CALIFORNIA AIR RESOURCES BOARD

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

March 15, 2019
9:00 a.m.

ADVANCE AGENDA

I. Approval of Minutes of Previous Meeting:

January 11, 2019

II. Discussion of Draft Final Reports:

1. "Association between Long-Term Ultrafine Particulate Matter Exposure and Premature Death," University of California, Davis, $848,584, Contract No. 14-314

   A large body of literature shows associations between fine particulate matter (PM2.5) and premature death, with the most persuasive evidence coming from long term epidemiological studies. The epidemiological evidence for a similar relationship with ultrafine particles (UFP) is limited and inconclusive; the current study aimed to help fill this research gap. The overall objective of the proposed study was to identify features of UFP's (e.g. number, mass, constituents) associated with premature death in California. This study, which combined statewide modeling of UFP distribution with monitoring data, greatly strengthens the exposure analysis for UFPs relative to previous work that relied on central site monitors. The results of this study provide CARB with a clearer understanding of the health impacts associated with exposure to UFP, including health risk at ambient concentrations.

2. "Measuring Real-World Emissions from the On-Road Heavy-Duty Truck Fleet," University of California, Berkeley, $450,000, Contract No. 12-315

   California Air Resources Board (CARB) regulatory programs have targeted emission reductions of particulate matter (PM) and oxides of nitrogen (NO_X) from heavy duty vehicles (HDVs) over the past decade, and real-world emissions measurements of the current fleet are essential for evaluating the efficacy of the programs. Emissions of PM, NO_X, particles, and gas-phase nitrogen species from HDVs at the Caldecott Tunnel (Oakland, CA) were quantified in 2014, 2015, and 2018 via a plume capture sampling method and matched to license plates. As diesel particulate filter (DPF) penetration increased to 91 percent and selective catalytic reduction (SCR) to 59 percent, black carbon (BC) emissions decreased

by 79 percent and NO_X emissions decreased by 57 percent. Issues with DPFs were identified in a small number of "high-emitters," with 3.8 and 3.2 percent of the fleet emitting half of fleet-averaged BC in 2014 and 2018, respectively (a relative decrease of 16 percent). NO_X emissions were less skewed, with the fleet portion contributing half of all NO_X decreasing from 20.1 to 14.2 percent over that same time period. Fleet-averaged BC emissions decreased from 0.41 to 0.18 g/kg fuel over these four years, while NO_X decreased from 16.3 to 13.2 g/kg fuel. NO_X emissions from SCR-equipped vehicles at this site were still broadly higher than predicted based on certification standards.

3. "Advanced Plug-In Electric Vehicle Travel and Charging Behavior," University of California, Davis, $1,167,228, Contract No. 12-319

   This study examined vehicle usage in plug-in electric vehicle (PEV) households throughout California through surveys, vehicle logging, and interviews between 2015-2018. A detailed survey covering vehicle purchase, vehicle fleet, driving and charging behavior, and sociodemographic information was completed by approximately 11,000 PEV owners. From these survey respondents, 272 households were recruited to participate in the vehicle data collection study, which consisted of installing a data logging device onto all household vehicles, including the non-PEVs. The logging study collected driving and refueling behavior on the order of 1 to 10 seconds per parameter for up to a year. From the logged households, 18 were selected to participate in interviews. At the vehicle-level, results indicate that the average percent electric vehicle miles traveled (eVMT), or percent of miles with no tailpipe emissions, in comparison to total vehicle miles traveled (VMT) for plug-in hybrid electric vehicles (PHEV) is 15-68 percent, depending on vehicle model. However, the percent eVMT at the household-level for PHEVs studied was only 4-38 percent due to miles driven on household internal combustion engine vehicles (ICE). The percent eVMT on battery electric vehicles (BEV) at the vehicle-level is 100 percent (by definition), while at the household-level it ranged between 33-68 percent eVMT versus total household vehicle VMT.

4. "Assessing the Travel Demand and Co-Benefit Impacts of Affordable Transit-Oriented Developments," University of California, Berkeley, $300,000, Contract No. 16RD003

   This study assessed the travel patterns of low-income households in order to estimate the impact of affordable transit-oriented developments (TODs) on vehicle miles traveled (VMT) using a multi-method research design. Data were collected, assembled, and analyzed for 292 tenants living in subsidized units both near and far from high quality transit to provide a robust picture of trip frequency, length, mode, purpose, and vehicle ownership as a function of development characteristics, household demographics, and urban setting. Results showed a significant association between affordable TOD and vehicle trip frequency, but not VMT. These mixed findings align with the mixed results found for other populations and settings. Qualitative results highlight the many benefits of living in affordable TODs, especially those in highly accessible areas and in close proximity to many services and opportunities.

