

State of California
AIR RESOURCES BOARD

Resolution 01-36

September 20, 2001

Agenda Item No.: 01-7-3

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 research proposal, number 2501-221, entitled "Vehicle-to-Grid Demonstration Project: Grid Regulation Ancillary Service with a Battery Electric Vehicle", has been submitted by AC Propulsion, Inc.;

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 2501-221 entitled "Vehicle-to-Grid Demonstration Project: Grid Regulation Ancillary Service with a Battery Electric Vehicle", submitted by AC Propulsion, Inc., for a total amount not to exceed \$164,676.

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 2501-221 entitled "Vehicle-to-Grid Demonstration Project: Grid Regulation Ancillary Service with a Battery Electric Vehicle", submitted by AC Propulsion, Inc., for a total amount not to exceed \$164,676.

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 \$164,676.

I hereby certify that the above is a true and correct copy of Resolution 01-36, as adopted by the Air Resources Board.

Marie Kavan, Clerk of the Board

ATTACHMENT A

“Vehicle-to-Grid Demonstration Project: Grid Regulation Ancillary Service with a Battery Electric Vehicle”

Background

The Air Resources Board has determined that zero emission vehicles need to be an integral part of the efforts to reduce air pollution in California. The Low Emission Vehicle program, first adopted in 1990, contains a mandate for the production of a growing number of ZEVs. In the most recent biennial review, completed in September 2000, the ARB commissioned an independent technical expert to evaluate the state of the art of batteries and other ZEV technologies. The report determined that high costs of batteries would result in a cost premium of battery powered electric vehicles over conventional vehicles. The report cites a \$20,000 per vehicle cost premium over a conventional vehicle was cited in the report. This cost premium has been widely used in attacks against the ZEV mandate.

Objective

The goal of this project is to integrate all of the essential elements needed to demonstrate the operation of a battery electric vehicle performing grid regulation while parked, and to demonstrate that capability in actual operation. The primary intent is to provide a way of adding value to the ownership of electric vehicles, whereby the reduced cost-of-ownership would ease an objection to their use and thus help reduce automotive air pollution.

Methods

This project will assemble available components into an existing battery electric vehicle, develop the controlling software, implement the control technology with the California Independent System Operator (CalISO), and demonstrate the vehicle in actual grid regulation usage for approximately 120 hours. During the demonstration periods, data will be collected on how well the vehicle responds to regulation commands, on power flow, on battery state of charge and other important parameters. These data will be analyzed to evaluate the feasibility of this technology for use of battery electric vehicles for grid power regulation.

Expected Results

It is anticipated that this project will successfully demonstrate the technology, hardware and software for using battery electric vehicles for grid power regulation, and to show the feasibility of this approach.

Significance to the Board

The proposed project aims to develop and demonstrate technology and systems that allow an electric vehicle to create value while the vehicle is stationary and plugged in to the power grid. By deploying the vehicle’s power systems to perform ancillary services for the power grid operator, there is the potential for economic value to be created that will nullify the excessive cost-per-emissions-benefit argument. With the value created through vehicle-based grid services, there is the potential for electric vehicles to have a lower net cost than a conventional vehicle. This could invert the cost vs. emissions benefit tradeoff as there could be a cost benefit together with the emissions benefit. The significance to the Air Resources Board is that vehicle based grid services may prove to be instrumental in overcoming market and cost barriers in the adoption of electric and other advanced technology vehicles.

Contractor:

AC Propulsion, Inc.

Contract Period:

Seven (7) months

Principal Investigator (PI):

Alec N. Brooks

Contract Amount:

\$164,676

Cofunding:

Volkswagen will contribute the use of a prototype “New Beetle” electric vehicle. CallSO will participate in the demonstration effort at no charge to the project.

Basis for Indirect Cost Rate:

The indirect cost consists solely of a profit of \$12,198, an acceptable rate of eight percent of the Total Direct Cost. No charge will be made for overhead or general & administrative costs.

Past Experience with this Principal Investigator:

This Principal Investigator participated in a study entitled “Vehicle-to-Grid Power: Battery, Hybrid, and Fuel Cell Vehicles as Resources for Distributed Electric Power in California,” supported by the ARB’s Mobile Source Control Division. The study’s results were well received.

Prior Research Division Funding to AC Propulsion:

Year	2001	2000	1999
Funding	\$ 0	\$ 0	\$ 0

BUDGET SUMMARY

AC Propulsion, Inc.

Vehicle-to-Grid Demonstration Project:
Grid Regulation Ancillary Service with a Battery Electric Vehicle

DIRECT COSTS AND BENEFITS

1.	Labor and Employee Fringe Benefits	\$ 106,061
2.	Subcontractors	\$ 600
3.	Equipment	\$ 30,487 ¹
4.	Travel and Subsistence	\$ 4,851
5.	Electronic Data Processing	\$ 0
6.	Reproduction/Publication	\$ 100
7.	Mail and Phone	\$ 0
8.	Supplies	\$ 1,100
9.	Analyses	\$ 0
10.	Miscellaneous	<u>\$ 9,280</u>
	Total Direct Costs	\$152,478

INDIRECT COSTS

1.	Overhead	\$ 0
2.	General and Administrative Expenses	\$ 0
3.	Other Indirect Costs	\$ 0
4.	Fee or Profit	<u>\$ 12,198</u>
	Total Indirect Costs	<u>\$ 12,198</u>

TOTAL PROJECT COSTS \$ 164,676

¹ The majority of the equipment budget is for an electric motor drive system costing \$22,500.