State of California
AIR RESOURCES BOARD

Resolution 01-45

October 25, 2001

Agenda Item No.: 01-8-2

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 01-56, entitled "Demonstration of Electric School Bus with Zebra Battery and Integrated Fast Charge", has been submitted by the Sacramento Municipal Utility District in response to the 2001 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 01-56, entitled "Demonstration of Electric School Bus with Zebra Battery and Integrated Fast Charge", submitted by the Sacramento Municipal Utility District, for a total amount not to exceed $140,000.

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 01-56, entitled "Demonstration of Electric School Bus with Zebra Battery and Integrated Fast Charge", submitted by the Sacramento Municipal Utility District, for a total amount not to exceed $140,000.

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 $140,000.

I hereby certify that the above is a true and correct copy of Resolution 01-45, as adopted by the Air Resources Board.

Marie Kavan

Marie Kavan, Clerk of the Board

ATTACHMENT A

Innovative Clean Air Technologies (ICAT) Grant Proposal:

"Demonstration of Electric School Bus with Zebra Battery and Integrated Fast Charge"

Background

Existing heavy-duty battery-electric-powered vehicles, such as school buses, have issues of low vehicle range, erratic performance and reliability, and increased maintenance burdens when compared with diesel-, CNG-, and hybrid-powered vehicles. Such issues inhibit the widespread deployment of these heavy-duty zero emission vehicles (ZEVs), resulting in greater air pollution due to the use of the internal combustion-powered alternatives. The proposed project will use technology that promises to remedy these deficiencies through the use of the first truly "advanced" battery system suitable for application to medium- and heavy-duty vehicles.

Objective

The overall project objective will be to demonstrate the performance and safety characteristics of this advanced heavy-duty ZEV technology and its utility in reducing emissions from school bus operations. Intermediate objectives include the retrofit of an existing Blue Bird 72-passenger school bus with an advanced electric propulsion system including a sodium-nickel chloride Zebra battery and integrated fast-charge capability. After a period of road testing, the bus will be delivered to Napa Valley Unified School District (NVUSD) for regular service operation and evaluation.

Methods

An existing bus will be equipped with the Zebra battery system and the associated electric drivetrain equipment. The bus will be tested for two months in simulated service to ensure it is operating properly. Then the bus will be delivered to the NVUSD for eight months of field service operation. During all vehicle operation, data will be collected regarding battery efficiency, energy consumption, mileage and maintenance costs. Comparison will also be made with the NVUSD's other electric bus operations and experience, including an upcoming demonstration of a nickel-metal hydride battery-powered bus.

Expected Results

The project is expected to demonstrate that electric vehicle technologies can be successfully applied to the medium- and heavy-duty transportation industries, specifically the school bus industry, when the proper technology is used and systems integration efforts are properly conducted.

Significance to the Board

The efforts of the Board to promote and encourage the use of zero-emission vehicles will be significantly advanced by this project. The proposed technology will remedy the shortcomings of previous medium- and heavy-duty vehicle designs and will accelerate the deployment of such vehicles and the emissions reductions that are unique to the pure-electric platform.

Applicant: Sacramento Municipal Utility District **Project Period:** 13 months

Principal Investigator: Ruth MacDougall **ICAT Funding:** $140,000

Cofunding: $260,713

SMUD:	$ 40,065
MES-DEA:	$ 27,648
Napa Valley Unified School District:	$ 8,000
U.S. Department of Transportation:	$185,000

Past Experience with This Principal Investigator: A separate project currently underway with this PI, managed by MSCD, is proceeding satisfactorily.

Prior ICAT Funding to Sacramento Municipal Utility District:

Year	2000	1999	1998
Funding	$ 0	$ 0	$ 0

BUDGET SUMMARY

Sacramento Municipal Utility District

Demonstration of Electric School Bus with Zebra Battery and Integrated Fast Charge

Direct Costs and Benefits	ICAT	Total
1. Labor	$ 0	$ 13,636
2. Employee Fringe Benefits	$ 0	$ 5,186
3. Subcontractors	$140,000	$370,648
4. Equipment	$ 0	$ 0
5. Travel and Subsistence	$ 0	$ 891
6. Materials and Supplies	$ 0	$ 0
7. Other Direct Costs	$ 0	$ 0
Total	$140,000	$390,361
Indirect Costs		
1. Overhead	$ 0	$ 10,352
2. Other Indirect Costs	$ 0	$ 0
Total	$ 0	$ 10,352
Total Project Costs	**$140,000**	**$ 400,713**

SUBCONTRACTOR BUDGET SUMMARY

Santa Barbara Electric Bus Works

Demonstration of Electric School Bus with Zebra Battery and Integrated Fast Charge

Direct Costs and Benefits	ICAT	Total
8. Labor	$ 16,933	$ 23,468
9. Employee Fringe Benefits	$ 5,079	$ 7,040
10. Subcontractors	$ 67,074	$ 89,074
11. Equipment	$ 0	$ 0
12. Travel and Subsistence	$ 10,800	$ 10,800
13. Materials and Supplies	$ 0	$170,087
14. Other Direct Costs	$ 10,000	$ 10,000
Total	$109,886	$310,469
Indirect Costs		
3. Overhead	$ 30,114	$ 60,179
4. Other Indirect Costs	$ 0	$ 0
Total	$ 30,114	$ 60,179
Total Project Costs	**$140,000**	**$370,648**