fleet is estimated to consist of 179,838 Heavy Heavy-Duty vehicles, 177,598 Medium Heavy-Duty vehicles, 36,263 Light Heavy-Duty-2 Vehicles, and 15,562 Buses, he said.*

Draft ATCM Requirements – Sutherland stated that the ATCM would be applicable to all commercial Diesel-powered vehicles > 10,000 lbs GVWR operating in California and to out-of-state and out-of-country vehicles when operating in California. The following requirements, he said, have not changed since the last workshop:

- A vehicle shall not idle longer than 5 minutes at any location.
- Buses (except school buses)
 - Are subject to 5 minute idling limit when no passengers are on board.
 - May idle up to 10 minutes prior to passenger boarding.
 - No idling restrictions imposed when passengers are on board.

* It should be noted that these emissions estimates are higher than earlier ones partly because "Light Heavy-Duty-2" vehicles will now be subject to the regulation. "Affected fleet" in this context means vehicles operating in California on any given day, and includes those registered out of state.

Changes to Draft ATCM – Mike Tollstrup took up the presentation at this point. He listed the following changes being considered by the staff:

- Within 100 feet of any residential, planned community, neighborhood commercial, or community-business zone or district
 - All idling restrictions apply
 - No queuing of idling vehicles allowed
 - No implementation delay for sleepers (i.e., the 5-minute idling limit is in effect right away)
- Sleepers:
 - Idling restrictions during rest periods become effective January 1, 2009
 - Alternatives to provide power to sleepers are currently available
 - Alternatives depend on age of truck and owner/operator preference
- Sleeper options:
 - No idling, as environmental conditions allow
 - Off-board truck stop electrification, e.g., IdleAire
 - On-board truck stop electrification, i.e., “shore power”
 - Hotel
 - Auxiliary Power Systems
 - Main truck engine
 - If a certified low idle-emission engine, e.g., < 40 g/hour NO_x for extended idling
 - Equipped with Level 3 PM control device or equivalent

Sutherland ended the staff presentation with scheduling information—there will be another workshop, then the 45-day Public Notice of the proposed regulation will be published in June, to accommodate a July Board hearing on the proposal. He encouraged written comments on all issues of concern to stakeholders.

Discussion

Attending the workshop were representatives of the trucking industry (California Trucking Association and American Trucking Association), Waste Management Inc., truck stop operators, the Sacramento Metropolitan Air Quality Management District (SMAQMD), the Sacramento Municipal Utility District (SMUD), and the California Electric Transportation Coalition. Discussion was relatively minimal, and confined mostly to questions about definitions and applicability. A representative of SMAQMD said that the district is trying to get Sacramento area governments to adopt ordinances to

limit idling, and asked how such ordinances would “interface” with the CARB ATCM. Livingston said that the more stringent requirement would have precedence.

The SMUD representative asked for a definition of “community business zone” as it is used in the proposed measure. John Kato said that the term is used by planning agencies to refer to smaller commercial zones located near residential areas. The intent of the proposed prohibition of idling within 100 feet of such areas, Kato went on, is to minimize emissions impacts on residents. He asked participants to help the staff clarify language in any part of the proposed ATCM that may be unclear.

Analysis

The minimal level of discussion and absence of any confrontational comment during this workshop indicate that stakeholders support, or are resigned to, the proposed ATCM.

California Environmental Policy Council Approves Use of PuriNOx Alternative Diesel Fuel and California Diesel Fuel Amendments

On April 30, 2004, the California Environmental Policy Council (Council) met to consider two staff reports: (1) a multimedia evaluation of Lubrizol’s application for verifying PuriNOx alternative Diesel fuel; and (2) a multimedia evaluation of the amendments to the California Diesel fuel regulations. The Council voted unanimously to approve both fuels for use in California. The Council agreed with findings that the limited and controlled use of PuriNOx formulations do not have a significant adverse impact on public health and the environment, as compared to California Diesel fuel. This finding is, however, conditioned on Lubrizol’s providing additional information and studies to fill current gaps in available information regarding the fuel’s toxicity and other long-term effects. The Council’s approval was the final step in Lubrizol’s application for the verification of its PuriNOx fuel under CARB’s Diesel Retrofit In-Use program.

The Council also unanimously approved the multimedia evaluation of CARB’s 2003 amendments to the California Diesel fuel regulations, which will go into effect in June 2006. That evaluation found that the low sulfur Diesel fuel specifications approved in 2003 do not have a significant adverse impact on public health and the environment, as compared to current California Diesel fuel.

This was only the second meeting of the Council; the first was in January 2000, when it considered studies pursuant to the Governor’s order to remove methyl tertiary-butyl ether (MTBE) from California gasoline (please see the related article in the February 2000 issue of *CVS News*). The Council was established in 1993 for the purpose of designating

the consolidated permit agency for any proposed project that requires a permit from more than one environmental agency in California. In particular, CARB is required to obtain approval from the Council before approving any regulations that include motor vehicle fuel specifications.* As specified when established, the Council is to consist of the head of the California Environmental Protection Agency (CalEPA) and the leaders of CalEPA's six Boards, Departments, and Offices. The current members are Terry Tamminen, Secretary of the California Environmental Protection Agency (CalEPA); Dr. Alan Lloyd, Chairman of the California Air Resources Board (CARB); Arthur Baggett, Jr., Chairman of the State Water Resources Control Board (SWRCB); Linda Moulton-Patterson, Chairwoman of the California Integrated Waste Management Board (CIWMB); Joan Denton, Director of the Office of Environmental Health Hazard Assessment (OEHHA); Edwin Lowry, Director of the Department of Toxic Substances Control (DTSC); and Paul Helliker, Director of the Department of Pesticide Regulation (DPR).

Multi-Media Evaluation of Lubrizol's PuriNOx Water/Diesel Emulsion

Following some fairly standard introductions from Tamminen and other members of the Council and their various staff, Dean Simeroth—Manager of the Fuels Section of CARB's Stationary Source Division—outlined the process and significant considerations regarding the multi-media evaluation of PuriNOx. CARB was the agency charged with coordinating the multi-media evaluation.

Simeroth began by stating that “the reason we're here” is that the California Health and Safety Code requires the following:

- Multimedia evaluation, which shall include assessments and subsequent peer review of:
 - Emissions of air pollutants including ozone-forming compounds, particulate matter, toxic contaminants (TAC), and greenhouse gases;
 - Contamination of soil, surface and ground water; and
 - Disposal or use of byproducts and waste material from the production of the fuel.

Furthermore, regarding CARB's adoption of motor vehicle fuel specifications Simeroth said that it is the Council's responsibility is to determine whether a significant adverse impact on public health or the environment may result from CARB's actions. If the

* Health and Safety Code Section 43830.8 requires that CARB may not adopt any regulation that establishes a specification for motor vehicle fuel unless that regulation, and a multimedia evaluation conducted by affected agencies and coordinated by the state board, are reviewed by the California Environmental Policy Council established pursuant to subdivision (b) of Section 71017 of the Public Resources Code.

Council finds no significant impact, said Simeroth, the proposed regulation or application stands as approved by CARB. If, however, the Council does determine a significant adverse impact, the Council must then recommend alternative measures to reduce or mitigate those impacts.

After making some general comments about the risk from Diesel PM, which accounts for 70% of the toxic risk from all TACs, Simeroth briefly outlined the basic tenets of CARB's In-Use Diesel Retrofit program—the program through which Lubrizol is seeking approval for the use of its PuriNOx Diesel fuel. As can be inferred by its name, this program seeks to reduce Diesel PM from in-use vehicles through the use of retrofits. All retrofit technologies (which include alternative Diesel fuels) must be verified in order to establish the performance and availability of the controls. The procedures used to verify the various technologies are spelled out in CARB's retrofit verification program, which was adopted by CARB in May 2002.* The retrofit verification program, continued Simeroth, establishes three levels of PM reduction performance for verifying the controls for specific engine types. The levels, and number of hardware technologies currently verified under each, are shown in Table 4.

Table 4			
CARB Retrofit Verification Program - Requirements and Current Status			
Control Level	Required PM Reduction	Required NOx Reduction	Number of Verified Technologies
Level 1	≥ 25% PM reduction	≥15% NOx reduction	2
Level 2	≥ 50% PM reduction		0
Level 3	≥ 85% PM reduction		6

Simeroth said Lubrizol's PuriNOx Diesel water emulsified fuel would qualify as a Level 2 (i.e., 50% minimum PM reduction) technology, which is an option currently missing from the list of currently verified technologies, as noted in Table 4.

PuriNOx Verification – Simeroth said PuriNOx is an alternative Diesel fuel that can be used in Diesel engines without engine modifications. It is a Diesel fuel/water emulsion technology, of which 80% is Diesel fuel and 20% is a combination of water and Lubrizol's patented additive package. Simeroth said the additive package, which is required to form the Diesel-water emulsion, was the real focus of the multi-media evaluation.

* Please see the June 2002 issue of *CVS News* for details.

Simeroth said the presence of water in the Diesel fuel creates a water micro-explosion phenomenon, and promotes an even spray pattern for a more complete combustion process. The water also reduces the combustion temperature, which in turn reduces NOx emissions. It also delays combustion, which results in reduced PM emissions. PuriNOx is blended at the terminal, continued Simeroth, and requires dedicated storage tanks. For these reasons, Lubrizol has targeted centrally fueled fleets and is not currently pursuing any retail sales outlets for its product. In 2002, there were two million gallons of PuriNOx used in California, and 3.5 million gallons will be used by the end of this year. Simeroth also noted that Lubrizol has the capacity to produce up to 35 million gallons in California—a figure that represents about 1% of the current California Diesel market. If approved, PuriNOx will be the only alternative fuel verified as an in-use retrofit technology by CARB. It will produce significant reductions in both NOx and PM, and will have a wide range of both on- and off-road applications. Start-up costs are low, compared to hardware retrofit options, said Simeroth, and it requires no modification of the engines in which it is used.

Results of Multi-Media Working Group – Simeroth then briefly described the results of CARB's evaluation of the air quality impacts associated with the use of PuriNOx. He was followed by staff members from the other three agencies in the working group delivering their respective summaries. CARB was charged with coordinating the evaluation and assessing the air quality impacts; the SWRCB was assigned to assess the surface and groundwater impacts; OEHHA determined the potential human health impacts; and the DTSC assessed the potential hazardous waste concerns.

CARB Evaluation - Simeroth said the CARB staff based its assessment on a relative comparison to CARB Diesel fuel. As part of its evaluation, staff considered criteria pollutants (i.e., NOx, THC, CO, and PM), air toxic emissions (i.e., Diesel PM, additives, and other toxics), and greenhouse gases (i.e., carbon dioxide and black carbon). Simeroth said the results of the staff's findings could be summarized as follows:

- PuriNox significantly reduces PM and NOx emissions in Diesel exhaust;
- PuriNOx significantly reduces the health risk from PM, a TAC in Diesel exhaust; and
- PuriNOx lifecycle emissions are expected to be similar to those from conventional Diesel fuel.

Following his prepared remarks, Simeroth fielded several questions from members of the Council. Edwin Lowry, Director of the Department of Toxic Substances Control, said he felt there were still too many unanswered questions, and asked how much importance the staff assigned in its evaluation to the fact that Lubrizol plans only small-scale PuriNOx operations. Simeroth answered that if Lubrizol were planning an immediate, widespread distribution of PuriNOx, CARB would not be recommending the Council's approval. Simeroth said the staff feels that the low production volume, the relatively benign

chemicals involved (six separate components in the additive package), and the upgrades in underground storage tanks undertaken over the past couple of years, all add up to a relatively low spill risk and a low contamination risk in the event of a spill.

Secretary Tamminen then asked Simeroth what the predicted risk would be in the event of a spill, given that PuriNOx has greater solubility than Diesel. Simeroth and other members of the evaluation team answered that not all of the evaluation results had been completed, including the one that measures aquatic toxicity, as was discussed in the next presentation.

SWRCB Evaluation – James Giannopolous of the SWRCB staff contracted with the Lawrence Livermore National Laboratory (LLNL) to review data supporting the Lubrizol report on potential water impacts associated with the use of PuriNOx. He said that the SWRCB based the following recommendations on a multimedia evaluation report from Lubrizol and the LLNL review.

The SWRCB found that the risks to the water environment are minimal and acceptable given the limited and controlled use of PuriNOx. It recommended that the following tasks be conducted expeditiously to address uncertainties associated with the additive package:

- Development of analytical methods for PuriNOx components of greatest concern;
- Improved soil column studies;
- Biodegradation studies;
- Aquatic toxicity testing; and
- Assessment of actual environmental distributions after a known release of PuriNOx additive or PuriNOx fuel.

