

**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**

**May 15, 2009  
9:00 a.m.**

**ADVANCE AGENDA**

**Draft Final Reports**

1. "Follow-On Development of CARBITS: A Response Model for the California Passenger Vehicle Market," University of California, Davis, \$100,000, Contract No. 05-303

The Air Resources Board (ARB) frequently adopts regulations that apply to new light-duty passenger vehicles but may have secondary effects on the overall on-road fleet and total statewide emissions. ARB previously contracted for the development of CARBITS, a forecasting model for California's passenger vehicle market, to support the rulemaking for the AB 1493 Pavley vehicle greenhouse gas standards. This contract produced an updated version of the model, CARBITS 2.0, that addresses some of the technical drawbacks of the original model and also expands its capabilities to incorporate the introduction of hybrid electric vehicles. The underlying behavioral model determining the fleet profile was changed from modeling vehicle transactions (e.g. replacements, additions, and deletions) to modeling the number and type of vehicles owned by households, which eliminated statistical noise issues and significantly reduced model runtimes. This change in model specification also allows CARBITS 2.0 to be based on more recent data sources on vehicle holdings and a more flexible modeling framework will allow for regular in-house recalibration as newer data become available. These modifications and enhancements address some of the criticisms received from stakeholders about the original CARBITS model, so that CARBITS 2.0 will be a more robust analytical tool for evaluating the effects of future rulemakings on light-duty vehicles.

2. "Traffic-Related Air Pollution and Asthma in Economically Disadvantaged and High Traffic Density Neighborhoods in Los Angeles County, California," University of California, Los Angeles, \$422,087, Contract No. 04-323

This study investigates asthma exacerbations at the neighborhood and individual level in children that live in high traffic density areas and who may be more

susceptible to adverse health impacts from air pollution exposure due to economic disadvantage. The investigators monitored oxides of nitrogen and nitrogen dioxide, as a surrogate for traffic pollution, at 200 locations within the Los Angeles Family and Neighborhood Survey study domain for the development of land use-based regression models. Other models were used to estimate regional background concentrations of ozone and fine particulate matter in an effort to evaluate whether these pollutants confound or modify the effects of exposure to traffic pollution. The study found that children more highly exposed to traffic pollution were more likely to report having current wheeze symptoms, and marginal positive associations were observed for odds of doctor-diagnosed asthma and medication use for asthma and wheeze in the past year. The study found differences between boys and girls in the effects of traffic related pollution exposure on lung function which suggests important differences in exposure or in the biological impact of air pollution on lung function in boys versus girls. In the future, these findings could help inform policy decisions on motor vehicle emissions control and asthma prevention/control in low socioeconomic status populations.

3. "Cardiovascular Health Effects of Fine and Ultrafine Particles during Freeway Travel," University of California, Los Angeles, \$640,674, Contract No. 04-324

Numerous epidemiological studies have linked increases in particulate matter exposure to increases in cardiovascular death and illness. There has been some evidence published that supports the hypothesis that ultrafine (UF) particles (diameter <100 nm) are associated with cardiovascular disease and symptoms. However, there are no systematic measurements of UF particles inside vehicles and their associated human health effects during commuting. Exposure to UF particles is substantially elevated near freeways, but most exposure occurs during actual travel on freeways. The primary objectives of the present study were to investigate acute effects in elderly volunteers riding on Los Angeles freeways and relate these effects to particulate matter and gaseous components of air pollution. The study used a modified nine-passenger van with an exposure chamber and filtration system to expose a total of 19 elderly, healthy subjects for two hours each to either unfiltered or filtered freeway air on two freeways, one dominated by gasoline vehicles (I-405) and the other with a high proportion of heavy-duty diesel trucks (I-710) although this freeway also is traveled by gasoline vehicles. Health assessments included 24-hour measures of heart rate and heart beat, analysis of blood for markers of inflammation and heart function, blood pressure, and lung function. Altered heart beat events during and after exposure decreased 20 percent on average with filtered air compared to unfiltered air. Individual responses related more strongly to particle count than to particle mass. Blood markers for altered heart function and systemic function decreased 30 percent on average in filtered air compared to unfiltered air. This study contributes to exposure assessment of freeway commuters and the health impact of UF particles associated with freeways.

4. "Inventory of Direct and Indirect GHG Emissions from Stationary Air Conditioning and Refrigeration Sources, with Special Emphasis on Retail Food Refrigeration and Unitary Air Conditioning," ARMINES, \$225,060, Contract No. 06-325

Under the Global Warming Solutions Act of 2006 (AB 32) the ARB identified the Refrigerant Management Program as an early action measure to reduce the emissions of high global warming potential (GWP) greenhouse gases (GHG) from commercial refrigeration and air conditioning (R/AC) systems in California. The first objective of this project was to develop an independent inventory of the high-GWP refrigerant banks and emissions from stationary R/AC systems in California to support this early action measure. This inventory was extrapolated out to 2020 under a business as usual (BAU) scenario and two scenarios involving the implementation of alternative technology. The contractor demonstrated that the implementation of some alternative technologies, including improved leak repair practices and modifications to display cases, could result in substantial emission reductions. The second objective of this project was to characterize baseline energy use and emissions (direct and indirect) from commercial refrigeration systems in California. This baseline data was used to conduct a life cycle cost assessment (LCCA), and a total equivalent warming impact (TEWI) analysis regarding changes from BAU after alterations to existing systems were made and after alternative technologies were implemented in the installation of new systems. The LCCA and TEWI analyses indicated that alterations to existing systems could yield substantial energy savings with relatively short pay back periods, but that installation of new alternative technologies were less economically feasible.

5. "Particulate Phase Peroxides: Concentrations, Sources, and Behavior," University of California, Los Angeles, \$109,975, Contract No. 04-319

Particulate matter has been associated with significant adverse health outcomes, but it is difficult to devise cost-effective control strategies without a better understanding of the cause of PM toxicity. Scientists believe that reactive oxygen species (ROS) are responsible for much of this toxicity, and the dominant ROS in PM is hydrogen peroxide ( $H_2O_2$ ). Using a technique to quantify peroxide levels in aerosols, University of California, Los Angeles (UCLA) previously found that  $H_2O_2$  levels are more than 100 times the level that had been predicted. Therefore, PM may be able to continuously generate  $H_2O_2$  in aqueous media such as lung fluid. This study explored the sources, levels, and behavior of  $H_2O_2$  in ambient air. The UCLA measured  $H_2O_2$  levels in PM from various sites and source types, such as photochemically processed air and diesel exhaust, and investigated their relationships. Size-segregated aerosols were collected on filters and analyzed for peroxides. UCLA also carried out laboratory studies to help determine how PM might evolve peroxide in lungs. This study will contribute substantially to the understanding of PM toxicity, and may lead to follow-up studies that should eventually help the ARB to devise control strategies for PM sources that are especially effective in generating  $H_2O_2$  and thereby harming human health.

## **Other Business**

6. Update to the RSC on CalNex and Other Field Studies in California in 2010