PROPOSED

State of California
AIR RESOURCES BOARD

Geofencing as a Strategy to Lower Emissions in Disadvantaged Communities

RESEARCH PROPOSAL

Resolution 17-33

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 2809-287, titled "Geofencing as a Strategy to Lower Emissions in Disadvantaged Communities," has been submitted by University of California, Riverside for a total amount not to exceed $300,224;

WHEREAS, the Research Division staff have reviewed Proposal Number 2809-287 and finds that in accordance with Health and Safety Code section 39701, the results of this study will identify geofencing strategies in the heavy-duty sector that could lower exposure to mobile source emissions in disadvantaged communities and inform potential incentive or regulatory policies that aim to reduce mobile source emissions and their impacts on vulnerable populations; 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 $300,224.

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Identification of Attachments to Board Resolution 17-33

Attachment A: "Geofencing as a Strategy to Lower Emissions in Disadvantaged Communities" Summary and Budget Summary

ATTACHMENT A

Geofencing as a Strategy to Lower Emissions in Disadvantaged Communities

Background

Medium- and heavy-duty diesel trucks, the majority of which are used for freight movement, are significant contributors of nitrogen oxides and particulate matter (PM) emissions. As a result, areas close to freight hubs such as ports, railyards, and distribution centers often experience elevated levels of diesel-related air pollution. There has been increasing awareness of this environmental justice issue, which has led to the designation of disadvantaged communities (DACs) in California per Senate Bill 535. These communities are now specifically targeted for investments aimed at improving public health, quality of life, and economic opportunity of their residents per Assembly Bill 1550.

CARB research has shown that the levels of PM2.5 have been decreasing, especially in the most impacted communities, but the disparity between the levels of PM2.5 in the most and the least disadvantaged still persists. CARB is initiating research to identify and monitor sources of PM2.5 in DACs, but additional research is needed to develop strategies that reduce exposure to traffic-related PM2.5. "Geofencing" is a promising new approach for reducing such exposure. It defines a virtual boundary of a specific area within a broader geographic area. The main concept is that when a vehicle enters a pre-defined "geofenced" area, its operation will be modified in a way that lowers its emissions in the geofenced area. In a broader sense, geofencing strategies can be applied not only spatially within a specific area, but also temporally, i.e., during specific time periods.

Objective

The objective of the proposed research is to identify policies that will promote the use of appropriate geofencing strategies to lower mobile source emissions in DACs and quantify their associated emission reductions.

Methods

The research team will conduct a literature review and interview policy consultants to develop a suite of potential geofencing strategies that could be implemented in multiple regions across California. This includes an investigation of control technologies that alter the performance of the on-board emissions technology when the vehicle enters a highly polluted area and an examination of potential pricing or regulatory strategies that limit or penalize high-polluting vehicles that enter polluted areas. The researchers will then conduct a series of modeling and simulation works to examine emission reductions associated with the implementation of selected geofencing strategies in the selected study areas relative to a baseline scenario. This will include expansion of the University of California at Riverside's Comprehensive Modal Emissions Model to include new categories for model year 2010 or newer conventional heavy-duty diesel trucks and plug-in hybrid electric trucks. The modeling will also include the development of control algorithms for selected geofencing strategies and simulations of the implementation of

the selected geofencing strategies in traffic microsimulation environment and evaluation of their potential emission reduction benefits. The modeling will also evaluate the reductions in the level of air pollution (and optionally population exposure to air pollution) in the selected study areas. The selection of geofencing strategies to be evaluated and the study areas will be performed in coordination with CARB staff and the Technical Advisory Committee. The results from the modeling exercise will then be used to identify appropriate geofencing strategies that will sufficiently lower mobile source emissions in California's DACs. The researchers will then develop an in-depth policy analysis, complete with an assessment and ranking of possible policy levers. This information will be analyzed to inform the development of potential incentive or regulatory policies that could be implemented by CARB to reduce pollutant emissions and their impacts in DACs.

Expected Results
The results from this research will quantify the potential reductions in heavy-duty vehicle emissions from the use of geofencing strategies in DACs. This information will then be used to inform the development of geofencing technologies by the industry and incentive or regulatory policies that can help reduce pollutant emissions and their impacts in DACs.

Significance to the Board
This project will provide important data to identify the most effective geofencing strategies to inform the development of policies aimed at reducing exposure to mobile source emissions that negatively impact health in DACs.

Contractor:
University of California, Riverside (UCR)

Contract Period:
24 Months

Principal Investigator (PI):
Kanok Boriboonsomsin, Ph.D., P.E.

Contract Amount:
$300,224

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: The project will be conducted by Dr. Kanok Boriboonsomsin, Dr. Matthew Barth, and Dr. Kent Johnson, who have extensive experience in vehicle and traffic simulation, vehicle emission modeling, and vehicle emission measurement and control, especially in the heavy-duty sector. The research team has extensive experience in geofencing strategies, and will be supported by well-qualified UCR's technical staff in achieving the objectives of the project.

Prior Research Division Funding to University of California, Riverside:

Year	2016	2015	2014
Funding	$ 500,000	$0	$1,288,560

B U D G E T S U M M A R Y

Contractor: University of California, Riverside

"Geofencing as a Strategy to Lower Emissions in Disadvantaged Communities"

DIRECT COSTS			
1.	Personnel (Salary and Fringe Benefits)	$ 202,026[1]	
2.	Travel	$ 3,000[2]	
3.	Materials & Supplies	$ 0	
4.	Equipment	$ 0	
5.	Electronic Data Processing	$ 0	
6.	Consultant(s)	$ 0	
7.	Subrecepient(s)	$ 0	
8.	Other Direct Costs	$ 48,532[3]	
	Total Direct Costs		$ 253,558
INDIRECT COSTS			
1.	Indirect (F&A) Costs[4]	$ 46,666	
	Total Indirect Costs		$ 46,666
TOTAL PROJECT COSTS			**$ 300,224**

NOTES:

[1]Employee benefits are based on actual benefit rates for named employees. Employee benefit rates vary due to the amount of benefits that each named employee utilizes (i.e. health, dental, vision, life insurance, etc.). In addition to fringe benefits for the GSR, University policy requires inclusion of partial fees and tuition remission and Graduate Student Health Insurance (GSHIP) for Graduate Student Researchers employed during each academic year with an appointment of 25 percent time or more. It is estimated that the GSR student fees and tuition would escalate by 11 percent (fees), 4 percent (tuition), and 7 percent (GSHIP) per year. These escalation factors are also included in the budgeted costs. One Graduate Student's tuition remission fees will be charged to the agreement: $6,121 per quarter for 3 quarters equal to one academic year.

[2]We budget $500 for the PI and one Co-PI to travel to Sacramento and present the research results to CARB staff. This is a one-day trip and will incur air fare and ground transportation & parking costs. The costs are based on our prior trips to Sacramento. We also budget $2,500 for the PI and one Co-PI to attend and present the research results at CRC Real-World Emissions Workshop. This is a 3-day event and typically held in Long Beach, CA. The costs include registration fee, lodging, ground transportation & parking, and per diem. The costs are based on our experience attending this event in prior years.

[3]As an off-campus facility of the University of California, Riverside, CE-CERT recovers direct, lease-based facilities rental charges. Facilities rental is charged at 26 percent of Modified Total Direct Costs (MTDC; total direct costs less any equipment, graduate student tuition/partial fee remission, and subcontracts beyond the first $25,000.

[4]Facilities & Administrative costs.