OEHHA Evaluation – Dr. Karlyn Black presented the results of the OEHHA evaluation. She said OEHHA still has some major concerns about the potential toxicity of PuriNOx, but that overall the benefit from the reduction of PM and NOx appears to outweigh the risks of potential increases in TACs. Specifically, she said the OEHHA scientists conclude that the use of PuriNOx may reduce illness and death due to pulmonary diseases, including lung cancer in adults and asthma in children, caused by substances in Diesel exhaust. She added that OEHHA supports recommendations for environmental persistence and toxicity testing made by the SWRCB, and recommends that measurement of nitrosamines in combustion emissions from PuriNOx fuel be required.

Following Black's presentation, DTSC Director Lowry asked what agency had the authority to control the storage and handling of PuriNOx. Simeroth answered storage

would be monitored by both CARB and the local air districts, identically as is done for current gasoline and Diesel facilities.

DTSC Evaluation – The DTSC found that there are no issues that preclude the limited use of PuriNOx while concurrently addressing knowledge gaps.

Peer Review – Simeroth said the findings discussed by the four agencies involved in the multimedia assessment were peer reviewed by a panel of experts from University of California. They supported the conclusions reached by the multimedia working group (summarized below), and also supported their recommendations to conduct studies concurrent with limited use of PuriNOx.

Following the presentations from the individual members of the multimedia working group, Simeroth gave a short presentation on their joint recommendations. He said the group found that the limited and controlled use of PuriNOx formulations does not pose a significant adverse impact on public health and the environment, as compared to California Diesel fuel. Simeroth added that these findings were to be conditioned on Lubrizol's providing additional information and conducting studies to fill the knowledge gaps, according to a prioritized schedule. He said Lubrizol agreed to provide the additional information at set dates over the next six months to seven years, according to a slightly modified schedule. Further, Simeroth said that in the event a short-term study indicates a significant risk, the supplemental biodegradation and aquatic toxicity studies would be conducted on an expedited schedule. In the event any of these studies indicate that PuriNOx poses a significant risk, he said, its use would be reviewed by the Council for consideration.

Testimony – Lubrizol's Environmental Policy and Regulatory Affairs Director Kimberly Jones spoke briefly about some specifics related to PuriNOx. She said that only two of the approximately 20 storage sites were below ground. She also said that the chemicals in the additive package, the specifics of which are confidential business information, are chemicals that are already widely used.

Following Jones' remarks, CARB Executive Officer Catherine Witherspoon said she saluted Lubrizol for its environmental commitment in getting PuriNOx through the verification process. She said there are other manufacturers of emulsified Diesel fuel who have been waiting to see how this multimedia evaluation would go, before they committed themselves to the process.

Sean Edgar, Director of the California Refuse Removal Council (CRC), said he “does not fully understand the trade-off we’re being asked to make.” He said he was concerned about the risks and remediation costs to refuse removal fleets associated with spilling PuriNOx on a highway or roadway in the event of an accident. He said there are about 1,200 trucks, which will be required to use approximately 1.4 million gallons of PuriNOx annually because it's the only verified technology available for those vehicles, and that he feels very uncomfortable with the unknowns associated with its use.

Following this discussion, each member of the Council thanked the staffs of all the agencies involved in the study for their good work, then voted unanimously to adopt their recommendations regarding the limited use of PuriNOx Diesel fuel.

Multi-Media Evaluation of Amendments to the California Diesel Fuel Regulations

Simeroth again presented the Council with an overview of the background and the findings of the multimedia working group's evaluation of the amendments to the California Diesel fuel regulations, which were adopted by CARB in June 2003. Those amendments, which were driven by the Diesel Risk Reduction Plan adopted by CARB in 2001, added the following specifications to California Diesel fuel:

- Established a sulfur limit of 15 ppmw, effective June 1, 2006*;
- Added one set of alternative equivalent limits as another option for meeting the 10% aromatic hydrocarbon standard; and
- Established a Diesel fuel lubricity standard of 520 microns wear scar diameter (WSD).

Simeroth noted that current Diesel sulfur content is between 120 and 130 ppmw, and that the proposed Diesel fuel lubricity standard listed above would sunset if the ASTM adopts a similar standard. He also said a scientific peer review panel, consisting of experts from the UC system, had reviewed the CARB proposal and agreed with the conclusions regarding the scientific basis for the evaluation, the estimation of emissions benefits, and the lack of significant adverse impacts.

Simeroth then discussed the conclusions of the Interagency Multimedia Fuels Workgroup, which was formed by the Council to evaluate the CARB amendments. That group consisted of CARB, OEHHA, DTSC, and the SWRCB. According to Simeroth, the findings of the workgroup were as follows:

The Environmental Policy Council Workgroup found that the Diesel sulfur limit, equivalent alternative limits, and lubricity standard have no significant adverse impact on public health and the environment compared to the current Diesel fuel regulations.

Simeroth said that the CARB staff therefore recommends that the Council adopt these findings and determine that no further multimedia evaluation is necessary.

* Simeroth noted that current Diesel sulfur content is between 120 and 130 ppmw.

Discussion – Following Simeroth’s presentation, CARB Executive Officer Catherine Witherspoon asked what happens to the sulfur that is removed from the Diesel fuel. Simeroth answered that it is primarily sold to fertilizer companies, and has nearly completely replaced the mined sulfur formerly used for that purpose.

CARB Chairman Alan Lloyd then asked Simeroth about the status of efforts to align the California and federal aromatics standard. Simeroth said the two sides had also discussed aligning the Diesel cetane number, but noted “there is not a lot of progress on either at the moment.” Following this discussion, the Council voted unanimously to approve the recommendations of CARB staff and the Council workgroup.

Immediately following the vote, Secretary Tamminen suggested that the Council meet every six months rather than as needed. The other members of the Council agreed that this was a good suggestion. And, CARB Chair Alan Lloyd suggested that the Council undertake a multimedia evaluation of hydrogen, presumably when used as a vehicle fuel. Following these remarks, the meeting was adjourned.

Analysis

Considering that the Council has a prior history of recommending approval of vehicle fuel constituents while simultaneously indicating that several additional studies are required to adequately address potential adverse impacts (e.g., ethanol as a replacement for MTBE), it is not surprising that it adopted the recommendations to approve the limited use of PuriNOx with similar provisions to continue studying and evaluating its effects. Furthermore, in this case, Lubrizol’s relatively small production capability also minimizes any potential risk.

The fairly rapid dispatching of the Council’s approval of CARB’s 2003 amendments to the California Diesel Regulations is also not unexpected, given that the amendments had no real impact on the basic properties of Diesel fuel other than sulfur content. Clearly the biggest issue that has arisen out of this meeting of the Council is what an organization that hasn’t met in over four years will do to fill the agenda at its now-biannual meetings.

CARB Holds Meeting of Maritime Air Quality Technical Working Group

On April 8, 2004, the California Air Resources Board (CARB) held a meeting of the Maritime Air Quality Technical Working Group, at which the staff presented proposed concepts for reducing emissions of nitrogen oxides (NOx) and particulate matter (PM) from auxiliary engines used on oceangoing vessels. Reducing emissions from oceangoing ships is one of four measures in the State Implementation Plan (SIP) related

to emissions from maritime operations. There have been several workshops or work group meetings on the various measures, including one held in March on harbor craft regulations.*

The staff envisions that statewide regulatory programs for oceangoing vessels will be adopted during 2004–2005, with implementation taking place over the period 2005–2010. The staff presentation, as well as the staff's replies to comments, questions, and discussions by stakeholders, indicates, however, that the CARB staff needs more information on maritime practices and ship operations, and needs to think more about how its proposed regulations may affect those operations. By the end of the meeting, it seemed clear that the staff will be reconsidering many of its proposals. The next meeting on controls for oceangoing auxiliary engines will be in June

Staff Presentation

Dan Donohue, Chief of the Emissions Assessment Branch within SSD, made welcoming remarks, and asked for self-introductions by those in attendance. The meeting was attended by representatives of a wide range of interests. They included regulatory personnel from Environment Canada, the U.S. EPA, the U.S. Maritime Administration, CARB, and three local California air pollution control districts; and representatives of shipping companies, marine engine builders MAN B&W and Wartsila, the Engine Manufacturers Association, Seaworthy Systems, fuel suppliers, and environmental advocacy groups. Also attending were representatives of the ports of Los Angeles, Oakland, Long Beach, and Houston, Texas.

Following the introductions, Peggy Taricco, Manager of the Technical Analysis Section within Donohue's branch, noted that the focus of the meeting was control of emissions from the auxiliary engines used on oceangoing vessels. She mentioned cruise ships and container ships as specific examples. According to Taricco, CARB staff believes that cleaner fuels will provide emission reductions from those engines, but other control options include operational controls, incentive programs, retrofits, and cold ironing. She noted that the staff still is gathering data and that regulatory language would be developed after those data had been collected and reviewed. We will rely heavily on the knowledge and real-world experience of those attending the meeting, she said. Finally, Taricco stressed that CARB is working to involve the U.S. EPA, local air districts, two other West Coast states, and Canada in a cooperative effort to promote consistency in regulations and requirements targeting this source of emissions. Taricco then introduced Paul Milky of the SSD staff, who made the presentation.

Auxiliary Engine Emissions - After noting that this was the fifth maritime workgroup meeting, Milky presented first the magnitude of auxiliary engine emissions. According

* For details on this meeting, please see our article in the April 2004 issue of *CVS News*. The CARB staff has since indicated that the harbor craft rulemaking will be delayed until early next year and that the next workshop will probably be held in July.

to charts he presented, the 2000 emission inventory for ships in the South Coast Air Quality Management District shows 35 tons per day (tpd) of NO_x and 3 tpd of PM. Hotelling operations, the charts indicated, account for 37% (13 tpd) of the NO_x and 27% (0.8 tpd) of the PM. Milkey said that the staff has identified several options for controlling emissions from auxiliary engines, the key ones being use of shoreside electrical power, substitution of marine gas oil (MGO) for heavy fuel oil (HFO), and add-on emission controls. Shoreside power (also referred to as ship electrification) would provide reductions of almost 100% in criteria pollutants, he said. Assuming that auxiliary engines currently operate on HFO, a switch to MGO would yield PM, NO_x, and SO_x (sulfur oxides) reductions of 60%, 6% to 10%, and 90%, respectively, according to Milkey. (Note that the 90% SO_x reduction comes from reducing fuel sulfur level from an assumed 2% in HFO.) Add-on controls produce varying reductions, Milkey said, but he provided no data regarding the magnitude of possible emission reductions.

Control Concepts - Control of emissions from auxiliary engines is “crucial,” Milkey said, because (1) their emissions are a significant proportion of overall ship emissions; (2) the majority of auxiliary engine emissions are released at dockside (which has large near-source health impacts), and (3) there are more control options available for auxiliary engines than for primary ship engines/boilers.

Turning to regulatory concepts, Milkey said that the regulatory development process is iterative, and CARB needs feedback from stakeholders. Because CARB will try to control auxiliary engine operations within California Coastal Waters as well as dockside and within harbors, he presented a slide showing the state and its coastal waters, the boundaries of which, he said, are based on meteorology, which determines whether offshore emissions will be seen on land.

Currently, Milkey said, the staff has these concepts in mind for reducing auxiliary engine emissions: using cleaner fuels, additional controls for “frequent visitors” to California ports, plus provisions providing flexibility. Milkey provided more detail on the cleaner fuel concept, saying that the staff’s idea is to require, beginning January 1, 2006, oceangoing ships to use MGO in auxiliary engines at dockside and in California Coastal Waters. MGO has a sulfur content of 0.2% currently, and on January 1, 2008, the sulfur limit would be lowered to 0.1%, consistent with the current European Union (EU) proposal, Milkey said. This fuel requirement would apply to the Diesel-electric generators on cruise ships, he added. The staff realizes that forcing auxiliary engines to use MGO while dockside or in California Coastal Waters raises several issues that need to be investigated, Milkey said. Among them, he said, are cost, fuel switching procedures, additional tankage and piping, engine compatibility, fuel availability, and safety. There will be a cost impact, Milkey continued, because distillate fuel is more expensive than HFO. The cost-effectiveness of requiring MGO is within the range of other measures adopted by the Board, however, thanks to the significant emission reductions, he said. The staff’s preliminary estimate of cost-effectiveness is \$1,700 per ton of NO_x/SO_x/PM combined, he said, or \$26,000 per ton of NO_x only. When questioned on these figures, Milkey admitted that they reflect fuel cost only, and do not include the cost of additional fuel storage and piping, or engine adjustment.

