



e-news



The Institute of Transportation Studies at UC Davis presents *ITS-Davis e-news*, a periodic electronic newsletter for affiliates, friends and others interested in accomplishments, new research and ongoing activities at the Institute. *ITS-Davis e-news* reports information directly from ITS-Davis and from UC Davis academic departments affiliated with ITS-Davis that are conducting transportation-related research and education. For previous issues, see the [e-news archives](#)

Contents

ISSUE 2

October 2000

- [New Initiatives](#)
 - [TIME OUT FOR TRUCK ENGINES](#): ITS-Davis Examines Benefits of Fuel Cells for Truck Auxiliary Power
 - [KNOWLEDGE IS POWER](#): W. Alton Jones Foundation Grant Expands Fuel Cell Outreach at ITS-Davis
- [Research Results](#)
 - [ITS-DAVIS RESEARCH CONTRIBUTES TO CALIFORNIA POLICY MAKING](#): Input to Emission Regulations
 - [MORE PUBLICATIONS FROM ITS-DAVIS](#): Hot off the Presses
- [Education Highlights](#)
 - [ANOTHER YEAR BEGINS](#): ITS-Davis Offers Range of Graduate Study Options
 - [CHEVRON FELLOW NAMED FOR 2000-01](#): Student Specializes in Modeling Fuel Processor System Components
 - [NOVEMBER IN PARIS](#): Graduate Student Spends Fall in Europe
- [ITS-Davis and Campus Highlights](#)
 - [FAWCETT HONORED](#)
 - [KUDOS TO MOKHTARIAN](#): ITS-Davis' Former Acting Director
 - [SPERLING RETURNS FROM SABBATICAL](#): Hard Work (and a Little Play) in Paris
 - [A STEADY HAND](#): Board of Advisors Helps Direct Activities of ITS-Davis
 - [FUEL CELL VEHICLE MODELING WORKSHOP](#): Real World Input to Research on Tomorrow's Technology
 - [ELECTRIFYING THE POLITICAL CLIMATE](#): UC Davis FutureTruck Wows Democratic Convention

[Top](#) | [New Initiatives](#) | [Research Results](#) | [Education Highlights](#) | [ITS-Davis and Campus Highlights](#) | [e-news archives](#) |

New Initiatives

TIME OUT FOR TRUCK ENGINES: ITS-Davis Examines Benefits of Fuel Cells for Truck Auxiliary Power

When trucks roll into a truck stop for required downtime, the drivers may take a break, but the trucks' engines don't. Typically, they stay on, idling for hours to prevent cold start and mechanical problems, and to power the driver's creature comforts such as heat and airconditioning, refrigerator, stereo, VCR and computer equipment. And as the engines idle, they spew



Prototype FC APU Truck -- 2000 Freightliner Century Class

pollutants into the air. One possible solution is a fuel cell to power the truck's auxiliary power unit (APU).

While fuel cell powertrains continue to face significant technical and economic barriers, small fuel cell APUs (1-5 kW) may have a viable near-term market. Several truck manufacturers are exploring this possible use for fuel cells, and an exciting new ITS-Davis project will provide important data to support continued development in this application.

Working cooperatively with Freightliner Corporation, the ITS-Davis study will quantify the potential benefits of utilizing fuel cells in lieu of leaving the engines idling. Researchers are estimating the potential reductions of:

1. Heavy truck fuel and lubricant consumption
2. Trucking costs
3. Air pollutants through elimination of truck idling

Conservative preliminary estimates find that fuel cell APUs in lieu of idling could substantially reduce truck fuel consumption, pollution emissions, greenhouse gas emissions, and trucking costs while simultaneously increasing energy efficiency and possibly payload capacity.

An average late model truck that idles six hours per day, 303 days per year, uses 9,090 gallons of fuel over five years, costing \$15,635 (at \$1.72 per gallon). In addition, the idling truck requires \$3,636 in preventive maintenance and \$7,272 in engine overhauls. Idling is estimated to contribute 1-3.6 tons of nitrogen oxide (NO_x) emissions and 43-142 tons of carbon dioxide (CO₂) over a five-year period. The savings realized by an APU depend upon the market cost of the APU, as well as the fuel-type and quantity of fuel consumed.

Researchers also have prepared a discussion of appropriate fuel cell architectures for truck auxiliary power applications and the costs/benefits associated with each. The first paper with the results of the above analysis of the fuel cell APU will be available January 8 at the Transportation Research Board Annual Meeting in Washington, DC.

