

**PROPOSED**

State of California  
AIR RESOURCES BOARD

**RESEARCH PROPOSAL**

Resolution 12-5

January 26, 2012

Agenda Item No.: 12-1-1

WHEREAS, the Air Resources Board (ARB) 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 2724-272, entitled "Atmospheric Measurement and Inverse Modeling to Improve Greenhouse Gas Emission Estimates" has been submitted by Lawrence Berkeley National Laboratory;

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 2724-272, entitled "Atmospheric Measurement and Inverse Modeling to Improve Greenhouse Gas Emission Estimates," submitted by Lawrence Berkeley National Laboratory, for a total amount not to exceed \$680,000.

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 2724-272, entitled "Atmospheric Measurement and Inverse Modeling to Improve Greenhouse Gas Emission Estimates," submitted by Lawrence Berkeley National Laboratory, for a total amount not to exceed \$680,000.

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 \$680,000.

## ATTACHMENT A

### **“Atmospheric Measurement and Inverse Modeling to Improve Greenhouse Gas Emission Estimates”**

#### **Background**

Assembly Bill 32 (Global Warming Solutions Act of 2006, AB 32) directs ARB to adopt regulations to require the reporting and verification of statewide greenhouse gas (GHG) emissions. Some of the current inventory estimates of GHG are uncertain, including methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O). Atmospheric GHG measurements from tall towers, when combined with inverse model estimation techniques, have the potential to accurately quantify GHG emissions.

#### **Objective**

The research proposed here constitutes a focused effort to validate and improve California's GHG emissions inventory.

#### **Methods**

The proposed project will be divided into three tasks: 1) continue to collect a long-term data set of GHG measurements from an existing tall radio and television transmission tower near Walnut Grove, adding continuous N<sub>2</sub>O measurements to the existing measurement suite and compiling a one-year measurement record for inverse modeling; 2) expand the ARB GHG research measurement network to a new tall tower site in the Riverside/San Bernardino area, capturing GHG emissions from the entire southern California (SoCal) air basin, and compile a one-year measurement record for inverse modeling; 3) apply inverse modeling to include the new Riverside/San Bernardino measurement site and the suite of measured GHGs in order to evaluate ARB's GHG emissions inventory.

#### **Expected Results**

This proposed research project will enable ARB to 1) continue measurements of a suite of GHGs (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, and high global warming potential gases) at the California Greenhouse Gas Emission Measurement Project sites and integrate them into the ARB's network, 2) expand the ARB measurement network to comprehensively sample GHG emission sources in the South Coast Air Basin, and 3) conduct comprehensive inverse modeling to quantify California's GHG emissions. The product of this work will be a rigorously defensible evaluation of selected GHG emission inventories and a measurement and modeling system capable of continuing those estimates into the future.

#### **Significance to the Board**

ARB is required by AB 32 to adopt regulations to require the reporting and verification of statewide GHG emissions. The proposed research allows independent estimates of GHG emissions, which are necessary to ensure that ARB meets its AB 32 requirements and has an accurate inventory on which to base the agency's rules and evaluate their impact.

**Contractor:**

Lawrence Berkeley National Laboratory

**Contract Period:**

36 months

**Principal Investigator (PI):**

Marc Fischer, Ph.D.

**Contract Amount:**

\$680,000

**Basis for Indirect Cost Rate:**

The indirect costs rate is consistent with the United States Department of Energy's full cost recovery policy.

**Past Experience with this Principal Investigator:**

Dr. Marc Fischer is well known for his extensive experience in the measurement and modeling of GHG emissions. He has conducted multiple similar studies for California Energy Commission and other federal and state agencies. Research results have been published in peer-review journals and presented at conferences.

**Prior Research Division Funding to Lawrence Berkeley National Laboratory:**

Year	2011	2010	2009
Funding	\$650,000	\$0	\$350,209

## BUDGET SUMMARY

Contractor: Lawrence Berkeley National Laboratory

"Atmospheric Measurement and Inverse Modeling to Improve Greenhouse Gas Emission Estimates"

### DIRECT COSTS AND BENEFITS

1.	Labor and Employee Fringe Benefits	\$ 209,137
2.	Subcontractors	\$ 108,962 <sup>1</sup>
3.	Equipment	\$ 0
4.	Travel and Subsistence	\$ 12,426
5.	Electronic Data Processing	\$ 16,000
6.	Reproduction/Publication	\$ 0
7.	Mail and Phone	\$ 0
8.	Supplies	\$ 21,940
9.	Analyses	\$ 0
10.	Miscellaneous	\$ <u>129,728</u>

Total Direct Costs \$498,193

### INDIRECT COSTS

1.	Overhead	\$ 181,807
2.	General and Administrative Expenses	\$ 0
3.	Other Indirect Costs	\$ 0
4.	Fee or Profit	\$ <u>0</u>

Total Indirect Costs \$181,807

**TOTAL PROJECT COSTS** **\$680,000**

<sup>1</sup> The total subcontractor cost includes the costs for the University of California, Riverside and the California Institute of Technology, as detailed in Attachments 1 and 2, as well as a procurement burden of \$5,426 which is in accordance with the Department of Energy's full-cost recovery policy and included in the Lawrence Berkeley National Laboratory's FY2012 Forward Pricing Rates.

Attachment 1

**SUBCONTRACTORS' BUDGET SUMMARY**

Subcontractor: University of California, Riverside

Description of subcontractor's responsibility: University of California at Riverside will take primary responsibility for ongoing physical interaction with the instruments at the new site in Southern California. Initial work will include visits to prospective field sites, assistance with deployment of in-situ instruments and training for routine instrument checks and maintenance. Ongoing work during the year of primary data collection will include bi-weekly site visits.

**DIRECT COSTS AND BENEFITS**

1.	Labor and Employee Fringe Benefits	\$	38,390
2.	Subcontractors	\$	0
3.	Equipment	\$	0
4.	Travel and Subsistence	\$	4,000
5.	Electronic Data Processing	\$	0
6.	Reproduction/Publication	\$	0
7.	Mail and Phone	\$	0
8.	Supplies	\$	2,635
9.	Analyses	\$	0
10.	Miscellaneous	\$	<u>0</u>
	Total Direct Costs		\$45,025

**INDIRECT COSTS**

1.	Overhead	\$	3,482
2.	General and Administrative Expenses	\$	0
3.	Other Indirect Costs	\$	0
4.	Fee or Profit	\$	<u>0</u>
	Total Indirect Costs		<u>\$ 3,482</u>

**TOTAL PROJECT COSTS**

**\$48,507**

Attachment 2

**SUBCONTRACTORS' BUDGET SUMMARY**

Subcontractor: California Institute of Technology

Description of subcontractor's responsibility: California Institute of Technology will take primary responsibility for analysis of gas samples for radiocarbon <sup>14</sup>CO<sub>2</sub>, including advice on the gas sampling system, assistance with deployment, biweekly sample extraction, and cryo-trapping of daily samples into weekly aliquots.

**DIRECT COSTS AND BENEFITS**

1.	Labor and Employee Fringe Benefits	\$	35,032
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	\$	8,991
9.	Analyses	\$	0
10.	Miscellaneous	\$	<u>0</u>
	Total Direct Costs		\$44,023

**INDIRECT COSTS**

1.	Overhead	\$	11,006
2.	General and Administrative Expenses	\$	0
3.	Other Indirect Costs	\$	0
4.	Fee or Profit	\$	<u>0</u>
	Total Indirect Costs		<u>\$ 11,006</u>

**TOTAL PROJECT COSTS**

**\$55,029**