The staff considers the fuel switching measure to be necessary, Milkey said, since it is technically feasible, is done currently for reasons related to certain engine maintenance operations, and switching fuels in main engines is common, he said, prior to maneuvering in harbors. He noted that many ships will need to add tanks and piping, but if space is not available, then existing tanks can be partitioned. On the issue of engine compatibility, Milkey said that the staff has not identified any specific auxiliary engines that cannot use MGO, and some manufacturers have reported that use of MGO can reduce maintenance costs. The staff still welcomes input from engine manufacturers and others on this issue, he added. The staff believes that MGO is widely available worldwide, but in California its availability may be an issue, and the staff welcomes input on this topic. Safety issues arise from concerns about improperly handled fuel transitions and the possibility of leaks at seals in the piping system when the less-viscous MGO replaces HFO. But since ships already switch fuels for maintenance, Milkey continued, they should be capable of handling both fuels, and any possible problems seem solvable.

Enforcement Cooperation - Milkey said the staff recognizes that its proposed requirements will add to the cost of shipping to and from California ports, thus reducing the ports' competitiveness. For this reason the staff has been pursuing cooperative efforts with regulators in other states and Canada, seeking ways to implement California's maritime strategies throughout the West Coast. Enforcing compliance with the proposed regulations offshore, but in California Coastal Waters, may require coordination with other governmental agencies, Milkey said, without providing examples. Documentation of fuel purchases or fuel sampling may be necessary to ensure that MGO is being used when it should be, he went on.

Frequent Visitors - The staff believes that "frequent visitor" ships "present opportunities" for additional emission reductions, Milkey said, and is trying to decide how to achieve those reductions. Optional requirements for frequent visitors may include cold-ironing, emulsified fuels, and engine retrofit controls, he said. The staff seeks input on the definition of "frequent" in this context, he added. The staff also recognizes that the marine industry is "very diverse," in Milkey's words, and that most ships are one of a kind. Thus the proposed auxiliary engine regulation must include provisions allowing flexibility and alternative compliance that will achieve equivalent emission reductions through alternative means. Adequate flexibility may be achieved by allowing emission averaging, Milkey said, across a single shipping company, for an entire port, or other grouping. He asked for input from stakeholders on the flexibility issue.

Ship Operations Survey - Milkey said CARB soon will send to shipping companies a survey asking for information on the number of visits to California ports by an individual vessel, and information on the main and auxiliary engines, fuel types, and electrical power supply on the ship. A draft version of the survey form was available at the workshop, and Milkey invited the audience to examine it and give the staff their comments and suggestions. To support the regulatory development, he continued, CARB is engaged in evaluations of control technologies, in-use emissions testing, and evaluations of cold-ironing alternatives and auxiliary engine control systems. Milkey

then displayed CARB's by now familiar regulatory development flow chart, which indicates that there are opportunities for public input at every stage of the process. He summarized his presentation by stating that controlling emissions from auxiliary engines is key to California's meeting its emission reduction targets. What he presented today, Milkey stressed, is "just a concept," and should be considered a starting point for discussions. CARB is open to alternatives that would meet the same emission reduction goals, and an extensive public process will be followed, he concluded.

Discussion

Milkey's presentation was followed by a period of discussion, questions by stakeholders, and replies by CARB staff, which replies often were poorly expressed and seemed to reveal a lack of knowledge of the issue. This discussion is summarized below by topic.

Emission Inventory – A representative of the Port of Oakland said that developing a "quality" inventory is an important step in the regulatory process. A baseline inventory will help direct CARB's regulatory efforts, he said, adding that it should include all visits to all ports. He questioned CARB's estimated hotelling emissions inventory, saying that a recent Environmental Impact Report done for the Port stated that 10% of total emissions were due to hotelling. (The CARB estimate, in contrast, is 36% of total emissions.) Since the inventory values go to the heart of cost-effectiveness considerations, the Port urged CARB to make sure they are correct.

T.L. Garrett of the Port of Los Angeles (PLA) said that the inventory presented by CARB is obsolete; PLA's inventory is more like the Oakland figures, he said. In addition, he said, ship electrification, i.e., use of shoreside power, will not reduce emissions by almost 100%, as CARB claimed. Because ships will continue to need to operate their boilers, the actual emission reduction will be in the 70% to 80% range, Garrett said. In response, CARB's Paul Milkey acknowledged that his analysis did not take boilers into account.

Definitions and Terminology – A representative of the South Coast Air Quality Management District said that "frequent visitors" as it will be used in the CARB regulation must be defined. He argued that mere numbers of visits is an improper criterion, because what matters is a ship's contribution to a port's total emissions, which depends on the time spent in port. A shipping company representative said that the frequency of ships' visits to a particular port is highly variable, and it depends on the type of ship and "the vagaries of world trade." A representative of the California Maritime Academy (CMA) said that all ship arrivals and departures are recorded, and that information is readily available. Garrett of PLA noted that the Port records visits, but CARB should consider the hours in port rather than simply the number of visits; available data will permit CARB to determine this, he said. Garrett also said that the term "cold ironing" should be replaced by ship electrification, because the ship's boilers will continue to operate while in port to provide steam and hot water. CARB's Donohoue said that references to cold ironing would be deleted from CARB draft documents.

Fuel Issues – A representative of the Engine Manufacturers Association asked the staff whether it had looked at the availability of MGO; Donohoue did not answer directly but noted only that the staff believes EPA will soon finalize its marine fuels regulations. A representative of American Ship Management, referring to the cleaner fuels concept, asked what emission reductions would result from switching to MGO with 0.2% sulfur. Milkey explained that SOx emissions following fuel sulfur content, so switching from 2% sulfur HFO to 0.2% sulfur MGO will produce a 90% reduction in SOx. That switch will also yield similar reductions in NOx and PM, Milkey said. The ASM representative said that the problem is that no one has the fuel. Milkey claimed that the fuel is available in the U.S., although its availability elsewhere varies.

A representative of the Philadelphia Navy Yard provided well-informed comments on the EU's marine fuel regulations. First, he noted that the EU directive has been in effect since July 2000. It requires that marine distillate fuel be no higher than 0.2% currently; this limit drops to 0.1% in 2008, he said. This fuel must be used when ships are at berth, within EU ports, and in transit through EU waters; these requirements are enforced by EU member states, so there is some variation in enforcement stringency, he said, although the EU itself does some fuel sampling, however, which permits better compliance. There is potential conflict between the EU and IMO fuel requirements, however, since the EU sulfur limits pertain only to marine distillates, and ships don't have to comply until their arrival at their first EU port. In addition, he said, oceangoing vessels using heavy fuels are not subject to the EU rule. PLA's Garrett said that cleaner fuels may be more effective in reducing emissions than ship electrification, but we won't know unless we can see the assumptions that CARB is using for all its control options. CARB's Taricco agreed. (By this time it was clear that the cost-effectiveness analysis CARB had performed so far was very preliminary.)

It was pointed out that not only are reduced-sulfur fuels more expensive, but fuel switching usually requires engine adjustments, both of which add to operating costs. A shipping company representative asked how CARB would monitor compliance with fuel-sulfur limits, and Milkey's reply was, "We assume that there is documentation of fuel purchases, but we will need to work with you guys on that." Donohoue asked for input on where in the "chain of providers" CARB should impose its requirements. A representative of the California Maritime Academy said that most ships carry documentation on their fuel purchases. The last word on fuels was an observation that West Coast refining capacity is limited, so the future availability of low-sulfur distillate fuels may be limited. The question was asked whether the CARB staff has looked into this. The staff reply acknowledged that a good comment had been made, and CARB looks forward to more input and comments before the next meeting in June.

Compliance Issues – The issue of averaging for compliance purposes was raised, the questioner asking whether averaging would be across all ports, or California-only operations, or port-specific. Milkey's reply was that it was a good question, Taricco added that the staff is open to suggestions, and Donohoue said, "We're just getting started, and we don't understand the industry as well as we'd like." The issue of compliance responsibility was also raised, with the questioner wondering who would be

responsible—the ship owner, the ship lessee, the cargo owner? This was followed by a short review of the ways in which ships are put into use through leasing, chartering, length of charters, and so on. The ASM representative said that California's requirements will have an effect on relations between ship owners and charterers.

Technical and Operational Issues – A representative of the Pacific Merchant Shipping Association said that a fuel switch has to start days ahead of when it is going to be needed, and operators can't easily switch back and forth between fuels. Also, he said, retrofitting exhaust controls may not be possible on existing vessels, since engine room space is already limited. Another commenter said that fuel switching also requires engine adjustments. Yet another asked if the staff had talked with people in Juneau, Alaska and Sweden about their shoreside electrification programs, which have now been running for a while. The staff knows about Juneau, but not about Sweden, was the reply.

Draft Shipping Survey - The staff's draft survey of oceangoing shipping companies was available for review, and several suggestions were made. There was agreement among commenters that CARB should track vessels by a registration number, e.g., the Lloyd's number, rather than their names, since vessel names change but the registration number does not. A representative of the Bluewater Network suggested that the survey ask for fuel sulfur levels and locations of fuel purchases.

When no more comments or questions were heard, CARB staff thanked participants for their input and asked that it continue, and acknowledged that this meeting had shown there are many aspects of proposed regulations on which the staff needs to gather more information and think more about the issues. The next meeting on auxiliary engines will be held in June, the staff said.

Analysis

Despite the fact that the staff's plans for sulfur limits on MGO coincide with those announced by the European Union, the requirement that ships switch their auxiliary engines from HFO to MGO while in California ports and California Coastal Waters may be hard to enforce and costly, since it may require additional tankage and piping plus engine adjustments. In addition, it has not been established that MGO is available on the West Coast, although the staff seems confident that supply will follow CARB's requirement.

The discussions showed that the staff's cost-effectiveness calculations need to be refined, and it would be wise for the staff to study the whole issue of the effect of its proposed regulations on costs. Even though the in-state population served by California ports is huge compared with the populations served by other West Coast ports, California ports could lose business if their costs increase due to CARB's regulations.

Workshop On Ship Emissions Reduction Technologies

In furtherance of its recent emphasis on reducing marine emissions, the staff of the California Air Resources Board (CARB) last month hosted a workshop on ship emissions reduction technologies conducted by the U.S. Maritime Administration (MARAD). The workshop was held during the afternoon of April 8, 2004 in the Cal/EPA hearing room in Sacramento, and was attended by about 40-50 interested persons. (A meeting of CARB's Maritime Air Quality Technical Working Group was held in the morning, and is discussed in the preceding article.) MARAD and CARB staff appear to have a cooperative working relationship; however, aside from a brief introduction by Peggy Taricco of CARB's Stationary Source Division, CARB staff did not participate.

MARAD Presentation

The workshop moderator was Daniel Gore of MARAD. In his introductory presentation, Gore said MARAD operates an Energy Technology Program that has the objective of providing California ship operators with information on potential energy and emission reduction technologies, cost benefits, and performance verifications. He added that the "ulterior motive" of the program is to encourage ship owners to participate in technology demonstrations and validations; to that end, he said, MARAD will be sponsoring another workshop next year targeted at ship operators.

Gore explained that the MARAD program is driven by newly adopted EPA and CARB emission programs affecting ship emissions,^{*} and the forthcoming new International Convention for Prevention of Marine Pollution from Ships (MARPOL) Annex VI standards governing NO_x emissions from ships with Diesel propulsion engines over 130 kW.[†] He also acknowledged the need to respond to emission reduction measures adopted in the U.S. for ozone nonattainment areas, and "public pressure." He referred to data showing that as emissions from other sources are controlled, ship emissions are becoming a major component of the emissions inventory. The MARAD program, he said, is intended to demonstrate technologies that can reduce emissions without adversely affecting fuel economy, and to disseminate information to the shipping industry.

Gore summarized recent and planned MARAD activities, which include baseline emissions testing, demonstration of retrofit technologies, use of alternative fuels, use of advanced technologies (fuel cells, turbines), and industry outreach. (MARAD is involved

^{*} Presumably a reference to EPA's 2003 regulations governing NO_x exhaust emissions from new Category 3 Diesel marine propulsion engines over 30 liters/cylinder, with voluntary standards for new marine engines over 2.5 liters/cylinder. See 40 CFR Parts 9 and 94. EPA has also proposed more stringent standards for marine Diesel engines displacing less than 30 liters/cylinder and for engines rated at 37 kW or less.

