CALIFORNIA AIR RESOURCES BOARD

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

June 26, 2020
9:00 a.m.

ADVANCE AGENDA

I. Approval of Minutes of Previous Meeting:

January 31, 2020

II. Discussion of Research Proposals

1. "Plume Capture Measurement of Vehicle Emissions at the Caldecott Tunnel for Heavy-Duty Emission Program Development and Verification," University of California, Berkeley, $450,000 Proposal No. 2835-295

   Measurements of real-world emissions from heavy-duty vehicles (HDVs) are needed to inform the development of emissions inventories, estimate the emissions benefits of policies that target the on-road heavy-duty fleet, better characterize the relatively small percentage of HDV "high-emitters", and to evaluate the deterioration and failure rates of HD aftertreatment, specifically diesel particulate filters and Selective Catalytic Reduction (SCR). This project will involve three field campaigns at the Caldecott tunnel in 2021, 2022, and 2023, each of which will measure fuel-based emission factors from at least 1,000 HDVs and match these to license plates. Results will include fuel-specific emission factors for black carbon (BC), nitric oxide (NO), nitrogen dioxide (NO2), ammonia (NH3), and nitrous oxide (N2O) for each vehicle. They will also include analysis of the impact of vehicle attributes (age, aftertreatment, etc.), new regulations, and other variables on these emissions. This project will allow estimation of the benefits of the full Truck and Bus Rule and inform both emissions inventories and the development of a Heavy Duty Inspection and Maintenance program.

2. "Vehicle Miles Travel Reduction Success and Opportunities to Overcome Remaining Barriers," University of California, Berkeley, $300,000, Proposal No. 2836-295

   California has adopted aggressive policies to reduce greenhouse gas (GHG) emissions in California, including the Sustainable Communities and Climate Protection Act of 2008 (SB 375), which sets targets for metropolitan areas in the state to reduce vehicle miles of travel (VMT). Based on current estimates, metro areas in the state are falling short of the VMT reduction goals stipulated by SB 375. This project will develop techniques to integrate and analyze various geo-located data sets to put in place a system to collect data on travel behavior and VMT over time. The researchers will analyze existing data, including big data, to create a statewide picture of VMT fluxes over time

and extract behavioral choices to generate estimates of urban mobility. This research project will also study what barriers exist that may be thwarting policies to reduce VMT, such as political and/or policy barriers to infill development, lack of access to transit or active travel modes, and lack of accessibility to key services and destinations. Results will allow policy makers to build on previous successes and provide a greater understanding of regional travel behavior to inform region-specific VMT reduction policies.

3. "Measuring, Analyzing, and Identifying Small-Area VMT Reduction," University of California, Davis, $199,500, Proposal No. 2837-295

   A key element of the state's effort to reduce GHG emissions from transportation is the requirement that MPOs adopt SCSs that demonstrate how the regions will reduce GHG emissions from autos and light trucks. However, the adoption of SCSs does not guarantee the adoption of policy and programming changes at the local level, nor on the-ground changes in development that would produce a reduction in VMT and associated GHGs. The goal of this project is to assess the degree to which on-the-ground changes in selected communities have produced reductions in VMT. A secondary aim is to examine the degree to which local and/or regional policy change brought about the observed on-the-ground changes. This project will complete a minimum of three case studies of local communities that have experienced substantial changes in the transportation system and/or land development patterns to assess the change in VMT that has resulted; the forces contributing to transportation and land use changes, including local and/or regional policy changes, will also be examined. These case studies may provide examples of best practices to achieve SCS goals as well as insights on barriers to successful SCS implementation.

4. "Developing a Comprehensive Framework for Estimating the Social Costs of Emissions of Criteria Pollutants and Air Toxics In California, and Identifying Other Direct and Indirect Benefits of California's Climate and Air Quality Programs," University of California, Davis, $456,245, Proposal No. 2839-295

   Achieving California's challenging air quality and climate objectives will require accurate information about the health benefits (and avoided damages) of relevant policies. Metrics on the impact of policies on the health and well-being will make it easier for communities and decision-makers to understand and track the effect of aggressive climate and air quality policies and measures. The current Cost of Carbon metric is not sufficient to meet these needs and new metrics are needed to better quantify climate, air quality health, and other co-benefits of California's climate programs. This project will address that need by qualitatively assessing the environmental, energy, economic, and social benefits related to California's climate and air-quality programs. This project will estimate air-quality health benefits by developing a more comprehensive set of concentration-response functions, capturing the effects of socio-economic status, and including a detailed analysis of the impacts of the emissions of toxic air contaminants. This work will also include estimates of the agricultural and visibility benefits of improvements in air quality, ecosystem benefits, and incorporate the interaction of the nitrogen cycle with air quality. The project will produce a spreadsheet model that will

account for all of the major factors that determine air-pollution damages. CARB staff will be able to use this model to evaluate the full social costs and benefits of its climate-change and air-quality programs.