5. “Characterize Physical and Chemical Properties of Manure in California Dairy Systems to Improve Greenhouse Gas (GHG) Emission Estimates,” University of California, Davis, $151,423, Contract No. 16RD002

   Dairy manure is an important emission source of methane, a short-lived climate pollutant, in California. The volatile solids (VS) and nitrogen (N) species contained in manure can be converted to methane (CH_4) and/or nitrous oxide (N_2O), and the emission factors (EFs) vary strongly with manure management systems. Hence, it is important to characterize VS and N concentrations in manure under various manure management systems. Currently, California uses the U.S. EPA’s assumptions regarding the chemical contents and subsequent EFs in methane emissions from manure management but California-specific dairy data is needed for an improved emission inventory. This project evaluated dairy demographics in San Joaquin Valley (SJV), identified major types of animal housing facilities and manure management systems, and measured VS concentrations and other chemical parameters in manure, along with the animal residence time on concrete (TOC), in four representative dairy farms with two predominant housing systems: freestall and non-freestall (drylot). TOC is a key parameter dictating the manure management downstream from animal housing to manure storage ponds. Results of this study indicated great variability in TOC (21 percent to 78 percent) with different dairy farms or cattle groups, and in VS concentrations (0.12 percent to 12 percent) with manure management practices such as the use of solid-liquid separation technologies. The California-specific information provided by this study on manure management and properties can be used to inform manure emission calculations or future research planning on manure emissions, as well as the development and evaluation of Alternative Manure Management Practices in California dairies.

6. “A Characterization of California Ozone Baseline using Ozonesonde Measurements at Two Coastal Sites,” San Jose State University Research Foundation, $281,699, Contract No. 15RD007

   Although surface-level ozone (O_3) has greatly decreased over most of California over the past several decades in response to air quality control efforts, O_3 levels in the SJV have decreased slower, preventing attainment of National Ambient Air Quality Standards (NAAQS). The unique trough-like topography, diverse emission sources, and high summer temperatures place extreme demands on the design of control strategies to reduce surface-level ozone in this region. These efforts are further complicated by background air in the troposphere that are affected by upwind anthropogenic precursors, long range transport, and stratospheric intrusion events. The goal of this project was to collect upper air ozone data at a California coastal site to better characterize the incoming baseline ozone aloft. The project measured vertical profiles of ozone on a near daily basis for three months, from the late spring to summer in 2016. This characterization of aloft ozone will provide a baseline for California, which is critically needed for the design of effective State Implementation Plan (SIP) to attain the current and future NAAQSs for ozone.

III. Discussion of an Interim Report

1. “Measurement of In-Use Emissions and Fuel Consumption from Vocational Heavy-Duty Vehicles with Conventional and Alternative Engine and Fuel Technologies in Southern California,” South Coast Air Quality Management District, $150,000, Contract No. 16RD012

   It is projected that heavy-duty vehicles (HDV) will continue to be a dominant source of nitrogen oxides (NO_X) and PM emissions in the South Coast Air Basin (SoCAB), and that NO_X emissions need to be further reduced for the region to meet NAAQS requirements for PM and Ozone. Understanding the impact of conventional and alternative engine and fuel technologies on in-use HDV emissions and fuel consumption is critical for developing air quality management plans for the region. Jointly with the South Coast Air Quality Management District (SCAQMD), the California Energy Commission (CEC), the Southern California Gas Company (SoCal Gas), and CARB cofunded a research project to measure emissions and fuel consumption from in-use HDVs operated in various vocations. To the total research cost of $3,250,000, CARB contributed $150,000 through a contract directly with SCAQMD. The vehicles tested include 200 HDVs in various on-road vocation types (transit bus, school bus, refuse hauler, delivery vehicle, and goods movement vehicle) and with conventional and alternative fuel types (diesel, bio-diesel, natural gas (NG), and electric vehicles). The study also includes a technology assessment to compare the benefits of different technologies in minimizing emissions and improving fuel consumption efficiency. Preliminary data reported in this Interim Report suggests that vehicles in different vocations have significantly different average speeds and fractions of operation in idling, and that their emission rates and fuel economies varied depending on both vocation types and engine and fuel technologies, suggesting the possibility to optimize the selection of technology for vocations.