[†] Annex VI also contains fuel oil and shipboard incineration requirements.

in most of the studies described below.) He stressed that MARAD operates as a partner with and advocate for the marine industry. Gore gave some details on specific MARAD studies of NO_x reduction retrofit technology on ferry boats at several locations across the country, and on several large cargo ships. He also referred to several studies by the U.S. Dept. of Transportation of hydrogen and fuel cell technologies, and to studies of emission measurement protocols. Gore noted that reports of most of the studies covered in the session are or will be available on-line. In closing, Gore again emphasized MARAD's focus on working with ship operators.

Following short introductions by Gore, five presentations were given. The title of each and a brief summary are presented below.

“Containership Residual Fuel Homogenization & Emulsification Technology Overview” – Matthew F. Winkler, Seaworthy Systems - Winkler described an on-board system for mixing water with fuel, with the result being a reduction in NO_x of up to 25%. He said PM emissions may increase, but will remain “invisible” at the stack, and that hydrocarbons and odor are reduced as well. Winkler said another impact is higher CO; power is reduced, he said, but can be compensated for by increasing injector capacity, and CO₂ emissions are reduced in proportion to reduced fuel use. He also described other possible impacts on vessel maneuvering, engine controls, and use in other on-board engines. Using a hypothetical ship in regular service on the California coast, Winkler said fuel emulsification would eliminate 70 tons of NO_x per year in coastal and port waters. He referred to fuel penalties, but said there is a potential 3% fuel savings when operating in “economy mode” with only 8% water injection out of port. Assuming a cost of \$400,000 to design and install the system, he calculated a cost-effectiveness ratio of \$1,246/ton for one year and \$253/ton over five years, which he said was a “bargain” compared to the cost of truck retrofits under the Carl Moyer program. In response to a question, Winkler agreed that the ship's engine would not be capable of doing as much work while being operated in “emissions mode” to reduce NO_x by 25%.

“MV Cabot – Combustion Air Fumigation Retrofit” – Ernst Radloff, Transport Canada, Transportation Development Agency - Radloff described his agency's experience with equipping a “ro-ro” (roll-on roll-off) containership with a water injection system on a trip from Montreal to St. Johns, Newfoundland, and measuring emissions as well as ship and engine operating parameters. He said the study concluded that NO_x and PM emissions are load dependent; that NO_x reduction up to 30% can be achieved and is a function of the water injection rate and load, with water injection being more effective at higher load; and that PM increases with water injection while on higher-sulfur fuel, but PM could go down on low-sulfur fuels. Radloff also presented a comparison between goods shipped from Montreal to St. Johns by water vs. goods shipped by truck, with the conclusion being that marine shipment takes about 2½ times longer but results in about 3 times less emissions. He also calculated a cost-effectiveness ratio of about \$385/ton (Canadian dollars) of NO_x reduced.

“MV Sine Maersk – Emission Measurements and Retrofit Technology” – Sven Henningsen, MAN B&W - In this study, MAN B&W participated in equipping a large

container vessel with new slide valves and water injection technologies. Henningsen said the result was reduced NO_x, with the reduction increasing with load, and higher PM, with PM increasing with load. He also presented data showing how NO_x is affected by the type of fuel, and how there are NO_x spikes during engine load transients. According to Henningsen, each additional percentage of water injection will reduce NO_x by a similar percentage, but that an injection rate of 25% is the practical limit. He elaborated further on a number of “penalties,” including increased fuel consumption, and higher PM, HC, and smoke. Other issues needing attention include freshwater supply for injection, and International Marine Organization approval (to avoid tampering charges). He advised that retrofitting water injection needs to be closely coordinated with the engine manufacturer because it affects the durability and function of so many engine parameters. In response to a question challenging his concern about increased PM, Henningsen said it is definitely an issue for Diesel-fueled engines, because of the fuel emulsifying agent; for other high sulfur fuels, where an additive is not necessary, he agreed that PM increases may not be a problem.

“Development of a Large Vessel Emission Measurement Protocol” – Bill Welch, U.C. Riverside Center for Environmental Research & Technology” - Welch provided a detailed outline of all the factors that must be considered in designing both certification and in-use test methods for ships. He concluded that development of test methods requires close coordination with all stakeholders, that in-use testing needs to emulate certification testing as closely as possible, and that ship owners and operators need to be involved.

“Universal Onboard Marine Vessel Emissions Measurement Protocols” - Mridul Gautum, W. Virginia University - As the final speaker, Gautum raced through a presentation of a long list of factors for development of a test method. His main message seemed to be that laboratory-type certification testing has inherent limitations, and that the focus should be on developing a good protocol for on-board testing. He also briefly described how a “compliance factor” approach, based on testing for emissions concentrations rather than more complex measurements as a function of fuel flow or engine output, could be used to avoid many difficulties. In response to questions, Gautum said that certification emission figures for off-road engines are completely different from actual emissions, and that the current inventories are “bogus” because actual emissions are 50-100% lower than emissions measured using the current eight-mode test.

Gore concluded the session by noting that the Administrator of MARAD has personally stated that his agency has “got to find a way to help California ports deal with their emissions issues.”

Analysis

This session showed that water injection appears to have promise as a workable NO_x reduction method for large ship engines in the future, but also that substantial questions

remain concerning possible increases in other pollutants (including PM), increased fuel consumption, test methods, and impacts on engine durability and vessel operations. On its part, MARAD seems committed to working closely with the shipping industry in an orderly fashion to address technical issues. It remains to be seen, however, whether any significant reduction in emissions from ocean-going vessels is achieved.

CARB Staff Asks For Additional Information on Supplemental ZEV Incentives

In Mail-Out #MSC 04-09, issued on April 29, 2004, the staff of the California Air Resources Board (CARB) asked for further public input on four possible incentive programs for ZEVs:

- ZEV credits for use of motor vehicle fuel cells in stationary applications;
- ZEV credits for hydrogen infrastructure development;
- Augmentation of credits for ZEVs used in transportation systems; and
- Revised base credit values for neighborhood electric vehicles (NEVs).*

As reported in the October 2003 issue of *CVS News*, the Board previously considered staff recommendations on the first three incentives at its September 2003 meeting. At that time, the staff expressed serious reservations about credits for stationary fuel cells, opposed credits for hydrogen infrastructure, and favored additional credits for ZEVs in transportation systems. At the end of the meeting, however, Board Chairman Alan Lloyd gave a “green light” for all three proposals, and instructed the staff to come back with a regulatory proposal in the spring of 2004.

According to the mail-out, the CARB staff has been consulting with other agencies and looking into the incentives both individually and as part of an integrated approach. The staff has also been looking at “other incentives,” and following up Board instructions to look at “a few pilot projects” and the use of renewable energy. The mail-out does not offer any explanation for why the staff has not been able to develop a regulatory program.

The mail-out also does not explain why the base credit values for Neighborhood Electric Vehicles (NEVs) have been added to the table. At the September 2003 meeting, the staff

* 2001-2002 model year NEVs produced for sale in California earn 1 ZEV credit, but are subject to a 4.0 credit multiplier if they were actually placed in service in California by September 30, 2003. The placed-in-service multiplier goes down to 1.25 for 2003 model year NEVs, 0.625 for 2004 and 2005 model year NEVs, and 0.15 for 2006 and later model year NEVs.

examined providing additional credits for NEVs used in transportation systems, and Chrysler testified in support of additional transportation system credits. However, this mail-out is directly contrary to Executive Officer Catherine Witherspoon's statement at the September 2003 meeting that the staff would not look at increasing the base credit for NEVs. Although it is not clear why, the staff apparently is now considering whether the base credits for NEVs should be increased, as the mail-out refers to the "adequacy" and "appropriateness" of the base credits.

Analysis

In our October 2003 article on this item, we noted that Chairman Lloyd seemed to be much more in favor of these incentives than other Board members and staff. By simply asking for more information, this mail-out does not offer any clues as to the current thinking of Lloyd or staff on the first three items. Just prior to the mail-out, on April 20, 2004, Governor Schwarzenegger signed Executive Order S-7-04, committing his administration to hydrogen vehicles and infrastructure development through the "California Hydrogen Highways Network" and calling for a Hydrogen Economy Blueprint Plan" (for details, see the second article in this issue). The Executive Order includes promoting both vehicle and stationary fuel cell development. One purpose of the mail-out may be to provide additional time for implementing the new Executive Order. The addition of NEV base credits to the agenda is surprising, and is definitely a change of position on the part of the staff. Overall, it is our impression that the subject of ZEV incentives has become more politicized than last year, and that the state's policy in this area is now being made by not just CARB but also the Governor and other agencies.

New EPA Eight-Hour Ozone Nonattainment Designations Announced

On April 15, 2004 Administrator Mike Leavitt announced the U.S. Environmental Protection Agency's nonattainment designations under EPA's recently adopted 0.08 ppm eight-hour ozone national ambient air quality standard,* which will soon replace the less stringent 0.12 ppm one-hour ozone standard. Nationwide, 474 counties are included in the designations. Except for California, all the counties fall within the three lower designations, dubbed Basic,[†] Marginal, and Moderate.

* The designations are posted at <http://www.epa.gov/ozonedesignations/part81r8c.pdf>

[†] A new category used by EPA to describe areas that are subject only to Clean Air Act ozone nonattainment "Subpart 1" requirements.

California is uniquely affected by having 14 counties (mainly in the Sacramento and San Joaquin valleys) designated in whole or in part Serious, and four counties (Los Angeles, Orange, Riverside, and San Bernardino) designated in whole or in part Severe. No other state has any counties in these two categories. The Severe nonattainment designation for the Los Angeles area, however, is less onerous than the Extreme designation that applies under the one-hour ozone standard.

California also includes a number of counties designated Basic (San Diego and several mountain counties), Marginal (the Bay Area), and Moderate (Ventura and portions of three desert counties east of Los Angeles). The attainment deadlines for Basic, Marginal, and Moderate areas are 2009, 2007, and 2013, respectively. The deadlines for Serious and Severe areas are 2013 and 2021, respectively. The dividing line between Basic ozone nonattainment areas and all other areas has been set at an eight-hour ozone design value of 0.121 ppm. The design values for the other categories are the same as those established in 1990 by Congress in section 181(a)(1)(Table 1) of the federal Clean Air Act.

Counties designated Basic will be subject to the general requirements for ozone attainment plans in “Subpart 1” of the CAA,* such as the development of emissions inventories, federal conformity (both transportation and general), and New Source Review for new or modified stationary sources emitting 100 tons per year or more of hydrocarbons or NO_x, but no vehicle inspection or reformulated gasoline requirements, and a simple “incremental” rate of progress (ROP) requirement.

All of the other “classified” counties are subject to more extensive “Subpart 2”† ozone attainment requirements; however, these requirements will be more onerous than under the one-hour standard only if an area’s designation is “bumped” to a higher level under the eight-hour standard, e.g. from Moderate to Serious. For Serious and Severe areas, this will include triennial emission inventory updates, additional offsets for facilities under New Source Review, Phase II vapor recovery at gasoline stations, enhanced vehicle inspection and maintenance, and the use of reformulated gasoline. These categories will also be subject to rigorous ROP demonstration requirements, starting with a 15% VOC reduction by 2008, plus annual 9% reductions of VOC/NO_x thereafter.

On the same date, EPA published companion “Phase I” regulations to begin implementing the emission control and planning requirements for the eight-hour standard, as applicable under the federal Clean Air Act (CAA). A key provision for stationary sources is EPA’s decision to drop the New Source Review applicability cut-offs and offset ratios that would apply under the one-hour ozone standard, once that standard is revoked. The one-hour standard will be officially revoked on April 15, 2005, but will maintain its presence through “anti-backsliding” provisions in the new regulations. These provisions require all mandatory control measures necessary for attainment of the one-hour standard to be kept in place until actual attainment of the eight-hour standard.

* Federal Clean Air Act, §§ 171-179B; 40 U.S.C. §§ 7501-7509a.

† Federal Clean Air Act, §§ 181-185B; 40 U.S.C. §§ 7511-7511f.

For example, for areas such as the South Coast Air Basin, Sacramento, and the San Joaquin Valley that are nonattainment under both standards at this time, all mandatory control measures under the one-hour standard must continue to be implemented; if a mandatory measure is not in place, it must be adopted and implemented, and there is a continuing ROP demonstration obligation for the one-hour standard. EPA has stated in the preamble to its new regulations, however, that the “discretionary” emission control measures adopted or committed to under the one-hour standard (sometimes referred to as the “black box” measures for an Extreme area) can be removed or revised by a state as long as there is no interference with attainment of or progress toward the eight-hour standard. It is therefore possible that California will be able to wiggle out of its commitment to black box measures in the South Coast Air Basin if the state claims it can make reasonable progress towards attainment of the eight-hour standard without such measures. Also, the regulations state that if a state fails to meet attainment or ROP obligations, once the one-hour standard is revoked next year EPA will no longer make failure-to-attain determinations or require areas to be reclassified to a higher nonattainment category.

