State of California
AIR RESOURCES BOARD

RESEARCH PROPOSAL

Resolution 12-9

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 2726-272, entitled "Assessment of the Emissions and Energy Impacts of Biomass and Biogas Use in California," has been submitted by the University of California, Irvine;

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 2726-272 entitled "Assessment of the Emissions and Energy Impacts of Biomass and Biogas Use in California," submitted by the University of California, Irvine, for a total amount not to exceed $169,997.

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 2726-272 entitled "Assessment of the Emissions and Energy Impacts of Biomass and Biogas Use in California," submitted by the University of California, Irvine, for a total amount not to exceed $169,997.

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 $169,997.

I hereby certify that the above is a true and correct copy of Resolution 12-9, as adopted by the Air Resources Board.

Mary Alice Morency, Clerk of the Board

ATTACHMENT A

"Assessment of the Emissions and Energy Impacts of Biomass and Biogas Use in California"

Background
Biomass and biogas resources have the potential to provide a significant portion of California's energy requirements, while reducing greenhouse gas (GHG) emissions and addressing air quality and waste disposal issues. Historically, most biogas energy has been derived from digester gas and landfill gas, and most biomass energy has been derived from wood and forest residues. However, additional sources are increasingly being used to generate electricity and renewable fuels: municipal solid waste, digestion of new waste streams such as dairy waste and food processing waste, and gasification of wastewater residues such as sludge. Biogas from digestion and from gasification of waste streams has the potential to provide added net energy benefits because the feedstock is already available and usually requires costs for removal or disposal that can be averted. Using the biomass and biogas fuels in a natural gas driven energy conversion device reduces the need for conventional fuel and contributes to energy sustainability while reducing emissions of greenhouse gas and criteria pollutants.

Objective
The objective is to analyze biomass and biogas resources and their integration into local fuel infrastructure in both urban and rural/agricultural environments, to determine the associated emissions of GHG and criteria pollutants, and to evaluate the potential air quality co-benefits of biomass and biogas use.

Methods
The University of California, Irvine (UCI) will evaluate renewable bio-resources in two distinct regions: the mostly urban South Coast Air Basin (SoCAB), and the mostly rural and agricultural San Joaquin Valley (SJV). UCI will obtain up-to-date information on biomass/biogas resources and facilities, and evaluate the potential and constraints of electricity and vehicle fuel supply from renewable bio-resources. UCI will use their "Preferred Combination Assessment" model to integrate the biomass and biogas technology combinations and their emission factors (GHG and criteria pollutants) into infrastructure scenarios on a life-cycle basis, and develop spatially- and temporally-resolved emissions fields associated with each scenario. The community multi-scale air quality modeling system will be used to estimate air quality impacts.

Expected Results
This study will quantify the emissions from various fuel paths that utilize biomass and biogas, determine the potential to exploit emerging resources in the South Coast Air Basin and the San Joaquin Valley, and determine the overall air quality impacts and GHG emissions of the projected biomass and biogas infrastructure.

Significance to the Board
The ARB has adopted regulations to promote renewable electric power and renewable transportation fuels through the Renewable Electricity and the Low Carbon Fuel Standards. Increased use of biomass and biogas can lead to reduced emissions of criteria

pollutants and greenhouse gases. Sewage digester gas, landfill gas, and biomass resources can be used to generate electricity and heat, and to provide renewable fuels. The results will provide a scientific basis to evaluate the expected air quality co-benefits from increased use of biomass and biogas.

Contractor:
University of California, Irvine

Contract Period:
24 Months

Principal Investigators (PIs):
Donald Dabdub, Ph.D. and Jacob Brouwer Ph.D.

Contract Amount:
$169,997

Basis for Indirect Cost Rate:
The State and the UC system have agreed to a ten percent indirect cost rate.

Past Experience with the Principal Investigators:
Dr. Donald Dabdub has successfully completed several ARB-funded research contracts. Dr. Jack Brouwer has conducted research on air quality and GHG impacts of future energy technologies.

Prior Research Division Funding to University of California, Irvine:

Year	2011	2010	2009
Funding	$285,000	$274,931	$571,883

BUDGET SUMMARY

Contractor: University of California, Irvine

"Assessment of the Emissions and Energy Impacts of Biomass and Biogas Use in California"

DIRECT COSTS AND BENEFITS			
1.	Labor and Employee Fringe Benefits	$ 124,735	
2.	Subcontractors	$ 25,000	
3.	Equipment	$ 0	
4.	Travel and Subsistence	$ 4,808	
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		$154,543
INDIRECT COSTS			
1.	Overhead	$ 15,454	
2.	General and Administrative Expenses	$ 0	
3.	Other Indirect Costs	$ 0	
4.	Fee or Profit	$ 0	
	Total Indirect Costs		$ 15,454
TOTAL PROJECT COSTS			**$169,997**

Attachment 1

SUBCONTRACTORS' BUDGET SUMMARY

Subcontractor: University of California, Davis

Description of subcontractor's responsibility: Provide current information on biomass technological developments and projections

DIRECT COSTS AND BENEFITS				
1.	Labor and Employee Fringe Benefits	$	21,641	
2.	Subcontractors	$	0	
3.	Equipment	$	0	
4.	Travel and Subsistence	$	1,086	
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			$22,727
INDIRECT COSTS				
1.	Overhead	$	2,273	
2.	General and Administrative Expenses	$	0	
3.	Other Indirect Costs	$	0	
4.	Fee or Profit	$	0	
	Total Indirect Costs			$ 2,273
TOTAL PROJECT COSTS				**$25,000**