State of California
AIR RESOURCES BOARD

Resolution 06-50

December 7, 2006

Agenda Item No.: 06-11-2

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 proposal Number 15, entitled "Adaptive Low Emission Microturbine for Renewable Fuels," has been submitted by the University of California, Irvine, Combustion Laboratory, in response to the 2006 Innovative Clean Air Technologies (ICAT) Program solicitation;

WHEREAS, the proposal has been independently reviewed for technical and business merit by highly qualified individuals; and

WHEREAS, the Research Division staff and the Executive Officer and Deputy Executive Officers have reviewed and recommend for funding:

> Proposal Number 15, entitled "Adaptive Low Emission Microturbine for Renewable Fuels," submitted by the University of Calfornia, Irvine, Combustion Laboratory, for a total amount not to exceed $215,000.

NOW, THEREFORE BE IT RESOLVED, that the Air Resources Board, pursuant to the authority granted by Health and Safety Code Section 39703, hereby approves the following:

> Proposal Number 15, entitled "Adaptive Low Emission Microturbine for Renewable Fuels," submitted by the University of California, Irvine, Combustion Laboratory, for a total amount not to exceed $215,000.

BE IT FURTHER RESOLVED, that the Executive Officer is hereby authorized to initiate administrative procedures and execute all necessary documents and agreements for the efforts proposed herein, and as described in Attachment A, in an amount not to exceed $215,000.

I hereby certify that the above is a true and correct copy of Resolution 06-50, as adopted by the Air Resources Board.

Lori Andreoni

Lori Andreoni, Clerk of the Board

ATTACHMENT A

Innovative Clean Air Technologies (ICAT) Grant Proposal:

"Adaptive Low Emission Microturbine for Renewable Fuels"

Background

The University of California, Irvine, Combustion Laboratory has developed an active combustion control system (ACCS) with a novel feedback sensor for use in microturbine generators (MTG). The ACCS uses a sensor, control logic, and variable geometry injectors to provide control of combustor fuel/air ratio independent of generator load. The sensor used in the system would be a non-intrusive ion-based sensor for monitoring the combustion process inside the engine in real time to allow for closed loop control of combustion chemistry (NOx, CO, and combustion stability) as ambient conditions, load, and fuel composition vary. The system would facilitate the burning of alternative fuels such as landfill gas and digester gas, and CO and NOx emissions would be reduced by about 75 percent and 30 percent, respectively, compared to a microturbine without the technology.

Objective

The objective of the project will be to demonstrate the effectiveness of the technology to reduce emissions across a range of microturbine generator loads and fuel composition.

Methods

The first task will be the refinement to the ion-sensing technology and the variable geometry fuel injection system in a modified MTG at the test facility at U.C. Irvine, and then the integration of the control logic. The second task will be the preparation of a site at a landfill where existing MTGs are operating. The final task will be the operation of the MTG at the selected landfill site with the ACCS with the monitoring of the performance and the emissions for six to seven months.

Expected Results

It is expected that the project will demonstrate the ability of the ACCS to facilitate the burning of alternative fuels, such as landfill gas, in MTGs over a range of loads. It is expected that both CO and NOx emissions will be reduced over the full range of loads and with the alternative fuels.

Significance to the Board

The technology would permit the burning of alternative fuels such as landfill gas and digester gas, thus reducing methane emissions and contributing to the Board's Climate Change emissions reductions goals. The NOx and CO emissions reductions achievable with the technology would assist in meeting the ARB's emission requirements for Distributed Generation operations.

Applicant: University of California, Irvine, Combustion Laboratory

Project Period: April 2007 to April 2009

Principal Investigator: Vincent McDonell

ICAT Funding: $215,000

Co-funding: $372,975

Past Experience with This Principal Investigator:

None.

Prior ICAT Funding to 2006

Year	2005	2004	2003
Funding	0	0	0

BUDGET SUMMARY

University of California, Irvine, Combustion Laboratory

"Adaptive Low Emission Turbine for Renewable Fuels"

Direct Costs and Benefits	**ICAT**	**Total**
1. Labor	$141,249	$305,298
2. Employee Fringe Benefits	$ 40,829	$ 84,237
3. Subcontractors	$ 0	$ 0
4. Equipment	$ 0	$ 25,000
5. Travel and Subsistence	$ 4,052	$ 4,052
6. Materials and Supplies	$ 20,940	$ 47,940
7. Other Direct Costs	$ 7,930	$ 7,930
Total	$215,000	$ 474,457
Indirect Costs		
1. Overhead	$ 0	$ 12,195
2. Other Indirect Costs	$ 0	$101,323
Total	$ 0	$113,518
Total Project Costs	**$215,000**	**$587,975**