Similarly, for an area like San Diego that is designated nonattainment under the eight-hour standard and maintenance under the one-hour standard, only the existing mandatory control measures must continue to be implemented (or retained as contingency measures); however, there no new measures that must be adopted for these areas, and there are no ROP or attainment demonstration requirements.

The EPA announcement states that “Phase 2” implementation requirements under the eight-hour standard will be forthcoming in several months. These will address primarily technical requirements, such as monitoring and attainment demonstrations, and the definition of reasonably available control technology. EPA is also revising its conformity regulations to take into account adoption of the eight-hour standard.

Analysis

While the new EPA regulations directly implicate such matters as monitoring, State Implementation Plans, conformity, and stationary source permitting, they will ultimately generate further and more aggressive mobile source regulation. The anti-backsliding requirements assure that all of the federally mandated programs in the California SIP designed to achieve and maintain the one-hour standard, as well as the one-hour ROP requirements, will continue to be implemented while the process of identifying and implementing additional programs needed to address the more stringent eight-hour standard begins. For areas like the South Coast Air Basin, where the SIP contains a “black box” of as-yet-unidentified discretionary measures, it appears that some reprieve has been given in the form of allowing the deadline for attainment of the eight-hour standard (2021) to be substituted for the 2010 deadline under the one-hour standard, thus allowing the timing for such measures to be stretched out for a decade. EPA and CARB will have to begin moving quickly, however, to adopt supplemental mobile source

controls as early as 2005 in order to meet the ROP demonstration requirements for the eight-hour standard that apply in 2008. The bottom line is that the eight-hour standard will guarantee another decade of progressively more stringent vehicle emission controls—some of them federal, some of them imposed by CARB—that go beyond what would have been needed under the one-hour standard.

Legislative Update

Many of the bills we have been following were amended in April and early May, as they faced committee hearings and deadlines for action. Some of the more significant amendments included the following:

- The incentives for vehicle scrappage proposed under *AB 2128* were increased, and the program through which the incentives would be provided was changed to the Consumer Assistance Program;
- The spot language in *AB 2424* was deleted and replaced with extensive requirements for vehicle scrappage and modeling to determine resulting emission reductions (the bill has since been dropped by the author, however);
- The bonus incentives proposed by *AB 2541*'s Low Emission Contractor Incentive Program were lowered, and the requirements for qualifying vehicles were tightened; and
- The temporary authority granted under *AB 2953* to provide Moyer funding for certain agriculture-related projects that might not otherwise qualify was expanded to include severe or extreme federal ozone nonattainment areas, but the authorization period was shortened by two years.

New to our coverage this month are the following bills:

- *AB 1966*, requiring CARB to establish guidelines for hydrogen refueling stations;
- *AB 2484*, proposing a tax credit for fuel-efficient vehicles similar to that proposed last year in *AB 1390*, combined with a funding mechanism previously proposed by *AB 198*;
- *AB 2847*, another bill (similar to *SB 1614*) proposing to increase the fuel tax to fund highway maintenance as well as vehicle emission reduction programs;

- *AB 2880*, increasing by two dollars the amount that local air districts are allowed to add to the vehicle license fee to fund air quality programs;
- *AJR 74*, seeking federal authority to allow hybrid vehicles to use high-occupancy vehicle lanes (this authority would be needed to implement provisions of *AB 2628*);
- *SB 403*, re-introducing a proposed California Clean Air Bond Act, as was carried last year in *SB 701*;
- *SB 1814*, proposing to allow the sale in California of federal fuel that does not comply with CARB's CaRFG requirements and impose a fee on such sales (this bill failed its first committee hearing and is already dead); and
- *SJR 28*, concerning CARB's request for a waiver from the federal oxygenated fuel requirements and related federal legislation.

As will be seen in the summaries below, some of the bills (e.g., incentives for vehicle scrappage under *AB 2128*, diversion of fuel tax revenue under *AB 2526*, increased vehicle registration fees under *AB 2880*, fees on fuel suppliers under *AB 3104*, increased fuel taxes under *AB 2847* and *SB 1614*, unspecified funding sources under *SB 1247*) address proposed funding mechanisms and/or a structure for vehicle retrofit or replacement programs, such as the Moyer program and the Lower Emission Schoolbus program. The Schwarzenegger administration has expressed interest in supporting such programs and providing incentives for vehicle owners to remove heavily polluting vehicles from use, but no specific funding plan has been yet been agreed upon.

Further details on the above bills as well as the others we are following are provided below. If a bill was amended, the bill number is shown in italics. If both the bill number and the author are italicized, it indicates that the bill is new to our coverage this month. Brackets [] are used to denote bills that will be dropping from our coverage. The current status of all the bills we are following is reflected in the reference chart provided after the summaries.

AB 1966 (*Campbell*) – As recently announced, Governor Schwarzenegger is seeking to pursue his campaign promise to develop a “hydrogen highway” in California.* In keeping with this, the bill (introduced as a spot bill) was recently amended to require the California Air Resources Board, in collaboration with the Department of Transportation, the Public Utilities Commission, and the California Energy Commission, to adopt guidelines for the production and licensing of hydrogen fuel cell consumer refueling

* As discussed elsewhere in this issue, on April 20 he announced the Hydrogen Highway Network Initiative and signed Executive Order S-7-04, which creates a public and private partnership for the development of a hydrogen refueling network.

stations. The bill in its amended form passed the Assembly Transportation Committee and has now gone to the Assembly Appropriations Committee.

AB 1971 (Lowenthal) – This is a follow-up bill to AB 2650, which was enacted in 2002 and carried by the same author. That bill imposed idling limits on truck engines waiting to load or unload at marine terminals (further details may be found in our 2002 *CVS News* legislative summaries). This bill clarifies applicability with respect to idling as well as queuing vehicles, and requires local air districts to base enforcement and monitoring on the extent to which terminals in their jurisdictions have problems with queuing, in addition to idling problems as was required under AB 2650. The bill passed the Assembly Appropriations Committee in April and was then passed by the Assembly. It has now awaiting assignment to a policy committee in the Senate.

AB 2042 (Lowenthal) – This is another bill focused on ports and carried by the author of AB 1971. This bill is sponsored by the author, whose district includes the Ports of Los Angeles (located in San Pedro) and Long Beach. The bill begins with a statement of legislative findings as to the health risks of Diesel engine exhaust, and notes the requirement of the federal Clean Air Act for a demonstration that construction of new highways in certain nonattainment areas will not worsen air pollution. The bill requires the South Coast Air Quality Management District to establish an emissions baseline for the Ports of Long Beach and Los Angeles, with the inventories to specifically include emissions from ocean-going vessels and harbor craft, cargo handling equipment, locomotives, and commercial vehicles. The Cities of Long Beach and Los Angeles would be required to limit or control growth and operations at their respective ports so that emissions don't exceed those baseline inventories. In addition, the cities would be required to report to the district annually, beginning March 1, 2006, on efforts to comply with this provision.

The bill passed both the Assembly Transportation and Appropriations Committees without amendment, and then went to the Assembly floor. While being read in the Assembly, the provisions regarding the baseline emissions inventories were amended, such that the baseline inventory for the Long Beach port should now be based on the port's 2002 inventory (rather than 2001), and that for the Los Angeles port on the 2001 inventory (rather than 2002). In addition, the bill now specifies that the baselines are to include only the following emissions: oxides of nitrogen, particulate matter, sulfur oxide, and total hydrocarbons. The bill is currently being read on the Assembly floor.

AB 2128 (Jackson) – This bill would provide a financial incentive for vehicle owners to retire their vehicles that fail a Smog Check inspection, and an additional incentive to replace the scrapped vehicle with a partial zero-emission vehicle (PZEV). Funding for these incentives would come from additional fuel taxes that are being proposed by SB 1614 (discussed below). AB 2128 would allocate \$50 million of those revenues annually, or 50% of the total allocated towards vehicle emissions mitigation, whichever is greater, for the financial incentives proposed by the bill. The provisions of AB 2128 would become operative only if SB 1614 passes.

As we indicated last month it would be, the bill was amended by the author to provide the financial incentives through the Consumer Assistance Program (CAP), rather than the High Polluter Repair or Removal Account in the Vehicle Inspection and Repair fund. Also, the maximum proposed incentive was increased to \$1,000 for scrappage (which is the current CAP limit) and up to \$1,500 if the vehicle is replaced with a vehicle meeting or exceeding the PZEV standards.

The bill passed the Assembly Transportation Committee with the author's amendments, and went to the Assembly Appropriations Committee.

AB 2366 (Chan) – This bill authorizes the Bay Area Air Quality Management District (the sponsor of the bill) to impose an additional one-dollar vehicle registration surcharge for purposes of funding projects to reduce vehicle emissions and vehicle use, similar to the additional surcharge in the South Coast and San Joaquin Valley air districts. The bill passed policy committee hearings in both Assembly Committee on Transportation and on Local Government, and is now in the Assembly Appropriations Committee.

[AB 2424 (La Malfa) – This bill was introduced as a spot bill on behalf of the Specialty Equipment Manufacturers Association (SEMA). The author amended the bill in April, gutting the spot language and replacing it with provisions related to the state's vehicle scrappage program. The provisions address both the eligibility requirements for scrappage as well as how the emissions of the scrapped vehicles are to be modeled by CARB in terms of calculating the emissions inventory and the benefits of the program. The provisions specify that median, rather than mean, data should be used in calculations for any given vehicle model year, category, and emission certification level. (This is based on the sponsor's view that the data are skewed by a few emitters or by small sample sizes.) It would also require that the use of vehicle fleet average emissions be verified by actual roadside or in-use data.

Additional criteria for scrappage would include that the vehicle be verified to have been driven at least 5,000 miles during the previous 12 months, have a functional odometer and driver's seat, have all original or required exterior lighting and interior pedals operational and present, be driven to the retirement facility under its own power, complete a test drive of at least 75 feet in both forward and reverse gears, and be free of any abnormal conditions that render it unsafe or unfit for regular operation. Other provisions include making all vehicles and their components available for resale to the public; requiring that vehicle owners be reimbursed in the form of a voucher to be used in purchasing a replacement vehicle, rather than in cash; and requiring the determination of emission reductions to be based on observed and actual conditions of the vehicle and replacement vehicle.

The amended bill was set for a hearing in the Assembly Transportation Committee, but that hearing was subsequently cancelled by the author. According to the author's office, the bill is not going to be pursued this year.]

AB 2484 (Ridley-Thomas) – The original language of this bill was gutted in April and replaced with provisions that combine the tax credit for fuel-efficient vehicles proposed last year in AB 1390 (which died in the Assembly Appropriations Committee), with the funding mechanism carried last year by Assemblymember Nation in AB 198 (which died in the Senate Committee on Revenue and Taxation). The proposed funding mechanism would disallow certain tax deductions related to purchase and use of large sport utility vehicles (SUV) by businesses (e.g., depreciation, tangible personal property benefits, lease deductions), except that the deductions would continue to apply for agricultural, timber, and construction businesses. In turn, the savings would be used to fund a tax credit for “fuel efficient vehicles.” Similar to last year’s AB 1390, these are defined under the bill as those having a fuel economy rating at least 35 percent higher than the average fuel economy rating (miles per gallon) for that particular CALCARS* vehicle class; vehicles with a combined fuel economy of less than 21 miles per gallon would not qualify. Also specifically included are vehicles “whose fuel economy is calculated in kilowatt-hours per 100 miles” (i.e., electric vehicles). The bill requires the CEC to annually calculate the average combined fuel economy for each CALCARS class, and to calculate the combined fuel economy for a qualifying vehicle based on an assumed split of 55% city mileage and 45% highway mileage.

Under the bill, taxpayers would be allowed to claim a \$1,000 tax credit for the purchase of a qualified vehicle—the credit would apply only to vehicle owners that own the vehicle for at least three taxable years and use the vehicle in California at least 80% of the time each year (if it is found that this requirement was not satisfied, the amount of the credit would be added back into the tax for that year).

