

**State of California
AIR RESOURCES BOARD**

**Research Screening Committee Meeting
Cal/EPA Headquarters Building
1001 I Street
Conference Room 510
Sacramento, California 95814
(916) 445-0753**

**March 30, 2007
9:00 a.m.**

ADVANCE AGENDA

Sole Source Proposals

1. "Evaluation of the Potential Impact of Emissions of HFC-134a from Non-Professional Servicing of Motor Vehicle Air Conditioning Systems," ARMINES, \$126,072.92, Proposal No. 2626-255

Millions of motor vehicle air conditioning systems (MACS) exist in California. The dominant MACS refrigerant in use, HFC-134a, is a potent greenhouse gas (GHG). The climate impacts from MACS are due primarily to direct refrigerant leakage and indirect CO₂ emissions resulting from equipment energy demands. This project will focus on the direct HFC-134a emissions associated with the servicing of MACS by the vehicle owner and on the leakage mechanism in those in-use systems. The proposed research will determine: 1) the mechanisms responsible for the emissions associated with do-it-yourself (DIY) servicing of MACS; 2) the total number of small cans of HFC-134a for retail sale to non-professionals in California, 3) the amount of HFC-134a remaining in the can "heel" after refrigerant transfer, 4) the amount of refrigerant that is emitted from the MACS during the re-charging process by the non-professional, and 5) the benefit of professional servicing. These data are necessary to evaluate the climate impact in California of DIY servicing and inform regulation development pursuant to the Global Warming Solutions Act of 2006, which mandates the reduction of GHG emissions in California to 1990 levels by the year 2020. Specifically, the intended regulatory strategy will consider restricting the retail sales of small cans of MACS refrigerant and mitigating the impact of DIY servicing practices for motor vehicle air conditioning systems.

2. "Characterizing A/C Refrigerant Emissions from Heavy-Duty On and Offroad Vehicles in California," Eastern Research Group, \$148,513, Proposal No. 2627-255

ARB has been at the forefront of controlling greenhouse gas (GHG) emissions of refrigerant from mobile air conditioning systems (MACS), having adopted AB1493 to limit such emissions, and other GHG gases, from light-duty on-road vehicles. The proposed contractor has developed a methodology to perform a detailed assessment of

MACS refrigerant emissions from heavy-duty on and off-road vehicles operating in California. The proposed approach will provide ARB with a comprehensive profile of A/C system configurations currently in use in the State, as well as for systems expected to enter the market in the near future. In addition, the contractor will facilitate an iterative process incorporating input from industry and other technical experts, to develop a reliable, verifiable refrigerant measurement method for use in the project. The results of this project will support ARB to develop measures that would extend regulation to the classes of vehicles not addressed by the AB1493 (vehicles other than LDVs).

Draft Final Reports

3. "Monitoring and Modeling of Ultrafine Particles and Black Carbon at the Los Angeles International Airport," University of California, Los Angeles, \$117,986, Contract No. 04-325

Exposure to ambient particulate matter (PM) poses serious health concerns in California, with fine PM (PM_{2.5}) and ultra-fine PM (UFP) exposure of special concern. Prior studies indicated that aircraft emissions from major airports could have significant impacts on neighboring communities, but were not able to quantify the extent of nearby PM exposures, nor the extent of health concern. This is because the methods used could not assess UF PM, and could not distinguish aircraft emissions from other combustion sources such as traffic arteries and nearby industrial sources. This study used near-real-time monitoring equipment at the Los Angeles International Airport (LAX) and in the nearby community to determine levels of UFP, black carbon, and PM_{2.5} emitted from aircraft. Aircraft activity at LAX was found to contribute pollutants to the downwind community.

4. "Analysis of Building Characteristics & Indoor Environmental Quality in California Classrooms," Westat, Incorporated, \$116,780, Contract No. 03-328

In 2001-2002, the Air Resources Board (ARB) and the Department of Health Services (DHS) conducted a study to assess environmental health conditions in California's portable classrooms, as required by California Health and Safety Code Section 39619.6. A great-deal of new data were collected for the Portable Classrooms Study (PCS). However, detailed analyses of some of these data were not funded in the initial study. The objective of this project was to further analyze variables on ventilation and other energy-related factors and examine their relationships to indoor air quality and other environmental characteristics in classrooms. In addition, the association of pollutant levels with a school's socioeconomic indicators was examined. The California Energy Commission (Commission) will use the results of this project to revise their building energy efficiency standards for schools and to provide guidance to schools for improved energy efficiency; the Commission is providing the major funding for this effort. The ARB will use the results of this study to help refine specific recommendations to schools and guide further actions for preventing indoor environmental quality (IEQ) problems in schools.

