

ELECTRIC AND HYBRID VEHICLES PROGRAM

**18th ANNUAL REPORT TO
CONGRESS FOR FISCAL YEAR 1994**



April 1995

**U.S. Department of Energy
Assistant Secretary, Energy Efficiency and Renewable Energy
Office of Transportation Technologies
Washington, DC 20585**

PREFACE

This eighteenth annual report serves to inform the United States Congress of the progress in Fiscal Year 1994 and the plans of the Department of Energy Electric and Hybrid Vehicles Research and Development Program. This document complies with the reporting requirements established under Section 14 of the Electric and Hybrid Vehicle Research, Development, and Demonstration Act of 1976, Public Law 94-413, as amended, 15 U.S.C. §2513. It also satisfies the reporting requirements of Section 615 of the Energy Policy Act of 1992, Public Law 102-486, 42 U.S.C. §13285. In addition, this report is intended to serve as a means of communication from the Department to all the public and private sector participants involved in making the program a success, and other interested parties.

The Department remains focused on the technologies that are critical to making electric and hybrid vehicles commercially viable and competitive with current production gasoline-fueled vehicles in performance, reliability, and affordability. During Fiscal Year 1994, significant progress was made toward fulfilling the intent of Congress. The Department and the United States Advanced Battery Consortium (a partnership of the three major domestic automobile manufacturers) continued to work together and to focus the efforts of battery developers on the battery technologies that are most likely to be commercialized in the near term. Progress was made in industry cost-shared contracts toward demonstrating the technical feasibility of fuel cells for passenger bus and light duty vehicle applications. Two industry teams which will develop hybrid vehicle propulsion technologies have been selected through competitive procurement and have initiated work, in Fiscal Year 1994. In addition, technical studies and program planning continue, as required by the Energy Policy Act of 1992, to achieve the goals of reducing the transportation sector dependence on imported oil, reducing the level of environmentally harmful emissions, and enhancing industrial productivity and competitiveness.

TABLE OF CONTENTS

Preface

1.0	Introduction	1-1
2.0	Fiscal Year 1994 Accomplishments	2-1
3.0	Battery Systems Research and Development	3-1
3.1	United States Advanced Battery Consortium	3-1
3.2	Exploratory Technology Research	3-2
3.3	Ultracapacitors	3-5
4.0	Fuel Cell Systems Research and Development	4-1
4.1	Light-Duty Vehicle Propulsion Systems	4-1
4.2	Heavy-Duty Vehicle Propulsion Systems	4-3
4.3	Research and Development	4-4
4.4	Exploratory Technology Development	4-5
4.5	Vehicle Systems Analyses	4-7
5.0	Propulsion Systems Research and Development	5-1
5.1	Hybrid Propulsion Systems Program	5-1
5.2	Modular Electric Vehicle Program	5-3
5.3	Site Operator Program	5-4
5.4	Engineering Evaluation and Testing	5-8
5.5	Student Competitions	5-12
6.0	Other Activities	6-1
6.1	The Energy Policy Act of 1992 and the Electric and Hybrid Vehicles Program	6-1
6.2	Interagency Coordination	6-2
6.3	Database Development	6-3
6.4	Electric Vehicle Readiness	6-4
6.5	Environmental, Health, and Safety Studies	6-6
6.6	Energy Storage for Hybrid/Electric Vehicles	6-7
6.7	Supporting Analyses and Assessments of Transportation Fuel Cells	6-8
7.0	Incentives	7-1
8.0	Use of Foreign Components	8-1
9.0	Recommendations for Initiatives	9-1
10.0	Fiscal Year 1994 Publications	10-1

1.0 INTRODUCTION

The transportation sector is the single largest user of petroleum in the United States; not only did it account for approximately 66 percent of all petroleum used last year, but more significantly, it used about 53 percent more oil than the country produced. The transportation sector is also a major contributor to air pollution. Extensive use of electric, hybrid, and fuel cell vehicles could lead to an overall reduction in petroleum fuels consumption for transportation and a corresponding reduction in on-road emission of environmentally harmful exhaust gases.

The Electric and Hybrid Vehicle Research, Development, and Demonstration Act of 1976 authorizes the Department of Energy to, among other things, "encourage and support accelerated research into, and development of electric and hybrid vehicle technologies." 15 U.S.C. §2501(b)(1). The Department established the Electric and Hybrid Vehicles Program to undertake, in cooperation with industry, research, development, testing, and evaluation activities to develop the technologies that would lead to the production and introduction of electric and hybrid vehicles in the Nation's transportation fleet. The Program is managed by the Electric and Hybrid Propulsion Division within the Office of Propulsion Systems. In Fiscal Year 1994, Congress provided an appropriation of \$74 million for the Program.

The current program structure and principal responsibilities of the organizational units are shown in Figure 1-1. The participants in electric and hybrid propulsion systems research and development, and their cost-sharing commitment, are listed in Table 1-1. Participants include major automotive companies, battery companies, component and propulsion system companies, universities, and electric vehicle users from the public and private sectors.

In Fiscal Year 1994, the Program continued to emphasize battery, fuel cell, and propulsion systems development. The Program also supported testing and evaluation of vehicles and components in laboratory and fleet operations. The battery program concentrated on technologies that could satisfy the mid- and long-term goals of the automobile manufacturers as determined by the United States Advanced Battery Consortium. Two major cost-shared contracts were placed with automotive industry teams for the development of hybrid propulsion systems that would double the fuel efficiency of conventional vehicles and satisfy the Environmental Protection Agency Tier II emissions standard.

The Energy Policy Act of 1992, in Title XX, Subtitle A, recognizes the role of electric vehicles in reducing the nation's dependence on imported oil. Section 2025 authorizes an expanded program of research and development of electric motor vehicles and associated equipment. Subtitle A of Title VI provides for a commercial demonstration program in electric vehicles. In Fiscal Year 1994, the comprehensive five-year program plan developed for carrying out the purposes of Section 2025 was completed.

This Annual Report describes the progress made in developing electric and hybrid vehicle technologies. The report provides a summary of Fiscal Year 1994 accomplishments, followed by detailed descriptions of program activities in advanced battery, fuel cell, and propulsion systems development. The results of testing and evaluation of new technology in fleet site operations and in laboratories are provided.

Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

Real-Time Litigation Alerts



Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

Advanced Docket Research



With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

Analytics At Your Fingertips



Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.