The bill would require the Franchise Tax Board to estimate the increase in state tax revenue that would derive from disallowing the specified SUV credit. That value would then be divided by \$1,000 to determine the number of tax credit certificates that would be available for that fiscal year. Vehicle dealers would be required to apply to CARB for tax credit certificates based on the number of qualifying vehicles in their inventory, and CARB would grant the certificates to dealers on a first-come, first-served basis. Dealers would then provide the certificates to purchasers of the qualified vehicles.

The bill is currently scheduled for a May hearing in the Assembly Committee on Revenue and Taxation.

AB 2526 (Oropeza) – This bill, sponsored by the author, would divert some of the revenue raised by the Diesel Fuel Tax into the Trust Fund for the Carl Moyer program. Specifically, it would allocate one-quarter of one cent (\$0.0025) per gallon of Diesel fuel sold. The bill passed the Assembly Transportation Committee and is currently on the suspense file in the Assembly Appropriations Committee.

* The California Energy Commission’s *California Light Duty Vehicle Conventional and Alternative Fuel Response Simulator*

AB 2541 (Frommer) – Sponsored by the Coalition for Clean Air (an environmental advocacy group headquartered in Los Angeles), this bill proposes a Low Emission Contractor Incentive Program, which would require the Department of General Services (DGS), in consultation with CARB, to develop a program that provides bonuses or preferences for contractors who use low-emission vehicles. The provisions of the program were amended slightly by the author in April, prior to the bill's first policy committee hearing, lowering the bonus incentives somewhat and slightly revising the requirements. Under the revised proposal, for state bids requiring contractors to use heavy-duty off-road equipment, a bonus of not less than five percent of the total score (lowered from 10 percent) would be awarded to bidders who had obtained low-emission status for their off-road fleet; comparable requirements would apply to contracts requiring the use of heavy-duty on-road equipment, and light-duty or medium-duty vehicles. Bidders providing proof of meeting certain ridesharing requirements would be awarded a bonus or preference of not less than three percent of the total score.

The amendments also modified the definition of low-emission vehicle, from vehicles that meet either CARB's ultra low emission vehicle II (ULEV II) standards, super ULEV (SULEV) standards, or are eligible for full or partial zero emission vehicle credit, to only vehicles that meet or exceed CARB's SULEV standards. Dropped from the bill was a provision stipulating that contracts could include a condition prohibiting the contractor from working on high ozone days (as designated by the district based on the federal eight-hour ozone standard) unless the contractor's fleet was verified by the district as a low-emission fleet.

A deadline of July 1, 2005, is set for implementation of the program, and DGS would be required to submit a report to the Legislature by January 1, 2008, and annually thereafter, on the program and participation rates for each of the types of preferences.

The bill passed the Assembly Committee on Business and Professions as amended by the author and is now in the Assembly Appropriations Committee.

AB 2628 (Pavley) – This bill was introduced on behalf of Governor Schwarzenegger, through CalEPA, and State Treasurer Phil Angelides. It would expand the current statutes that authorize ultra low-emission vehicles (ULEVs) and super ULEVs (SULEVs) to use high-occupancy vehicle (HOV) lanes to also include hybrid vehicles that meet CARB's advanced technology partial zero-emission vehicle (AT PZEV) standards and have a highway fuel economy rating of at least 45 mpg, as well as 2004 model year and earlier hybrid ULEVs, SULEVs, and PZEVs that meet the same fuel economy standard. Approval from the federal government would first be required, however. (As noted below, the author has now introduced a resolution—AJR 74—that seeks such federal approval.) As currently necessary for ULEVs and SULEVs, these vehicles would be required to have a decal or label from the California Highway Patrol (CHP). This bill would limit the total number of such vehicles authorized to use the lanes by prohibiting the CHP from issuing more than 75,000 decals. In addition, once 50,000 such decals had been issued, if the Department of Transportation determined that "significant high-

occupancy vehicle lane breakdown” had occurred, no further decals could be issued. The bill currently does not define what is meant by such a breakdown.

The current statutes include a provision that the Governor can remove individual HOV lanes (or portions thereof) from the increased access provisions during periods of peak congestion if the level of service in the lanes has degraded to specified levels. This bill would instead grant that authority to the Department of Transportation.

The bill passed the Assembly Transportation and Appropriation Committees in April, and was passed by the Assembly in early May. It is now in the Senate for assignment to a policy committee.

AB 2644 (Oropeza) – In 2002, CARB adopted an Air Toxic Control Measure (ATCM) limiting idling by schoolbuses, which was approved and implemented in 2003. This bill, sponsored by the author, would codify the requirements of that regulation into statute. It passed the Assembly Transportation Committee without amendment in April, and then passed the full Assembly with minor editorial amendments. The bill is now awaiting assignment in the Senate.

AB 2683 (Lieber) – This bill, sponsored by the Bay Area Air Quality Management District, would change the model year exemption that applies to the vehicle inspection and maintenance (“Smog Check”) program. Currently, the model year exemption is based on a 30-year window; this bill would change that to any pre-1976 model year vehicle. (The exemption for newer vehicles—those four or less model years old—would continue to apply.) The bill passed the Assembly Transportation Committee in April, and is now on the suspense file in the Assembly Appropriations Committee.

AB 2847 (Oropeza) – This bill is similar to SB 1614, and would impose an additional fuel tax in order to fund road maintenance, operation, and construction, as well as programs that “mitigate the air impacts of motor vehicles.” (Unlike SB 1614, this bill does not specify any breakdown for allocation of the revenue.) This proposed increase would sunset as of January 1, 2008, and was initially set at five cents per gallon. The Assembly Transportation Committee passed the bill with an amendment adding an urgency statute, so that the bill would take effect immediately if enacted. The author then amended the bill to delete the specified increase of five cents per gallon and instead leave the amount unspecified. The bill then went back to the Assembly Transportation Committee, where it was passed and referred to the Assembly Appropriations Committee.

AB 2880 (Pavley) – Current law allows local air districts to impose an additional vehicle fee surcharge of four dollars, in order to fund air quality programs. This bill would increase that by two dollars, for a total surcharge of six dollars. The bill has passed the Assembly Transportation Committee and is now on suspense in the Assembly Appropriations Committee.

AB 2899 (Horton) – The National Biodiesel Board is sponsoring this bill, which would set specifications for biodiesel and biodiesel blends, and also create a carbon dioxide

(CO₂) labeling program for displaying lifecycle CO₂ reductions. The bill references ASTM specifications for biodiesel (ASTM D-6751 and D-975), and would prohibit retail sale to the general public of biodiesel blends from B21 to B100 unless the dispenser displays a sign state the specific volume concentration. As noted below, the labeling requirement for blends from B6 to B20 were deleted. Persons selling finished blends containing 20 percent biodiesel would be authorized to display a sign stating “Biodiesel Blend 20.”

The bill would require the California Energy Commission (CEC) to conduct lifecycle CO₂ analyses to determine the levels of lifecycle CO₂ reductions. Provisions of the bill stipulate that the CEC should adopt the findings of a federal agency (or combination of agencies) that may have conducted such analyses. If no previous lifecycle analysis has been conducted, the CEC is to consider data and findings provided by industry and research studies (both private, academic, and government^{*}). The commission may establish a testing program and/or establish lifecycle reductions based on the previous findings if it finds the data to be adequate. These lifecycle reductions would form the basis for a voluntary CO₂ labeling program for petroleum, biodiesel, and finished fuel blends. The bill also states that it is the Legislature’s intent to allow biodiesel users to generate CO₂ emission reduction credits for credit banking and trading programs, and for eligibility as a CO₂ reduction compliance strategy under greenhouse gas reduction rules and programs established in California.

The author made some technical amendments to the bill in April, as well as deleted the requirement that would have prohibited retail sale to the general public of biodiesel blends from B6 to B20 unless the dispenser displayed a sign stating “Contains up to 20 percent Biodiesel.” Added to the bill was the requirement that the label noting the life-cycle reductions also display the fuel efficiency, with the CEC being assigned the responsibility for assessing and determining those levels.

The bill passed the Assembly Transportation Committee as amended by the author, and is now in the Assembly Appropriations Committee.

AB 2906 (Nation) – This bill, sponsored by the Union of Concerned Scientists, builds upon existing statutes that require CARB to specify smog index numbers for new light-duty vehicles. The bill would require CARB to revise the decal to list a global warming index, which would be based on the emissions of carbon dioxide and other greenhouse gases from the vehicle relative to those emissions from all subject vehicles for the same model year. As specified in the bill, calculation of emissions should include emissions from vehicle operation as well as upstream emissions, including those from production and delivery of fuels and other sources prior to fuel combustion in the vehicle. CARB would be required to develop the new decal by January 1, 2007, and it would be required on vehicles beginning with the 2009 model year.

^{*} Results of a joint Biodiesel Lifecycle Inventory Study were released by the U.S. Departments of Energy (DOE) and Agriculture (USDA) in May 1998.

The bill passed the Assembly Transportation Committee without amendment. Subsequent to that hearing, the author revised the statutory structure of portions of the bill, but did not change the major provisions. The bill is currently in the Assembly Appropriations Committee.

AB 2953 (Canciamilla) – This bill, sponsored by the author, would amend the statutes governing the Carl Moyer NOx reduction program, to allow temporary funding for some projects that are currently prohibited from being funded under the program. Under existing statutes, projects (i.e., new purchases, retrofits, repowers, or add-on equipment) that are required by federal, state, or local rules or regulations are not eligible for Moyer grants. This bill would allow districts that are designated as a serious nonattainment area with respect to federal particulate matter (PM) or ozone standards to adopt criteria for funding such projects if they are to be used for agricultural sources of air pollution. This proposed coverage area was expanded by amendments in the Assembly Transportation Committee to also include severe or extreme federal ozone nonattainment areas. The committee amendments shortened the proposed applicability period by two years, however, so that it would now sunset January 1, 2008, rather than 2010. With these amendments, the bill was passed to the Assembly floor.

[AB 2983 (McCarthy) – The California Air Resources Board is sponsoring this bill, which would create a Clean Schoolbuses, Healthy Kids Program, in conjunction with CARB's existing Lower-Emission Schoolbus program. Proposed program language was never introduced to the bill, which at present states only the Legislature's intent to create the program. As it contained no statutory proposal, it was never assigned to nor heard in a policy committee, and it is now dead. CARB has indicated that it might still put forth some sort of proposal this year, however, which might be introduced into other legislation.]

AB 3104 (Firebaugh) – This bill proposes a fee on fuel suppliers in order to fund emission reduction projects, and is sponsored by Sierra Club California (the legislative lobbying group for California chapters of the Sierra Club) and Environment California (the environmental arm of CALPIRG, the California Public Interest Research Group). After a lengthy series of legislative findings regarding air pollution, vehicle emissions, and emission reduction programs such as the Moyer NOx reduction program and CARB's Lower Emission School Bus program, it sets forth provisions for the "California Environmental Health and Air Quality Funding Act of 2004." The bill would create a Fund with the same name in the State Treasury, revenues for which would come from a fee imposed on fuel suppliers who remove fuel from a terminal or refinery rack, import fuel into California (not including importation by bulk transfer), or remove or sell fuel to an unlicensed person. A fee would also be imposed for removal or sale of blended fuel by the blender, based on the difference between the total number of blended gallons removed or sold and the number of gallons of fuel used in producing the blended fuel and on which a fee was previously paid.

The bill includes several provisions related to collection of the fee by the State Board of Equalization. Monies from the fee would be allocated to the local air districts in

accordance with each district's share of the state air toxics emissions inventory, for use in emission reduction or mitigation programs. Each district would be required to adopt a funding program and to establish, in coordination with CARB, a system for prioritizing projects. Criteria should include the extent and severity of Diesel and gasoline air pollution addressed by the project, the project's cost-effectiveness, the proximity of the contamination to and impact on communities, and the projected or past success of the project. Specific projects that may be included are those qualifying under the Carl Moyer NOx Reduction program, the Lower-Emission School Bus program, and the Voluntary Accelerated Light-Duty Vehicle Retirement Enterprises (scrappage) program, as well as programs to mitigate, alleviate, research, or evaluate health effects.

In accordance with statutes enacted with passage of AB 1390 in 2001, the bill specifies that districts with a population of at least one million distribute 50% of the funds in a manner that directly benefits low-income communities and communities of color that are disproportionately impacted by air pollution.

The bill includes an urgency statute, so it would take effect immediately if enacted. The bill passed the Assembly Transportation Committee without amendment and is now in the Assembly Appropriations Committee.