5. "Polycyclic Aromatic Hydrocarbons (PAHs): Sources of Ambient Quinones," University of California, Riverside, \$120,000, Contract No. 03-314

Exposure to fine particulate matter in ambient air has been associated with high rates of death and disease. Although the causes are not established, much of these health effects may be due to quinones residing on the particles. Quinones can generate large amounts of toxic "reactive oxygen species" that can overwhelm cellular defenses. polycyclic aromatic compounds (PAH) quinones, which are formed from atmospheric reactions of PAHs present in vehicular exhaust, may have significant consequences for the health of Californians. In order to understand the extent of PAH-quinone formation in ambient air, PAHs were chosen based upon their abundance in ambient air, and photolyzed in an environmental chamber. Reaction products were analyzed, with an emphasis on quinones. The researchers found that phenanthrene, a relatively abundant PAH in ambient air, becomes phenanthraquinone (PQ) at unexpectedly high yields at night. This is significant because other researchers believe that PQ is responsible for much of the toxicity of directly-emitted diesel exhaust. Understanding the role of atmospheric reactions in the production of PAH-quinones is necessary in order to assess the potentially significant health threat to California residents.

6. "Incidence of Malfunctions and Tampering in Heavy-Duty Diesel Vehicles, and Their Emissions Impact," University of California, Riverside, \$199,103, Contract No. 01-340

Heavy-duty diesel trucks (HDDTs) are substantial contributors to the California mobile source emissions inventory, and HD diesel engines (HDDEs) have been subject to increasingly stringent tailpipe emissions standards. However, since the "off-cycle" NO_x situation of the late 1990's (in-use HDDEs had higher NO_x emissions than would be expected based on engine certification results), there has been an interest in determining the in-use emissions performance of HDDEs. The objective of this project was to procure and test a small number of HDDTs to collect emissions data to gauge the in-use performance of these HDDEs. The HDDTs tested ranged in model years between 1996 and 2004. As would be expected, NO_x emissions were highest from the oldest model year HDDT, and lowest for the latest model year HDDTs. Verifying that in-use emissions trends are consistent with reductions in certification standards is critical to ensuring compliance with applicable emissions standards, and this research project provided one such measure of verification.

7. "Assessment of Out-of-State Heavy-Duty Truck Activity Trends in California," University of California, Davis, \$64,976, Contract No. 04-328

Heavy-duty diesel trucks (HDDTs) are significant contributors to the mobile source emissions inventory for NO_x and particulate matter (PM), and the impact of emissions from out-of-state HDDTs has long been a subject of interest to the ARB. In addition to sometimes different certification standards (especially for Mexican-registered HDDTs), these HDDTs may be burning non-California specification diesel fuel ("CARB diesel") and thus have higher emissions than HDDTs burning CARB diesel. The objective of this

project was to study and characterize the activity of these out-of-state HDDTs in terms of their population, vehicle miles traveled, and refueling practices. The project objectives were primarily accomplished through the development and administration of roadway surveys conducted at various border crossing points in California. The survey results indicate that the out-of-state heavy-duty diesel trucks in California account for 14-17 percent of the operating truck population and 26-29 percent of the truck mileage on California roads. Results indicate that 25-28 percent of all HDDT mileage in California is by HDDTs burning out-of-state diesel fuel. The results from this study will aid in improving and refining the HDDT emissions inventory estimates for out-of-state HDDTs.

8. "Development of a Micro Air Particulate Analyzer (Micro APA) for Ubiquitous Deployment in Air Quality Monitoring and Epidemiological Studies," University of California, Davis, \$220,896, Contract No. 03-346

The commercially available instruments for characterizing ambient particulate matter (PM) are not well-suited for widespread deployment by persons who are not highly trained to use them and backed by considerable resources. Additionally, existing instruments tend to be large and require frequent operator intervention. Overcoming these limitations would enhance research capability to collect useful PM size data of high spatial and temporal resolution. This project was intended to develop a prototype of an affordable, portable, easy-to-use instrument to measure the size distribution of PM smaller than one micron. The project did not reach its final objective. The prototype device developed could detect airborne PM under laboratory conditions, including detection of generated aerosol size trends, but detailed measurements are labeled in the report as "not conclusive". The principle implication for the Board's work is that PM measurement research activities will necessarily have to continue with existing technologies and methodologies, and will not be able to take advantage of the envisioned cheaper and smaller device to improve spatial and temporal measurement resolution.

9. "Research into the Development of Biological Methods of Dust Suppression in the Antelope Valley," San Diego State University, \$89,814, Contract No. 01-339

Dust from fallow and abandoned farmland has caused severe PM10 problems in the Antelope Valley (Mojave Desert portion of Los Angeles County). As part of a federal, state, local and private cooperative effort, ARB funded San Diego State's Soil Ecology and Restoration Group (SERG) to study cost effective means to revegetate barren land, with the goal developing guidance for land owners to control dust by establishing stable cover with native plants. SERG established multiple test plots across different soil types to evaluate the relative success of different plant species, planting methods, post-planting care, and development of sustainable soil nutrient supply. The results showed that a stable plant cover can be created on abandoned farmland, that the unusually high salt and nutrient load in fallow farmland (compared to undisturbed desert) generally favored plants of the genus *Atriplex*, and that those plants generally benefited from mulching and deep irrigation. In addition comparison across soil types showed that site-specific conditions alter the degree of success and indicate that optimum species choice

should be based on local soil conditions. The success of this program gives land owners and regulators new tools to apply to achieve long-term dust control on abandoned farmland.