CALIFORNIA AIR RESOURCES BOARD

Research Screening Committee Meeting
Cal/EPA Headquarters Building
1001 I Street
Conference Room 510, 5th Floor
Sacramento, California 95814
(916) 445-0753

October 18, 2019
9:00 a.m.

ADVANCE AGENDA

I. Approval of Minutes of Previous Meeting:

July 18th, 2019 meeting

II. Discussion of Draft Final Reports:

1. "Identify Outlier Makes and Models of Light Duty Vehicles Using Remote Sensing Devices" Eastern Research Group, $74,975, Contract No. 17RD014

   This study analyzed on-road emissions of various pollutants, including nitric oxide, from approximately 35 million vehicles in the greater Denver area, Colorado. These observations were made from 2009 through 2018. Results were aggregated into vehicle groups, defined by a specific combination of model year, make, model, engine displacement, and fuel. Although the Colorado fleet has a greater proportion of pickup trucks and fewer smaller passenger cars than the California fleet, the large size of the Colorado dataset allowed emissions of under-represented (relative to CA) vehicle groups to be quantified. The highest on-road NO emissions of the Colorado fleet are still dominated by previously-identified Volkswagen/Audi/Porsche diesel vehicle groups, and sharp (greater than 50 percent) reductions in NO emissions for these groups were seen for model years 2015 and later. More recently, a handful of vehicle groups were found to have exhibited high average on-road emissions for one or more years, but none were found to have the type of systematic issues seen earlier during the Volkswagen emissions scandal. Emission deterioration rates were quantified at the vehicle group level for model year 2009 and later vehicles, and were relatively small: hydrocarbon emissions increased by around 1 ppm/year, NO emissions by 4 to 5 ppm/year, and carbon monoxide increased by around 0.01 percent/year.

2. "Measuring Emissions from the On-Road Vehicle Fleet in West Los Angeles," University of Denver, $40,000, Contract No. 17RD015

   Light- and medium-duty vehicle exhaust emissions are important sources that contribute to urban air pollution. CARB needs a substantial set of long-term, real-world vehicle emission measurement data to monitor emission trends over time. Through a data collection campaign in spring 2018, this project extends a sixteen-year record of on-road vehicle emission measurements using remote sensing devices at a West Los Angeles location. The contractor collected 19,259 measurements of CO, HC, NO, nitrogen dioxide, ammonia,

and sulfur dioxide, calculated their fuel-based mass emission rates, and conducted emission trends analysis. The results show that, between 1999 and 2018, fleet emissions have decreased by 84 percent for CO, 79 percent for HC, and 76 percent for NO. Over the same period of time, the 99th percentile emission rates have decreased by 73 percent for CO, 67 percent for HC, and 40 percent for NO. Since the 2013 campaign, the 99th percentile emission rates have been leveling out, which could slow future fleet emission reductions.

3. "A Tool to Prioritize Sources for Reducing High PM2.5 Exposures in Environmental Justice Communities in California," University of Texas at Austin, $180,000, Contract No. 17RD006

California ambient PM2.5 concentrations have decreased by up to 30 percent in the past two decades; however, environmental justice (EJ) communities are still exposed to higher levels of PM2.5 than non-EJ communities. It is critical to identify sources contributing to higher PM2.5 levels in EJ communities and prioritize them for emission reduction. The objective of this project is to develop and use a screening tool to identify and prioritize sources contributing to higher levels of PM2.5 observed in EJ communities in California. A spatial database of intake fractions (iF, the fraction of emissions emitted by a specific source that is inhaled by the population) for primary and secondary PM2.5 was constructed from results obtained from a reduced complexity chemical transport model and census data for different groups based on age, income level, and race/ethnicity. The wide range of iF values observed in the study affirms the importance of using spatially-explicit iF data to compare exposure impacts among different sources. Given information on location and emission rates of PM2.5 or precursor emissions (NOX; oxides of sulfur, SOX; NH3; and volatile organic chemicals, VOCs), the iF database was used to calculate the resulting PM2.5 intake for the total population and each demographic group. This information was used to derive exposure disparity metrics for different disadvantaged or vulnerable groups. Groups of lower socioeconomic status, including non-white, low-income, low educational attainment, or linguistically isolated groups, systematically experienced higher PM2.5 exposure concentrations from all emissions categories. Differences in per-capita PM2.5 exposure concentration ranged from up to 15 percent by income and 35 percent by race. The two top sources of PM2.5 exposures, on-road vehicles and industrial activity, contributed most to exposure disparity by race in absolute terms, while some minor sources, such as commercial cooking and petroleum refining, resulted in higher relative differences in PM2.5 exposure. These examples illustrates the strength of the screening tool to enable impact-oriented comparison of PM2.5 emission sources, and may help prioritize effective emission reduction targets to achieve CARB's EJ goals.