AJR 50 (Pavley) – This resolution begins with a lengthy series of statements regarding fuel cell vehicles, after which it resolves that the state is committed to support hydrogen and fuel-cell vehicle commercialization by 2010 by taking several actions:

- Ensuring that commercially available hydrogen and fuel cell vehicles are offered on the retail market;
- Providing convenient access to hydrogen fueling stations for at least 60 percent of Californians;
- Including the maximum number of hydrogen and fuel cell vehicles possible in appropriation application in California's state vehicle fleet; and
- Providing a commitment to development of renewable sources of energy for hydrogen production.

The resolution then resolves that state agencies in California will work with local and regional government on issues related to accelerating hydrogen production and installing hydrogen refueling stations, and other issues associated with commercialization. Lastly, the resolution asks the U.S. Department of Energy to recognize California's activities and ensure appropriate levels of federal funding.

The resolution was recommended for adoption by the Senate Committee on Environmental Quality, and referred to the Senate Appropriations Committee.

AJR 72 (Frommer) – This resolution asks the U.S. EPA to review and reconsider California’s request for a waiver from the Clean Air Act’s requirement for use of oxygenated gasoline, citing various arguments regarding emissions and fuel supplies. The Assembly Transportation Committee recommended that the resolution be adopted, and it then went to the Assembly floor, where numerous co-authors were added. It was adopted by the Assembly and is now in the Senate.

AJR 74 (Pavley) – As noted above, AB 2628 proposes to allow hybrid vehicles that meet CARB’s advanced technology partial zero-emission vehicle (AT PZEV) standards and have a highway fuel economy rating of at least 45 mpg to use high-occupancy vehicle (HOV) lanes, but federal authority would be required. This resolution, introduced by the author of AB 2628, seeks that authority by urging the President and the Congress to pass legislation that would allow single-occupant hybrid electric vehicles with the referenced fuel economy rating, and that conform to any other requirements identified by the responsible agency, to use HOV lanes in California. In leading up to this request, the resolution includes numerous statements regarding California’s dependence on petroleum for transportation, fuel economy, and hybrid electric technology.

The bill was recommended for adoption by the Assembly Transportation Committee, with amendments noting that California’s HOV lanes in many instances have excess capacity such that they could temporarily accommodate single-occupant hybrid electric vehicles, without degrading traffic flow in the lanes. It then went to the Assembly Appropriations Committee.

SB 403 (Florez) – This is a two-year bill carried over from last year that previously addressed MTBE water contamination and remediation. The author gutted that language in mid-April, however, and replaced it with provisions for a California Clean Air Bond Act. The text of the new language is similar to that carried by the same author last year in SB 701, which died in the Senate Appropriations Committee. The amended bill now proposes a \$4.55 billion California Clean Air Bond Act, which, if enacted by the voters, would allocate the bulk (\$3.9 billion) of the funds to CARB, in accordance with the specified distribution outlined below. (This is the same as proposed last year in SB 701.)

- \$400 million to the Carl Moyer program to reduce NOx emissions.
- \$600 million to the Carl Moyer program specifically to offset NOx emissions from farm equipment (included in this language is the provision that engines powering farm equipment vehicles of any weight may be eligible, and that the cost-effectiveness criteria otherwise specified in the Moyer program would not apply).
- \$500 million for the purchase of low, ultra-low, and zero emission vehicles in areas with the most severe air pollution impacts, as well as for the development and purchase of propane motor fuel technology.

- \$500 million for programs related to agricultural waste (e.g., agricultural waste chipping).
- \$400 million to grants to local air districts or other agencies for technologies and conservation management plans focused on improving air quality, environmental protection, and agricultural production.
- \$300 million to local air districts for emissions monitoring and health and environmental assessment.
- \$500 million for asthma-related projects.
- \$300 million for bus retrofit and fuel projects, including engine retrofit or replacement programs for schoolbuses and transit buses, and refueling infrastructure projects.
- \$400 million for CARB's Innovative Clean Air Technology Program.

Of the remaining funds, \$400 million would go to the Department of Agriculture for programs related to animal operations, and \$250 million would go to the Department of Conservation for allocation to the California Farmland Conservancy Program and/or the Williamson Act.

The bill also includes various provisions for administering the funds. It does not currently specify the election at which this act would be presented to the voters. The bill is awaiting assignment to a policy committee in the Assembly.

SB 1247 (Soto) – This bill begins with several statements of legislative findings regarding the health threat associated with vehicle emissions, the responsibility of local air districts to develop programs to reduce health risks associated with air pollution, and the lack of a dedicated funding mechanism to support existing financial incentive programs to reduce emissions. The language and format of these findings were revised somewhat by the author in April amendments,* but the general nature remained unchanged. Deleted, however, were the following specific principles that were listed as those that the Legislature intended to be considered by CARB and local air districts when establishing emission reduction and mitigation programs:

- Stable funding sources and financial incentives dedicated to emission reduction and mitigation for gasoline and Diesel-powered motor vehicles and nonroad engines;

* The author amended the bill on April 12 and again on April 16; the summary here reflects both sets of amendments.

- Maximum feasible emission reductions at the earliest possible date, using existing control technologies and incentives for advanced control technologies;
- Cost-effective emission reductions that leverage third-party financial assistance to the maximum extent feasible;
- Preventing any single source category from bearing an unfair burden; and
- Seeing that local air districts play a key role in determining emission reduction and mitigation priorities.

Instead, this was replaced with a statement of intent that CARB and the districts should place greater focus on obtaining emission reductions from mobile sources, especially gross polluting sources, and not place additional burdens on stationary sources “due to inadequate control of mobile source emissions.” (This last phrase was later deleted.)

The author also added statutory language to the bill, which proposes an Incentive-Based Emission Reduction Program for Internal Combustion Engines. The goal of the program as stated in the bill is to “reduce unhealthful air emissions from internal combustion engines through the application of financial incentives-based programs, relying to the greatest extent possible on existing programs with proven cost-effective results.” The bill specifies several criteria that CARB and the districts are to consider when implementing programs authorized under the bill, some of which reflect the criteria that had been included as intent language in the initial version of the bill. (As noted below, subsequent committee amendments changed these to program requirements.) These criteria include the following:

- Demonstrated cost-effectiveness, with 80 percent of all expenditures to be prioritized based on cost-effectiveness using specific criteria;
- Real emission reductions that are both measurable and surplus;
- For statewide programs, equitable distribution of monies among air districts (later deleted);
- Impact measured by improvement in attaining ozone and PM standards, not the type of fuel used;
- Quantifiable objectives, with independent and external reviews of program performance;
- Consideration of startup and scalability issues, and potential negative consequences; and

- For programs affecting the general public, convenience for the general public should be an underlying principle; and for all programs, compliance with environmental justice principles.

Specific programs that would be eligible for funding under the bill include the Moyer program, the Lower-Emission School Bus program, vehicle retirement (scrappage) programs, lawnmower electrification programs, and retrofit or replacement of agricultural engines and pumps.

The bill would create a special fund in the State Treasury to run the program, upon appropriation of funds by the Legislature. (It does not, however, currently specify a funding source.) Other sources, including those in the federal and private sector, would also be allowed to contribute to the fund. Provisions are included in the bill for administering the program, including the specification that districts spend 50 percent of the monies they receive from the program's fund in a manner that directly addresses air pollution or health impacts resulting from the refining and combustion of gasoline and Diesel fuel in communities with the most significant exposure to air pollution. The bill would also require CARB, in cooperation with the districts, to provide a report to the Legislature on the program by March 1, 2007, and annually thereafter through 2023. The program would sunset on December 31, 2022.

Following the author's amendments, the bill was heard and amended in the Senate Committee on Environmental Quality. These amendments changed the criteria listed above that CARB and the districts were to consider to program requirements, and amended some of those requirements. In addition to deleting the language regarding equitable geographic allocation of moneys, clarification was provided regarding state and district authority for implementing programs, specifying consistency with current regulations. The bill is now awaiting a second policy hearing in the Senate Transportation Committee.

SB 1397 (Escutia) – This bill is sponsored by the South Coast Air Quality Management District (SCAQMD), and is aimed at reducing emissions from locomotives. It begins with a series of legislative findings referring to exceedances of the federal and state air quality standards for particulate matter and ozone, the need to control or mitigate emissions from locomotives, and emissions reductions claimed in the 2003 Air Quality Management Plan for the South Coast. The bill states that until the federal EPA adopts emission reduction regulations for locomotives, the SCAQMD should be authorized to adopt an emission reduction and mitigation program. As an example of mitigation, the bill cites the addition of grade separations between rail lines and surface streets, the lack of which is currently contributing to emissions from idling vehicles.

Some of the statutory provisions of the bill are very similar to those carried for the SCAQMD last year in AB 1063 (which failed to pass out of the Assembly Transportation Committee). The bill would authorize the SCAQMD to adopt retrofit requirements for

heavy-duty vehicles, nonroad engines, and nonroad vehicles if the vehicle/engine operates substantially in a rail yard in the district and is part of a fleet of at least 15 vehicles/engines operated by a single owner or lessee. Under the restrictions set forth in the bill, no such regulation may be implemented before January 1, 2007, and CARB would be required to submit any regulations to EPA for waiver or authorization.

The SCAQMD would be required to establish “fair share emission reduction targets” for locomotives to meet in order to assist in attaining federal one-hour ozone, PM₁₀, eight-hour ozone, and PM_{2.5} standards, and applicable state standards. A deadline of December 31, 2005, is mandated for establishing targets relative to the federal one-hour ozone standard and the PM₁₀ standard. Beginning January 1, 2006, the District would be authorized to adopt a regulation that would impose a reasonable mitigation fee on railroad companies that operate in Los Angeles, Orange, Riverside, or San Bernardino counties. For the district to impose the mitigation fee, it would first need to find that there is a clear connection between the activities being charged a fee and the emissions to be mitigated; and that the fee is necessary for mitigation, does not exceed reasonable mitigation costs, is apportioned fairly based on each feepayer’s operations, and will not lead to a significant adverse impact on air quality due to shifting traffic from rail to other modes of transportation. In addition, the authority to impose a mitigation fee would not apply if the U.S. EPA has adopted regulations that would meet the established “fair share” reduction targets, or if all of the affected railroads entered into a binding agreement with the district to meet the fair share target. If such an agreement or such regulations only partially meet the fair share targets, then the emissions to be mitigated by a fee shall be reduced proportionately.

The bill also includes statements of legislative intent regarding a locomotive emission reduction and mitigation program, as detailed in our March and April summaries, as well as various requirements for the South Coast to adopt a program for spending the revenue raised from the fees.

The bill passed the Senate Committee on Environmental Quality in April with amendments specifying that the SCAQMD adopt binding and enforceable rules regarding the emission reduction targets (rather than a resolution) and that no reimbursement would be necessary to local agencies or school districts for any costs under the program.

The bill then received a second policy hearing in the Senate Transportation Committee, where it was again amended. These amendments exempt passenger rail equipment from the bill’s provisions, and modify the requirements for assigning priority in use of the funds. Under the amended language, the District must ensure that at least 50% of the funds are spent in reducing toxics and particulate matter in communities in the Alameda Corridor, the Alameda Corridor East, and the Route 710 corridor with the most significant exposures. This is more specific than the previous language, which states that priority should be given to communities most impacted by railroad-caused air pollution, and is consistent with legislative intent language that was already contained in the bill.

The bill is now awaiting a hearing in the Senate Appropriations Committee.

SB 1614 (Torlakson) – This bill (sponsored by the author) would impose an additional fuel tax to fund transportation-related programs. The bill as heard in the Senate Transportation Committee on April 20 proposed an additional 10 cent (\$0.10) per gallon excise tax on both gasoline and Diesel fuel, with 9 cents of that to go towards state highway and local road construction, maintenance, and improvement. The remaining one cent per gallon would be allocated for environmental programs that mitigate vehicle air quality impacts. (As noted above, AB 2128 would allocate a portion of that specifically for vehicle scrappage; AB 2847 also proposes to increase the excise tax, but does not specify the amount or allocation.) The bill failed to pass the Senate Transportation Committee in that form, but reconsideration was granted. The author then amended the bill to lower the proposed increase to five cents, by specifying a new rate of 23 cents/gallon (a five-cent increase over the current 18 cent/gallon rate), and also add a provision that would delay implementation of the increase until the retail price of regular unleaded gasoline dropped below \$2/gallon. Also added was a provision that would apply an equivalent inventory tax on existing tax-paid fuel suppliers held by blenders, wholesalers, and retailers. The bill also includes provisions related to the federal rate, with the goal of keeping the combined federal and state rate the same. The author's office has indicated, however, that these provisions may need further correction. In addition, the amount of the proposed increase is currently under discussion.

