State of California
AIR RESOURCES BOARD

RESEARCH PROPOSAL

Resolution 07-12

April 26, 2007

Agenda Item No.: 07-4-2

WHEREAS, the Air Resources 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 2627-255, entitled "Characterizing Air Conditioning Refrigerant Emissions from Heavy-Duty On and Off-road Vehicles in California," has been submitted by Eastern Research Group;

WHEREAS, the Research Division staff has reviewed and recommended this proposal for approval; and

WHEREAS, the Research Screening Committee has reviewed and recommends for funding:

> Proposal Number 2627-255 entitled "Characterizing Air Conditioning Refrigerant Emissions from Heavy-Duty On and Off-road Vehicles in California," submitted by Eastern Research Group, for a total amount not to exceed $148,513.

NOW, THEREFORE BE IT RESOLVED, that the Air Resources Board, pursuant to the authority granted by Health and Safety Code section 39703, hereby accepts the recommendation of the Research Screening Committee and approves the following:

> Proposal Number 2627-255 entitled "Characterizing Air Conditioning Refrigerant Emissions from Heavy-Duty On and Off-road Vehicles in California," submitted by Eastern Research Group, for a total amount not to exceed $148,513.

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 effort proposed herein, and as described in Attachment A, in an amount not to exceed $148,513.

I hereby certify that the above is a true and correct copy of Resolution 07-12, as adopted by the Air Resources Board.

Lori Andreoni

Lori Andreoni, Clerk of the Board

ATTACHMENT A

Characterizing Air Conditioning Refrigerant Emissions from Heavy-Duty On and Off-Road Vehicles in California

Background

The Air Resources Board (ARB) intends to reduce emissions of greenhouse gases (GHG) in California. One type of GHG emissions is leakage of the refrigerant from vehicular air conditioning (AC) systems. Almost all motor vehicles made after 1994 use HFC-134a, a potent GHG, as the refrigerant. In 2004 the ARB approved regulations, pursuant to AB 1493 (Pavley 2002), to limit GHG emissions, including refrigerant, from new light-duty vehicles (LDV) sold in the state beginning with the 2009 model year. The results of this project will support development of measures that would extend regulation to the classes of vehicles not addressed by the 2004 regulations (vehicles other than LDVs).

Objective

The objective of this project is to develop an inventory of refrigerant emissions from the air-conditioning (AC) systems of on- and off-road motor vehicles of all classes other than LDVs, in California. This study will characterize the AC technologies used in the various vehicle classes, with emphasis on the technologies now, or about to be, used in new vehicles.

Methods

This study will accurately characterize working life emissions from heavy-duty on- and off-road vehicles. Specifically, the study will evaluate long-term leakage as well as rapid losses from AC systems used for cabin climate control. The mix of different AC systems currently on the market, and those anticipated for the future, will be characterized and evaluated. Candidate leak flow rate methodologies will be identified and verified for use, characterizing expected precision and measurement uncertainty. Target vehicles will be identified and recruited for measurement. Data will be collected from a representative sample of the different system types over a period of up to a year to establish leak rates. The findings will be evaluated to determine representative leak flow rates for the different system types, and combined with surrogate activity data to estimate an emission inventory for base case and future year scenarios. A Quality Management Plan will be developed and implemented, covering all steps in the project.

Expected Results

The project is intended to develop an inventory of refrigerant emissions from the AC systems of on- and off-road motor vehicles of all classes other than LDVs, in California.

Significance to the Board

The results of this project will support the Board to develop measures that would extend regulation to the classes of vehicles not addressed by the AB 1493 (vehicles other than LDVs).

Contractor:
Eastern Research Group (ERG)

Contract Period:
24 months

Principal Investigator (PI):
Rick Baker

Contract Amount:
$148,513

Basis for Indirect Cost Rate:
ERG has used the indirect cost rates (average for the various line items is 45 percent) approved by the U.S. Environmental Protection Agency.

Past Experience with this Principal Investigator:
The PI has had very positive previous research collaborations with all organizations involved in this project. Mr. Rick Baker as the project PI is being contracted by ARB to perform a bottom-up survey of targeted off-road engine categories in California. The study will provide ARB with a comprehensive and consistent profile of equipment applications, end-users, populations, and activity patterns for the range of different industrial, public, and residential equipment operators across California. In this study, the strong experience of Mr. Baker in surveying the motor vehicle sector has been demonstrated very well.

Prior Research Division Funding to ERG:

Year	2006	2005	2004
Funding	$0	$0	$299,985

BUDGET SUMMARY

Contractor: Eastern Research Group

Characterizing A/C Refrigerant Emissions from Heavy-Duty On and Off-Road Vehicles in California

DIRECT COSTS AND BENEFITS				
1.	Labor and Employee Fringe Benefits	$	25,058	
2.	Subcontractors	$	48,442[1]	
3.	Equipment	$	0	
4.	Travel and Subsistence	$	2,741	
5.	Electronic Data Processing	$	871	
6.	Reproduction/Publication	$	250	
7.	Mail and Phone	$	750	
8.	Supplies	$	7,895	
9.	Analyses	$	0	
10.	Miscellaneous	$	16,740[2]	
	Total Direct Costs			$ 102,747
INDIRECT COSTS				
1.	Overhead	$	21,996	
2.	General and Administrative Expenses	$	12,768	
3.	Other Indirect Costs	$	0	
4.	Fee or Profit	$	11,002	
	Total Indirect Costs			$ 45,766
TOTAL PROJECT COSTS				**$ 148,513**

[1] Dr. Winfred Schwartz (60 hours @ 77.55/hour) 4,641
Dr. Denis Clodic (60 hours @ 108.88/hour) 6,533
SDV/ACCI 37,268

[2] Costs are for test site expenses that include operator compensation and incentives.

Attachment 2

SUBCONTRACTORS' BUDGET SUMMARY

Subcontractor: SDV/ACCI

Description of subcontractor's responsibility:
SDV/ACCI will identify and train a field engineer to conduct the day-to-day measurements under Tasks 1 and 2 of the study. The field engineer will dedicate 8 hours per testing day over 61 days, for a total of 488 hours over the course of the project.

DIRECT COSTS AND BENEFITS				
1.	Labor and Employee Fringe Benefits	$	16,398	
2.	Subcontractors	$	0	
3.	Equipment	$	0	
4.	Travel and Subsistence	$	0	
5.	Electronic Data Processing	$	0	
6.	Reproduction/Publication	$	0	
7.	Mail and Phone	$	0	
8.	Supplies	$	0	
9.	Analyses	$	0	
10.	Miscellaneous	$	0	
	Total Direct Costs			$ 16,398
INDIRECT COSTS				
1.	Overhead	$	10,164	
2.	General and Administrative Expenses	$	7,826	
3.	Other Indirect Costs	$	0	
4.	Fee or Profit	$	2,880	
	Total Indirect Costs			$ 20,870
TOTAL PROJECT COSTS				**$ 37,268**