This project is one of several new initiatives underway through the Fuel Cell Vehicle Center. Christie-Joy Brodrick, Timothy Lipman, Mohammad Farshchi, and Harry A. Dwyer are the principal researchers.

ITS-Davis is currently finalizing the follow-on idling work, the scope of which includes:

1. A comprehensive market study to determine the characteristics and number of consumers likely to accept this application of fuel cell technology
2. Assessment of the market potential and costs/benefits of incorporating the fuel cell APUs into in-use and refurbished tractors



PEM FC Integrated by Xcellsis into the Prototype

ITS-Davis will compare this strategy to other retrofit technologies, such as engine-rebuilds, catalyst retrofits, and other aftertreatment devices.

ITS-Davis is currently seeking funding to collect data on engine idling emissions at truck stops in the U.S.

Photos courtesy of S. William Gouse, Executive Engineer Technology Planning, Freightliner LLC

KNOWLEDGE IS POWER: W. Alton Jones Foundation Grant Expands Fuel Cell Outreach at ITS-Davis

In 1998, the W. Alton Jones Foundation granted ITS-Davis \$120,000 to launch an outreach and education program to support the Fuel Cell Vehicle Center (FCVC). The initial gift enabled ITS-Davis to contribute to both the technical and policy debate around fuel cell development through one-on-one meetings with key environmental and regulatory staff, a program of publications and presentations on critical issues, and by inviting key environmental and regulatory staff to participate actively in on-campus conferences and seminars.

Impressed by the Institute's work and by the broad base of relationships ITS-Davis has cultivated with government, industry and nonprofits, the Foundation has generously renewed and expanded the grant, to \$160,000 over next two years.

With the new funding, ITS-Davis will continue its current outreach effort and extend it with three new elements:

1. A series of short courses and meetings to educate and inform NGO staff and regulators on FCV technologies and policies, in order to establish a common level of understanding.
2. An internship program for our advanced graduate students to directly infuse the technical findings from our FCV modeling program into NGOs and government agencies.
3. A program of policy analysis to monitor and influence ZEV/FCV policy.

The Institute appreciates the continuing support from W. Alton Jones for this critical effort that is shaping fuel cell technology and policy for the future.

For more information about the W. Alton Jones Foundation, visit: <http://www.wajones.org>

[Top](#) | [New Initiatives](#) | [Research Results](#) | [Education Highlights](#) | [ITS-Davis and Campus Highlights](#) | [e-news archives](#) |

Research Results

ITS-DAVIS RESEARCH CONTRIBUTES TO CALIFORNIA POLICY MAKING: Input to Emission Regulations

The University of California is designated as the research arm of California's government. As such, ITS-Davis Director Dan Sperling notes, "We have purposefully created research programs that consider the many technology and policy options for reducing pollution and petroleum use. We seek to compare the relative merits of many options -- conventional, diesel and natural gas ICEs, and the many electric drive vehicle options."

The California Air Resources Board (ARB) completed another review of its zero-emission vehicle regulation in early September. The board retained the regulation, which will influence air quality policy and advanced vehicle development around the world. ARB staff and board members again considered ITS-Davis studies as part of their deliberations.

ITS-Davis has conducted research used by ARB on vehicle emissions and fuels since its inception 10 years ago. "UC Davis has been a valuable resource in California's zero-emission vehicle program," said ARB Chairman Alan Lloyd, Ph.D. "The university's technical experts have helped California develop a sound scientific and technical basis for developing programs to meet its air-quality goals."

New ITS-Davis studies on which ARB relied on for its most recent review include:

- RR-00-7, Burke, Andrew F., K.S. Kurani, E.J. Kenney (WestStart-CALSTART), "Study of Secondary Benefits

of the ZEV Mandate"
August 2000, pp. 105 \$15

This study describes nine categories other than California air quality that have benefited from the air board's ZEV regulation. The categories include the following:

- Vehicle emissions outside of California
 - EV patent activity
 - Funding for EV programs in government and industry
 - EV-related economic impact in California
 - Development of ultra-clean vehicle technologies
 - Development of low-speed electric transportation such as bicycles, scooters and neighborhood electric vehicles, and the
 - Development of advanced battery technologies for electric utilities and for consumer products, such as computers and cellular telephones.
- RR-99-4, Delucchi, Mark A., A. Burke, T. Lipman, M. Miller, "Electric Vehicle Lifecycle Cost and Energy-Use Model: Report for the California Air Resources Board" May 2000 \$25

This report documents the design and lifecycle cost model and calculates the initial retail cost and total lifecycle cost of vehicles that meet range and performance requirements. The model can be used to investigate the relationship between the lifecycle cost -- the total cost of vehicle ownership and operation over the life of the vehicle -- and important parameters in the design and use of the vehicle.