The bill is on hold in the Senate Transportation Committee.

SB 1615 (Denham) – This bill is sponsored by the Department of Motor Vehicles. Under current statutes, vehicles 30 model years old or older are exempt from the inspection requirements of the Smog Check program. Under a separate provision, however, applicable specifically to out-of-state vehicles being registered for the first time in California, only model years 1965 or earlier are exempt. This bill would repeal that specific provision for out-of-state vehicles. The author's office stated that there had been complaints to the Department of Motor Vehicles regarding the discrepancy in model year applicability and there was concern about possible lawsuits over the difference, citing the lawsuit over the Smog Impact fee for out-of-state vehicles a few years ago. The bill has now passed both the Senate Transportation and Appropriation Committees without amendment, and is now up for a vote in the Senate.

[SB 1814 (Battin) – This bill was introduced by a different author (Aanestad), on a different topic, but was gutted in April and replaced with provisions introduced by the current author to address the issue of fuel supply and price. The bill would authorize gasoline meeting federal requirements to be imported into and sold in California, and require CARB to impose a fee of eight cents per gallon on importers of federally approved gasoline that doesn't meet California's RFG requirements. The bill also requests that the University of California conduct a study examining several specific matters related to fuel sales and use, including the impact of the aforementioned noncomplying fuel sale on gasoline prices in California, on air quality, and on late-model cars (specifically catalytic converters), as well as issues related to transporting and distributing the fuel. The bill includes a provision that if EPA adopts fuel standards more stringent than California's, the proposed fee would not apply. The bill was heard in this

form in the Senate Transportation Committee, but failed to pass. The author's office indicated that it will not attempt to have the bill reconsidered, and it is now dead.]

SJR 28 (Torlakson) – Similar to AJR 72, this newly introduced resolution asks the U.S. EPA to reconsider granting CARB's request for a waiver from the federal oxygenated fuels requirement. It goes on to request that if EPA does not grant the administrative waiver, the U.S. Congress enact legislation authorizing California to waive the oxygen content requirement for reformulated gasoline so long as the fuel meets other federal requirements. In referring to legislation, it specifically mentions legislation similar to or including S. 947, introduced by Senators Feinstein and Inhofe, which would grant state governors the authority to waive the 2% oxygenate requirement for reformulated gasoline (RFG) as long as the fuel met all other federal RFG requirements.

The resolution was recommended for adoption by the Senate Committee on Environmental Quality and was then adopted by the Senate. It is now in the Assembly for assignment to a policy committee.

Quick Legislative Reference Guide		
Bill	Subject	Status
AB 1966	CARB to adopt guidelines for hydrogen refueling stations	Assy. Appropriations
AB 1971	Idling limits at marine terminals	Senate, for assignment
AB 2042	Baseline inventories for Ports of Los Angeles and Long Beach, and limits on future emissions	Assembly floor
AB 2128	Financial incentives for vehicle scrappage	Assy. Appropriations
AB 2366	Additional one-dollar vehicle registration fee in Bay Area Air Quality Management District	Assy. Appropriations
AB 2424	Vehicle scrappage criteria	Dead
AB 2484	Tax credit for fuel-efficient vehicles	Assy. Rev. & Tax.
AB 2526	Fund Moyer program with revenue from Diesel Fuel tax	Assy. Appropriations
AB 2541	Low Emission Contractor Incentive Program	Assy. Appropriations
AB 2628	Allow hybrid AT PZEVs to use HOV lanes	Senate, for assignment
AB 2644	Codify CARB's ATCM on schoolbus idling limits	Senate, for assignment
AB 2683	Change Smog Check older-vehicle exemption to pre-1976 model years	Assy. Appropriations
AB 2847	Increase fuel tax to fund road maintenance and vehicle emission reduction/mitigation programs	Assy. Appropriations
AB 2880	Increase local air district vehicle fee surcharge (currently four dollars) to six dollars	Assy. Appropriations

Quick Legislative Reference Guide		
Bill	Subject	Status
AB 2899	Labeling requirements for biodiesel fuels, and lifecycle CO ₂ analysis	Assy. Appropriations
AB 2906	CARB to develop global warming index for new vehicles	Assy. Appropriations
AB 2953	Funding under Moyer program for agricultural sources	Assembly floor
AB 2983	Clean Schoolbuses, Healthy Kids Program	dead
AB 3104	California Environmental Health and Air Quality Funding Act	Assy. Appropriations
AJR 50	State efforts to support hydrogen and fuel-cell vehicles	Sen. Appropriations
AJR 72	EPA review of CARB's request for a waiver from oxygenated fuel requirements	Senate, for assignment
AJR 74	Request federal approval for hybrid electric vehicles to use HOV lanes	Assy. Appropriations
SB 403	California Clean Air Bond Act	Assembly, for assignment
SB 1247	Incentive-Based Emission Reduction Program for Internal Combustion Engines	Sen. Transportation
SB 1397	Heavy-duty retrofit requirements and "fair share" targets for locomotive emission reductions	Sen. Appropriations
SB 1614	Additional fuel tax to fund road maintenance and emission reduction/mitigation programs	Sen. Transportation
SB 1615	Smog Check program requirements for out-of-state vehicles registering in California	Senate floor
SB 1814	Use of gasoline that doesn't comply with CaRFG standards	dead
SJR 28	EPA review of CARB's request for a waiver from oxygenated fuel requirements, and support for related federal legislation	Assembly, for assignment

Rulemaking Calendar Update

CARB recently released its Rulemaking Calendar for 2004, which is available on its website.* Most of the items on the calendar are already in progress and have been reported on here previously; and the projected schedule for some of the items is already out of date (for example, heavy-duty OBD is listed as going to the Board in April, which

* <http://www.arb.ca.gov/regact/calendarb.pdf>

has changed to May; the idling regulation listed for May is now scheduled for July). New items include amendments to the exhaust emission regulations for off-road compression ignition engines, projected to go to the Board in October, and development of a Diesel PM control measure for public off-road fleets, with a projected Board hearing date of November 2004. The CARB staff has indicated, however, that no action is currently planned on the latter item, as there are no staff members available to work on it, so it will not be going to the Board this year. We were unable to confirm anything regarding amendments to the off-road compression ignition rule, but no workshops have yet been scheduled. We will add this item to our calendar if appropriate when further information becomes available.

Also on the calendar is a rulemaking related to State Implementation Plan (SIP) measures OFF-ROAD LSI-1, "Lower Emission Standards for New Off-Road Non-Preempt Gas Engines" and OFF-ROAD LSI-2 (Consolidated): Clean Up Off-Road Gas Equipment Fleet Through Retrofit Controls and New Emission Standards," both referring to spark ignition engines 25 hp and greater. A workshop has recently been announced for this item and is scheduled for May 26 in Sacramento.

On the agenda for the May Board hearing is, as noted above, the heavy-duty onboard diagnostics proposal, the staff report for which is discussed elsewhere in this issue, as well as a report to the Board on implementation of amendments to the service information rule that was approved at the January Board hearing (please see our February 2004 issue for further details). In addition, the staff will be presenting the Board with an update on an implementation plan for Governor Schwarzenegger's Hydrogen Highway. As noted in our Legislative Update summary, the Governor recently announced a Hydrogen Highway Network Initiative and signed Executive Order S-7-04, which creates a public and private partnership for the development of a hydrogen refueling network.

CARB has several workshops scheduled for May. A workshop was held on May 6 to discuss strategies to reduce PM emissions, as required by last year's SB 656, and will be covered in our next issue. Fleet-related measures being proposed under CARB's Diesel Risk Reduction Plan will be addressed at workshops scheduled for May 17 in Sacramento and May 18 in El Monte. As has been reported previously, in developing amendments to its fleet rule for public transit agencies the CARB staff decided to develop a separate rule for nonurban buses, which will be the subject of an afternoon workshop on these days. (Amendments related to urban buses will be presented to the Board for adoption in June.) In the morning, a workshop will be held to cover the proposed Air Toxic Control Measure (ATCM) for on-road heavy-duty Diesel public fleet vehicles. As stated in the notice accompanying the draft regulation, the staff is now proposing to also apply the measure to privately owned utilities.

Also on May 18, the staff will hold a workshop to discuss its recently released draft test procedures and proposal for portable fuel containers (delayed slightly from the previously anticipated May 12 date), and on May 26 will be the aforementioned LSI workshop. The next in CARB's ongoing series of fuels-related workshops has been scheduled for June 3.

As discussed elsewhere in this issue, CARB held a workshop in April discussing its draft technology and cost assessment with respect to its proposed climate change (AB 1493) regulations. The next workshop on this rulemaking has not yet been scheduled, but the staff has indicated that it might be in late June. Related to the general topic, the California Energy Commission has announced a June conference titled "From Climate To Economics: Anticipating Impacts Of Climate Change In California."* Included on the agenda are topics related to evaluating the effects of climate change on California and mitigation of greenhouse gas emissions.

The next workshop to discuss CARB's proposed rulemaking for harbor craft is tentatively anticipated for July. The Board hearing, previously set for October, has now slipped until early next year.

CARB has also now postponed its rulemaking on Enhanced Vapor Recovery (EVR) for Aboveground Storage Tanks until sometime next year, to allow the staff time to conduct more outreach efforts and review its inventory. As discussed at the February workshop (please see our February 2004 issue), the staff felt that it needed a better estimate of the tank size distribution and asked stakeholders at that time for further information.

Also postponed until next year is development of the ATCM for fuel delivery tanker trucks. The CARB staff has stated that it now expects to wrap this into a more general measure focusing on private fleets, development of which isn't expected to start until next year. We have therefore removed it from our calendar.

Delayed indefinitely, according to the CARB staff, are the proposed idling emission reduction requirements for 2007 and later model year heavy-duty Diesel vehicles. This item, most recently discussed in our January 2004 issue, was originally scheduled for a November 2003 Board hearing. It was then postponed to January 2004 and later to June 2004, while the staff continued discussions with stakeholders. The staff has now said that the rulemaking will not be going forward this year, although it may pursue optional certification standards and optional standards for off-road Diesel auxiliary power units (APUs). We are thus removing this rulemaking from our calendar, and will report on the optional proposals if and when there is any activity in that regard.

The table on the following page summarizes the status of the current rulemaking items. Those not discussed above remain on schedule or uncertain at this time.

* Further information on the conference, including registration information and a draft agenda, may be found at http://www.energy.ca.gov/global_climate_change/2004_conference/.

CARB Rulemaking Calendar
Projected by Sierra Research
Status as of May 2004

Subject	Next Action	Date of Next Action	Projected Hearing Date	Model Year or Date of Implementation
Adopt List of PM Measures	Workshop	May 6	July 2004	--
Amendments to ATCM Fleet Rule for Transit Agencies to Add Non-Urban Buses	Workshop	May 17/18	September ? 2004	?
ATCM for On-Road Heavy-Duty Diesel Fueled Public Fleets and Private Utility Fleets	Workshop	May 17/18	Late 2004	2005-2011
Portable Fuel Container Regs	Workshop	May 18	December 2004	2005-2006
Heavy-Duty OBD	Board Hearing	May 20	May 2004	2007
ATCM to Limit Heavy-Duty Idling	Workshop	May 21	July 2004	2004-2009
Requirements for Off-Road LSI Engines > 25 hp	Workshop	May 26	October 2004	?
Clean Fuels Outlets	Workshop	June 3	September 2004	?
Phase 3 RFG Amendments	Workshop	June 3	October 2004	?
CA Diesel in Marine and Locomotive Engines	Workshop	June 3	Late 2004	?
Amendments to ATCM Fleet Rule for Transit Agencies and Urban Bus Standards	Board Hearing	June 24	June 2004	2005-2010
AB 1493 Implementation	Workshop	Late June?	September 2004	2009
Commercial Harbor Craft Regs	Workshop	July	Early 2005	2005?
Update Vapor Recovery Equipment Defects List	Exec. Officer Hearing	July	July 2004	?
Permeation Standard For Gasoline Dispenser Hoses	Workshop	Spring/Summer?	December 2004	2007-2011
Adopt Certific. & Test Procedures For AST Vapor Recovery Systems	Workshop?	?	2005	2006
Fuel Cargo Tank Transfer Reg.	Workshop	?	2005	2006

Next Month:

- CARB Hearing on Heavy-Duty OBD
- Workshop on Strategies to Reduce Particulate Emissions
- Workshop on ATCM for On-Road Heavy-Duty Diesel Public Vehicles
- Workshop on Amendments to Fleet Rule for Transit Agencies
- Workshop on Portable Fuel Containers
- Workshop on LSI Engines