

State of California  
AIR RESOURCES BOARD

RESEARCH PROPOSAL

Resolution 05-76

December 8, 2005

Agenda Item No.: 05-12-2

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 2594-250, entitled "Improving the Carbon Dioxide Emission Estimates from the Combustion of Fossil Fuels in California", has been submitted by the University of California, Berkeley;

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 2594-250, entitled "Improving the Carbon Dioxide Emission Estimates from the Combustion of Fossil Fuels in California", submitted by the University of California, Berkeley, for a total amount not to exceed \$75,000.

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 2594-250, entitled "Improving the Carbon Dioxide Emission Estimates from the Combustion of Fossil Fuels in California", submitted by the University of California, Berkeley, for a total amount not to exceed \$75,000.

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 \$75,000.

I hereby certify that the above is a true  
and correct copy of Resolution 05-76, as  
adopted by the Air Resources Board.

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Lori Andreoni, Clerk of the Board

## **ATTACHMENT A**

### **“Improving the Carbon Dioxide Emission Estimates from the Combustion of Fossil Fuels in California”**

#### **Background**

Central to any study of climate change is the development of an emission inventory that identifies and quantifies the primary anthropogenic sources and sinks of greenhouse gas (GHG) emissions. Fossil fuel combustion accounted for 98 percent of gross California carbon dioxide (CO<sub>2</sub>) emissions. The transportation sector accounted for the largest portion of emissions, averaging 59 percent of the total CO<sub>2</sub> emissions from fossil fuel combustion in California for the period 1990-1999. Carbon dioxide emissions are one of the best-characterized emissions in the existing state inventory, but there still exist significant sources of uncertainties. Improved emission estimates for greenhouse gases are needed for evaluating the effects of existing and planned air quality programs on carbon dioxide emissions in the state. More accurate fuel consumption data may also allow improving the estimation of criteria pollutant emissions.

#### **Objective**

This project has three main objectives: 1) estimating the level of uncertainty related to emissions from fuel consumption in the existing inventory, 2) investigating the development of new or improved methodologies for estimating the consumption of specific fuels for which data are scarce or unreliable, and 3) providing recommendations regarding initiation of new data collection activities to improve the accuracy of the California CO<sub>2</sub> emissions inventory.

#### **Methods**

The project team will examine the factors contributing to uncertainty in the data sources used in the current Energy Balance and GHG inventory and contrast the existing data with alternate state and federal sources. The range of discrepancy in the consumption data for fuels will be documented. The project team will also focus efforts on obtaining additional data on the distribution and use of fossil fuels in California. The proposal states that the most important priority for improving California's CO<sub>2</sub> estimates concerns the consumption of petroleum products. For this study, the project team will estimate feedstock use in the chemical industry and will investigate alternative methodologies for allocating bunker fuel consumption for air transport and maritime shipping. Although uncertainties regarding the consumption of natural gas and coal appear to be much less pronounced, the project team will also explore opportunities for improving data on these two fuels.

#### **Expected Results**

The project deliverables will include a final report quantifying the uncertainties with the existing data, identifying new sources of fossil fuel data (if these sources are identified during this project), and making recommendations on methodological and testing improvements as well as development of improved data collection activities that the state should implement to improve its CO<sub>2</sub> emission estimates. The project team will also submit an article based on this work to a peer-reviewed journal and will hold a technical seminar on the results of the project.

**Significance to the Board**

The key areas of uncertainty related to CO<sub>2</sub> emissions in the California inventory include differences between various data sets, estimates of bunker fuel consumption for international transport, estimates of petroleum products used as feedstocks in refineries and chemical plants, and estimates of the heat and carbon content of the various fossil fuels combusted in California. Clearly understanding these uncertainties and developing new methodologies or data collection activities to reduce these uncertainties can significantly improve the characterization of California's CO<sub>2</sub> emissions. Improved emission estimates for greenhouse gases are needed for evaluating the effects of existing and planned air quality programs on carbon dioxide emissions in the state. More accurate fuel consumption data may also allow improving the estimation of criteria pollutant emissions.

**Contractor:**

University of California, Berkeley

**Contract Period:**

18 months

**Co-Principal Investigators (PIs):**

Michael Hanemann Ph.D. and Lynn Price

**Contract Amount:**

\$75,000

**Basis for Indirect Cost Rate:**

The State and the UC system have agreed to a ten percent indirect cost rate.

**Past Experience with these Principal Investigators:**

These Principal Investigators have performed successfully on past contracts with ARB and California Energy Commission.

**Prior Research Division Funding to UCB:**

Year	2005	2004	2003
Funding	\$543,997	\$1,021,876*	\$715,194

\* Approximately \$780,000 was funded by the California Energy Commission.

# BUDGET SUMMARY

University of California, Berkeley

“Improving the Carbon Dioxide Emission Estimates from the Combustion of Fossil Fuels in California”

## **DIRECT COSTS AND BENEFITS**

1.	Labor and Employee Fringe Benefits	\$	4,545
2.	Subcontractors	\$	70,000 <sup>1</sup>
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	\$	<u>0</u>
	Total Direct Costs		\$74,545

## **INDIRECT COSTS**

1.	Overhead	\$	455
2.	General and Administrative Expenses	\$	0
3.	Other Indirect Costs	\$	0
4.	Fee or Profit	\$	<u>0</u>
	Total Indirect Costs		<u>\$455</u>

**TOTAL PROJECT COSTS** **\$75,000**

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<sup>1</sup> Both the PI and the subcontractor, Lawrence Berkeley National Laboratory (LBNL), are well qualified to undertake this research project. However, ARB can not contract directly with LBNL due to non-reconcilable differences on contract provisions. Thus, UC Berkeley was selected to lead this project because the UCB PI is currently being funded by the CEC for ongoing development of the Berkeley Energy and Resources (BEAR) model, and he is highly qualified in examining the factors contributing to uncertainty in the data sources used in the current Energy Balance and greenhouse gases inventory.

## Attachment 1

# SUBCONTRACTORS' BUDGET SUMMARY

Subcontractor: Lawrence Berkeley National Laboratory

Description of subcontractor's responsibility: 1) Estimating the level of uncertainty related to emissions from fuel consumption in the existing inventory, 2) investigating the development of new or improved methodologies for estimating the consumption of specific fuels for which data are scarce or unreliable, and 3) providing recommendations regarding initiation of new data collection activities to improve the accuracy of the California CO<sub>2</sub> emissions inventory.

### **DIRECT COSTS AND BENEFITS**

1.	Labor and Employee Fringe Benefits	\$	37,253
2.	Subcontractors	\$	0
3.	Equipment	\$	0
4.	Travel and Subsistence	\$	1,796
5.	Electronic Data Processing	\$	0
6.	Reproduction/Publication	\$	0
7.	Mail and Phone	\$	0
8.	Supplies	\$	0
9.	Analyses	\$	0
10.	Miscellaneous	\$	<u>2,488</u>
	Total Direct Costs		\$41,537

### **INDIRECT COSTS**

1.	Overhead	\$	21,310
2.	General and Administrative Expenses	\$	0
3.	Other Indirect Costs	\$	7,153
4.	Fee or Profit	\$	<u>0</u>
	Total Indirect Costs		\$ 28,463

### **TOTAL PROJECT COSTS**

**\$70,000**