PROPOSED

State of California
AIR RESOURCES BOARD

RESEARCH PROPOSAL

Resolution 11-18

February 24, 2011

Agenda Item No.: 11-1-1

WHEREAS, the Air Resources Board (ARB 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 2720-270, entitled "Developing Databases to Estimate California-Specific Climate Forcing Benefits of 'Cool Roofs'," 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 2720-270 entitled "Developing Databases to Estimate California-Specific Climate Forcing Benefits of 'Cool Roofs'," submitted by the Lawrence Berkeley National Laboratory, for a total amount not to exceed $250,000.

NOW, THEREFORE, BE IT RESOLVED that ARB, 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 2720-270 entitled "Developing Databases to Estimate California-Specific Climate Forcing Benefits of 'Cool Roofs'," submitted by the Lawrence Berkeley National Laboratory, for a total amount not to exceed $250,000.

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 $250,000.

ATTACHMENT A

"Developing Databases to Estimate California-Specific Climate Forcing Benefits of 'Cool Roofs'"

Background

By the year 2020, the Climate Change Solutions Act of 2006 seeks to reduce greenhouse gas (GHG) emissions by 174 million metric tons (MMT) of carbon dioxide equivalent/year (CO_2e/y), of which about 16 percent (27.3 MMT CO_2e/y) are expected to come from voluntary programs. About 15 percent of these voluntary reductions (4 MMT CO_2e/y) could be achieved through cool-community measures such as cool roofs that reflect sunlight back to the atmosphere and prevent absorption and heating of residences and commercial buildings. Cool roofs thus reduce air conditioning energy requirements and help to meet green building criteria. Research at Lawrence Berkeley National Laboratory (LBNL), funded by ARB and the California Energy Commission (CEC), has developed cool roof retrofit project databases, cool roof and pavement demonstration studies, a one-stop website for cool roof consumers, contractor training courses, and design of an on-line survey to find out why people would choose cool roofs.

In addition to energy savings, modifications that increase roof reflectivity (albedo) also produce a climate "benefit" by creating a negative radiative forcing proportional to the amount of additional sunlight reflected back through the atmosphere to space compared to the pre-existing surface. Quantifying this "indirect albedo benefit" has been a matter of scientific debate and ARB staff conducted an independent peer review with key scientists in this area. The peer review recommended that California specific data be collected. Subsequent to the peer review and relying on California specific radiation measurements, staff did a bottom-up benefit assessment. One outcome of the assessment was the recognition that a more detailed California specific simulation, including building albedo databases are necessary for this quantification.

Objective

This project will develop California specific inputs necessary for improved estimates of the climate benefits of increasing urban albedo through the widespread application of cool roofs. Specific project objectives are to develop roof and urban solar reflectance data resources in California and in particular in seven major urban areas - Los Angeles, San Diego, San Jose, San Francisco, Fresno, Long Beach and Sacramento.

Methods

To reach project objectives, principal investigators (PI) would update data sources for albedo measurements and roof stocks, map solar reflectance (albedo), locate and classify roofs, and characterize roof stock albedos.

To incorporate new albedo data sources, the PI will review, acquire and assemble new sources of ortho-imagery, Light Detection and Ranging (LiDAR) measurements, solar reflectance data and building stock data in California's major urban regions. To map solar reflectance, PI will acquire ortho-imagery and local measurements of solar reflectance and use a geographic information system tool to prepare spatial and

temporal maps of solar reflectance in California's seven major urban regions (Los Angeles, San Diego, San Jose, San Francisco, Fresno, Long Beach and Sacramento). To locate and classify roofs, PI will produce maps of roof outlines in California's major urban regions, discuss the source data for the maps, create a tabular summary of the distribution of roof stocks, and report on data analysis and the resulting map products. To characterize roof stock albedo, PI will combine the outputs from the previous efforts to produce maps of roofs in California's major urban regions indicating solar reflectance and (where available) shading impacts and to provide the necessary supporting data.

Expected Results
The existing roof albedo data bases and associated solar reflectance maps combined with existing evidence of cool roof systems provide the Board staff with an improved and defensible assessment of indirect albedo benefit and total GHG benefits of instituting "cool roof," and "cool community" programs in California.

Significance to the Board
A state-wide cool roof/cool community program would contribute a significant amount of GHG equivalent reduction and potentially become a major part of our voluntary emission reductions. As such, proper assessments of the program benefits are of critical concern to the Board.

Contractor:
Lawrence Berkeley National Laboratory

Contract Period:
24 months

Principal Investigator (PI):
Ronnen Levinson, Ph.D.

Contract Amount:
$250,000

Basis for Indirect Cost Rate:
The state has agreed to the federal laboratory's system of estimating overhead and indirect costs.

Past Experience with this Principal Investigator:
Staff has worked extensively in the last decade with Dr. Levinson and most closely for the last three years in an ARB-CEC-LBNL joint project and are confident in Dr. Levinson's professional expertise and excellent execution of tasks in this topic area.

Prior Research Division Funding to Lawrence Berkeley National Laboratory:

Year	2009	2008	2007
Funding	$350,209	$0	$0

BUDGET SUMMARY

Contractor: Lawrence Berkeley National Laboratory

"Developing Databases to Estimate California-Specific Climate Forcing Benefits of 'Cool Roofs'"

DIRECT COSTS AND BENEFITS			
1.	Labor and Employee Fringe Benefits	$ 117,997	
2.	Subcontractors	$ 0	
3.	Equipment	$ 0	
4.	Travel and Subsistence	$ 3,000	
5.	Electronic Data Processing	$ 0	
6.	Reproduction/Publication	$ 0	
7.	Mail and Phone	$ 0	
8.	Supplies	$ 10,870	
9.	Analyses	$ 0	
10.	Miscellaneous	$ 30,018[1]	
	Total Direct Costs		$161,885
INDIRECT COSTS			
1.	Overhead	$ 88,115	
2.	General and Administrative Expenses	$ 0	
3.	Other Indirect Costs	$ 0	
4.	Fee or Profit	$ 0	
	Total Indirect Costs		$ 88,115
TOTAL PROJECT COSTS			**$250,000**

Notes:

1. These are electricity use, department burden, and organization burden as specified at the federal Department of Energy (DOE). Electricity is estimated at a flat rate of $50/month. Department burden (7%) and recharges constitute general departmental costs including, but not limited to, laboratory and office space, telephone charges, faxes, electronic backups, photocopying, and department-level administrative support. Organization burden (17%) is a direct cost applied to total salaries plus fringe benefits. Rates are included in LBNL's FY2011 Forward Pricing Rates and approved by DOE.