4. “Improving the CalEnviroScreen Score at the US-Mexico Border,” San Diego State University Research Foundation, $150,000, Contract No. 16RD010

   The main objective of this study was to improve the understanding of the impacts of air pollution from Mexico on border communities in the USA. In addition, the study aimed to improve models and tools such as CalEnviroScreen (CES) and Environmental Justice Screening Method (EJSM) so they accurately capture the cumulative environmental impacts. This study gathered existing data from sources in Baja California near the US Mexico border and performed validation and ground truthing. The study developed a process for evaluating the data, incorporating the data with existing California data as accurately and comparable as possible, and converting the data to a useable geocoded input for CES and EJSM. To achieve the objective, three types of analysis were performed. The first mapped activities for sources in Baja California, including burn events; the second modelled the potential areas of influence (PAI) of selected sources and potential source regions for California communities; and the third estimated the impact of sources close to the border on existing community scores in the EJSM. The present study evaluated the impacts of the new facilities and source information on screening scores of census tracts near the border. The study identified data gaps and other data characteristics that limit accuracy and completeness in characterizing emissions from this area. The data also highlighted that urban burning was common in Mexicali. Air toxics emissions sources in Mexico have a clear potential to affect communities and individuals in the US-Mexico border region. This study recommended the use of the tools developed in the analysis to determine border-specific approaches to improving CES that takes into account Baja California sources. The results of this study will be beneficial to CARB, allowing a more accurate assessment of EJ communities in California.

5. “Are Adverse Health Effects from Air Pollution Exposure Passed on from Mother to Child?,” University of California, Davis, $330,483, Contract No. 15-303

   In animal models, some experimental evidence suggests that early life environmental exposures can alter gene function, leading to adverse health effects that span two or more generations without additional exposure (epigenetic changes). A previous CARB funded study followed rhesus macaques that were exposed in infancy to high levels of wildfire smoke-related fine PM2.5 and compared them to control animals born the next year that were not exposed to high air pollution levels as infants. In adolescence, the exposed animals demonstrated adverse lung and immune function changes compared to control animals. The current project extended the original investigation by evaluating immune and lung function in the smoke-exposed and control females, now adults. Researchers also examined these females’ offspring for evidence of epigenetic changes. Investigators addressed three specific aims: 1) to determine whether the altered immune responses previously observed in the smoke-exposed animals persisted, and whether the same response occurred in the animals’ unexposed offspring; 2) to determine whether changes in lung health (volume, density, obstruction) previously observed in the smoke-exposed animals persisted, and whether the same response occurred in the animals’ unexposed offspring; and 3) to

determine whether the offspring of smoke-exposed animals showed similar immune changes as their mothers. Study results showed that, compared to control animals, exposed females exhibited altered cytokine (immune marker) synthesis in blood cells cultured with microbial components. Smoke-exposed animals also showed evidence of lung remodeling. Offspring of exposed animals displayed significant changes in immune markers relative to offspring of control animals. The possibility that environmental exposures can lead to detrimental health effects across generations has significant public health and air quality management implications, as it suggests a mechanism by which chronic disease burden can be maintained long after exposures have declined.

III. Other Business:

1. Update on the 2020/2021 Research Plan