5. "Decision Drivers to Facilitate Lower-Polluting Consumer Choices," University of California, Los Angeles, $200,000, Proposal No. 2840-295

   California is a nation leader in adopting the most ambitious goals when it comes to reducing air quality and climate pollutants. A greater understanding of the drivers of lower polluting consumer choice can bolster the effectiveness of the policies and programs that CARB has implemented to achieve these goals. The objective of this project is to help incentivize consumers to use lower polluting products and services. First, the Contractor will acquire a better understanding of the motivations that underpin consumers' choices in purchasing higher-polluting products rather than more sustainable ones, in order to develop recommendations for improving policy mechanisms aimed at facilitating choices of consumers acquiring and disposing of products, and consequently result in a faster uptake of sustainable products. Second, the Contractor will design a communication campaign for end users and other target audiences of varying demographics to facilitate better environmental outcomes by leveraging the fuller understanding of choice drivers. The results of this work will provide an adaptable and scalable framework to message the benefits of environmentally sustainable practices to ensure that they are adopted rapidly, in the most targeted and cost effective manner, and lead to lasting consumer behavior change. CARB staff will use this framework in-house to improve the efficacy of its programs to accomplish the state's air quality and climate goals.

6. "Total Exposures to Air Pollutants and Noise in Disadvantaged Communities," University of California, Berkeley, $800,679, Proposal No. 2838-295

   Exposures to ambient pollutants such as PM2.5 and O3, as well as ultrafine particles (UFPs) and air toxics (e.g. volatile organic compounds (VOCs)) in disadvantaged communities (DACs) are associated with a variety of health effects, including asthma, respiratory disease, cardiovascular disease, lung cancer, and poorer neurodevelopmental outcomes in children. In addition to pollutant exposures, DACs are subjected to higher levels of ambient noise. A growing body of evidence shows that this environmental stressor contributes to hearing loss, annoyance, sleep disturbance, increased occurrences of hypertension and cardiovascular disease, and impaired cognition in school age children. While studies have shown that DACs are subjected to disproportionate exposures to air pollutants and noise, there is less information regarding the comparison of the direct impact of different sources, activities, and residential spaces on the total air pollutant and noise exposures for individuals. This study will consist of indoor and outdoor field studies along with personal monitoring conducted in four separate DACs selected based on potential air pollutant sources as well as different types of residential spaces. The expected results will address knowledge gaps about exposures in DACs by providing information on how personal behaviors and external factors such as building characteristics (housing stock, types of installed appliances, ventilation and filtration systems, etc),

modes of transportation, or participant location contribute to exposure and indoor air quality (IAQ) and the potential health risks for DAC residents. The results of this study will support the goals of California Assembly Bill (AB) 617 by identifying localized sources and personal activities that are most responsible for air pollutant and noise exposure in DACs and suggest optimal mitigation strategies. In addition, this study would support CARB's IAQ and personal exposure program by providing insight on what proportion of exposures to air pollutants occur in indoor environments and how strategies such as increased high efficiency filtration, consumer product choices, and building electrification can influence these exposures.

