State of California
AIR RESOURCES BOARD

Emission Impacts of Connected and Automated Vehicle Deployment in California

RESEARCH PROPOSAL

Resolution 17-34

October 26, 2017

Agenda Item No.: 17-10-3

WHEREAS, the California Air Resources Board (CARB or Board) has been directed to carry out an effective research program in conjunction with its efforts to combat air pollution, pursuant to Health and Safety Code sections 39700 through 39705;

WHEREAS, a research proposal, number 2810-287, titled "Emission Impacts of Connected and Automated Vehicle Deployment in California," has been submitted by the University of California, Davis for a total amount not to exceed $220,000;

WHEREAS, the Research Division staff have reviewed Proposal Number 2810-287 and finds that in accordance with Health and Safety Code section 39701, the results of this study will be used to quantify and characterize the potential air quality and climate implications of light duty connected and automated vehicle penetration in California through 2050. The outcomes will provide valuable information for the next generation of Advanced Clean Cars regulations and policies related to Senate Bill 375, among others; and

WHEREAS, in accordance with Health and Safety Code section 39705, the Research Screening Committee has reviewed and recommends funding the Research Proposal.

NOW, THEREFORE BE IT RESOLVED, that CARB, pursuant to the authority granted by Health and Safety Code sections 39700 through 39705, hereby accepts the recommendations of the Research Screening Committee and staff and approves the Research Proposal.

BE IT FURTHER RESOLVED, that the Executive Officer is hereby authorized to initiate administrative procedures and execute all necessary documents and contracts for the Research Proposal as further described in Attachment A, in an amount not to exceed $220,000.

I hereby certify that the above is a true and correct copy of Resolution 17-34 as adopted by the California Air Resources Board.

Rana McReynolds

Rana McReynolds, Clerk of the Board

Resolution 17-34

October 26, 2017

Identification of Attachments to Board Resolution 17-34

Attachment A: "Emission Impacts of Connected and Automated Vehicle Deployment in California" Summary and Budget Summary

ATTACHMENT A

"Emissions Impacts of Connected and Automated Vehicle Deployment in California"

Background

Light duty connected and automated vehicles (CAVs) are one of many rapidly evolving transportation technologies that will reshape California's transportation future and substantially impact vehicle miles traveled (VMT), energy use, greenhouse gas (GHG), and criteria pollutant emissions from light-duty cars. While they are not yet commercially available, CAV development is moving rapidly; the United States Society of Automotive Engineers indicates that driverless cars are on track to begin entering commercial fleets by the early 2020s.

CAVs are expected to deliver many benefits for the transportation system and for vehicle occupants including safety improvements, travel cost reductions, and increased productivity for occupants. However, CAVs may also induce more travel (resulting in greater VMT, traffic emissions, and GHGs) and encourage dispersed land use development. Since CAVs are not yet present in the market, the direction and magnitude of these impacts are still unknown, but there is a growing body of research on the potential characteristics and impacts of light-duty CAV deployment. However, what this body of research lacks is a focused study of the potential impacts of CAVs in California, taking into account key issues related to regional and local air quality, observed travel behavior of Californians, and the potential impact of CAVs on state climate and air quality goals.

Objective

The research objective is to determine the range of projected impacts of varying penetration levels of light-duty CAVs on energy use, VMT, and GHG and criteria pollutant emissions at the transportation system-level in California through 2050. Realistic, California-specific CAV deployment scenarios will be developed that take into account various market, consumer, and policy developments and interactions.

Methods

The proposed project would identify potential state policies that can or will influence the penetration of CAVs into the California light duty fleet and use these policy scenarios to develop light-duty CAV penetration scenarios. To do this, the researchers will combine findings from existing literature and input from national experts collected via a targeted workshop. The workshop will include experts in travel behavior, CAV technology and adoption, travel demand forecasting, and transportation sustainability along with real-world practitioners—specifically planners and policymakers from state agencies, regional metropolitan planning organizations, and local agencies. In addition to identifying key elements of different scenarios, the researchers also propose assessing the likelihood that the various scenarios will occur based on literature and expert input.

After the CAV penetration scenarios have been identified, the investigators will apply the California Statewide Travel Demand Model (CSTDM) to simulate the different CAV penetration scenarios and to quantify a range of impacts through 2050. This stage of the project will include analyses of the impacts of several policy levers—such as ride-pooling, zero-emission vehicle technology adoption, and energy decarbonization—and evaluations of how CAVs can be deployed in conjunction with shared modes of transportation (e.g., public transit and shared-mobility services). Finally, the research team will develop an in-depth policy analysis complete with an assessment and ranking of possible policy levers.

Expected Results
This project will help CARB identify potential outcomes and impacts of CAV penetration in California so that the State can proactively design policies and programs that ensure the attainment of future climate, air quality, and other state goals.

Significance to the Board
This research will allow the Board to quantify and characterize the potential energy usage, VMT, and GHG and criteria pollutant emissions outcomes of light duty CAV penetration in California through 2050. The outcomes will provide valuable information for the next generation of Advanced Clean Cars regulations and policies related to Senate Bill (SB) 375, among others.

Contractor:
University of California, Davis

Contract Period:
24 months

Principal Investigator (PI):
Dr. Giovanni Circella, Ph.D.

Contract Amount:
$220,000

Basis for Indirect Cost Rate:
The State and the UC system have agreed to a 25 percent indirect cost rate.

Past Experience with this Principal Investigator:
Dr. Giovanni Circella is a professional researcher in the Institute of Transportation Studies of the University of California, Davis. While CARB has not previously contracted with him as a principal investigator, he has participated in several

CARB-funded research projects and contracts. In 2014, he co-authored policy briefs and technical background documents that identify and quantify the impacts of key transportation and land use policies on vehicle use and greenhouse gas emissions. These documents support CARB's SB 375 program, and California metropolitan planning organizations frequently reference and cite these documents in their regional transportation plans and sustainable communities' strategies. Additionally, he contributed to CARB research contract 11-322, "Modeling Household Vehicle and Transportation Choice and Usage" alongside Dr. Patricia Mokhtarian, assisting with the research and analysis, the composition of the final report, and the presentation of the work at the CARB Research Seminar.

Prior Research Division Funding to University of California, Davis:

Year	2016	2015	2014
Funding	$ 650,000	$1,468,460	$2,249,136

BUDGET SUMMARY

University of California, Davis

Emissions Impacts of Connected and Automated Vehicle Deployment in California

DIRECT COSTS			
1.	Personnel (Salary and Fringe Benefits)	$ 142,048	
2.	Travel	$ 19,626[1]	
3.	Materials & Supplies	$ 13,524	
4.	Equipment	$ 0	
5.	Electronic Data Processing	$ 0	
6.	Consultant(s)	$ 0	
7.	Sub-recipient	$ 0	
8.	Other Direct Costs	$ 802	
	Total Direct Costs		$ 176,000
INDIRECT COSTS			
1.	Indirect (F&A) Costs[2]	$ 44,000	
	Total Indirect Costs		$ 44,000
TOTAL PROJECT COSTS			**$ 220,000**

[1] Includes $19,626 for "Travel and Subsistence" to cover the costs of a targeted workshop with key stakeholders, experts, and planners whereby the investigators will collect input on the development of light-duty CAV penetration scenarios. This workshop is essential to ensure that the scenarios considered in the quantification stages of the project are valid and realistic.

[2] Facilities and Administrative costs.