7. "Impact of Air Pollution on COVID-19 Case and Death Risk in California," University of California, San Francisco, $105,493, Proposal No. 2841-295

   Long-term exposure to air pollution is emerging as one of the most important risk factors for deaths from coronavirus disease 2019 (COVID-19) infections. A preliminary study from Harvard has shown that an increase in 1 µg/m3 in PM2.5 was related to an 8 percent increase in COVID-19 death rates in the U.S. The Harvard study, while helpful in introducing the concern of a linkage between air pollution and COVID-19, needs to be repeated in California with more specific data at a smaller scale. Given the high levels of pollution in California and the concern for community and individual exposure to air pollution, this study is critical to be able to determine the vulnerability of Californians to COVID-19. Using more spatially refined data on case/death counts and exposure estimates, the investigators propose to study the relationship of several air pollutants: PM2.5, PM10, NO2 and O3, with COVID-19 case/death rates in California. The University of California, San Francisco (UCSF) will focus not only on long-term exposures, but also more proximal exposures before the COVID-19 outbreak. UCSF will also be able to examine the risk of more severe cases of COVID-19 using hospitalization and Intensive Care Unit (ICU) counts, and also focus specifically on the impact of COVID-19 on EJ and vulnerable communities in California. After obtaining exposure estimates and address-level COVID-19 data, the investigators will assemble an analysis dataset in a GIS platform, which will link health and exposure data with other important covariates. Covariate datasets will include the American Community Survey (ACS), the Behavioral Risk Factor Surveillance System (BRFSS), CalEnviroScreen, U.S. Census, and other data as needed. Areas will be adjusted for testing rates as possible. Multivariable and mixed statistical models will be performed on the data as appropriate to estimate COVID 19 risk. The sensitivity of the results to additions/removals of key covariates will be examined. A final report and metadata will be provided to CARB upon completion.

8. "Ambient Air Pollution and COVID-19 Disease Severity or Death among Confirmed Cases in Southern California," University of California, Los Angeles, $607,967, Proposal No. 2842-295

   The COVID-19 pandemic represents one of the largest threats to population health in more than a century. Biologically plausible reasons suggest that air pollution may make people more susceptible to contracting COVID-19, and once they have the disease, air pollution exposure may contribute to a worse prognosis. The objective of the study is to assess whether air

pollution exposures lead to worse outcomes in confirmed COVID-19 cases among members of the Kaiser Permanente Southern California (KPSC) HMO. The wealth of individual information on the members of this cohort can help to determine the role of air pollution exposure in a worsening of COVID-19 disease including admission to hospital, admission to the ICU, advanced oxygen treatment or being put on a ventilator, and death in hospital. The individual information included in the health data will enable the investigators to examine whether exposure gradients along socioeconomic status, race, and ethnicity are partly responsible for a worse prognosis of some patient groups (e.g., non-whites) as well as examining the impacts of preexisting conditions. Contractors will use advanced land use regression exposure modeling to estimate ambient concentrations of several common air pollutants, including NO2, PM2.5, and O3. Contractors will also use chemical transport models (CTMs) to estimate speciated fine and ultra-fine particles. These CTMs also enable researchers to examine specific sources of the particles, and to link these estimates to all confirmed cases in the KPSC database. These data will be to assess whether higher chronic air pollution contributes to worse COVID-19 progression in diagnosed patients.

III. Discussion of a Draft Final Report:

1. "Brake & Tire Wear Emissions," Eastern Research Group, $349,990, Contract No. 17RD016

   California's vehicle emission inventory, EMFAC, helps CARB keep track of important sources of pollution and is a critical tool in mitigating air quality issues on both regional and local levels. Updates to the inventory are necessary to continue meeting air quality goals and to understand how regulatory measures may impact air quality. EMFAC predicts that non-exhaust sources, such as brake and tire wear, are the main source of primary PM from on-road vehicles. In order to ensure that the model is updated and has detailed information on this source as a function of vehicle type, vehicle age, and vehicle driving behavior, CARB awarded a contract to Eastern Research Group, Inc. (ERG) and Link Engineering (LINK) to measure and characterize PM emissions from a variety of brake components and under various operating conditions. ERG and LINK used an enclosed brake dynamometer connected to a constant volume sampler (CVS) with carefully controlled climate conditions to measure brake PM emissions using state-of-the-art measurement techniques. The investigators have provided a detailed report summarizing their findings. They found that PM emissions were sensitive to braking materials, braking force, and simulated vehicle weight. The investigators also simulated regenerative braking, a typical feature of advanced clean cars, and found that this technology led to lower overall PM emissions. The test results will be used to create new emission factors for the EMFAC model. Given that brake wear is currently estimated to be the largest source of primary PM from on road vehicles, updates to the model that include current materials and advanced technologies will help CARB better assess how these emissions will impact air quality on a regional level, but more importantly on a local scale, particularly for populations living near major roadways.