The last issue of ITS-Davis e-news reported on earlier market research conducted at UC Davis that the ARB has used. Those reports are discussed at <http://its.ucdavis.edu/e-news/aug00.html#3.2>

In addition to providing research input to the board's review, UC Davis Engineering Professor Andy Frank and his students displayed their hands-on work with externally-charged hybrid vehicles outside ARB's September hearing in Sacramento. These cars included the award-winning FutureTruck and FutureCar. In fulfilling one of their goals of educating the public the students also spoke at the ARB hearing and to reporters.

To learn more about the ARB review process, visit: <http://www.arb.ca.gov/msprog/zevprog/zevprog.htm>

MORE PUBLICATIONS FROM ITS-DAVIS: Hot off the Presses

- RP-00-16, Kitamura, Ryuichi, K. Masunaga, Y. Fujimori, "EV Carsharing/Rental Pilot Project in Kyoto: An Outline of the Project" EVS-17, The 17th Annual Electric Vehicle Symposium, October 15-18, 2000, Montreal, Canada
- RP-00-15, Sperling, Daniel, T.E. Lipman, M. Lundberg, "An Electric-Drive Vehicle Strategy for Sweden" EVS-17, The 17th Annual Electric Vehicle Symposium, October 15-18, 2000, Montreal, Canada
- RP-00-14, Delucchi, Mark A., "Environmental Externalities of Motor-Vehicle Use in the U.S." Journal of Transport Economics and Policy, May 2000, Volume 34, Part 2. pp. 135-168
- RR-00-8, Redmond, Lothlorien, "Identifying and Analyzing Travel-Related Attitudinal, Personality, and Lifestyle Clusters in the San Francisco Bay Area" September 2000, pp. 169 \$20
- RR-00-5, Sperling, Daniel, "Energy and Environmental Challenges for the Japanese Automotive Industry" July 2000, pp. 8 \$5
- RR-00-2, Niemeier, Debbie A., M. E. Sumpter, "Transportation Needs of Sacramento County Welfare

Recipients" May 2000, pp. 115 \$15

ITS-Davis publications, including FCV publications, can be ordered by fax, e-mail or mail. International orders must be pre-paid.

Checks or money orders are accepted. No credit cards.

e-mail: itspublications@ucdavis.edu

Fax: 530-752-6572

Mail: Attn: Publications Desk, Institute of Transportation Studies, UC Davis, One Shields Avenue, Davis, CA 95616-8762

[| Top](#) | [| New Initiatives](#) | [| Research Results](#) | [| Education Highlights](#) | [| ITS-Davis and Campus Highlights](#) | [| e-news archives](#) |

Education and Research Highlights

ANOTHER YEAR BEGINS: ITS-Davis Offers Range of Graduate Study Options



New TTP and other students at an ITS-Davis reception earlier this month

Historically, the central transportation challenge has been how to expand the supply of infrastructure to meet the growing demands for travel. But that approach is increasingly confronted with high environmental and financial costs. Today's challenges include managing demand and reducing vehicle-generated pollution.

Graduate study at UC Davis prepares students for the current and future demands of a career in the fast-changing field of transportation. Our program allows students from many backgrounds to expand their intellectual scope and partake in a multidisciplinary approach to education and research. Our goal is to produce transportation professionals who are capable of solving real-world problems; pros who are at ease with both technology and policy.

We offer a broad array of courses and employ faculty and researchers from a wide variety of disciplines. Our flexible programs allow students to customize their studies based on personal interests while receiving assistance and guidance from a faculty advisor.

Our two largest graduate programs are the Transportation Technology and Policy program housed under the Institute of Transportation Studies, and the Transportation Planning and Design program housed within the Civil and Environmental Engineering Department. Both offer M.S. and Ph.D. degrees. Depending on a student's specific interests, several other programs may be appropriate, such as Mechanical Engineering, Chemical Engineering, Economics, Ecology, Geography, or Statistics.

Many mid-career professionals find the opportunity to obtain a one-year, coursework-only master's degree appealing. At the same time, many students prefer the close faculty mentoring and research experience involved with doing a master's thesis.

A National Science Foundation Integrative Grant for Education and Research Training (IGERT) awarded in October 1998 has allowed the Institute to provide benefits to all transportation students on campus:

- State-of-the-art laboratory equipment and computers;
- Innovative course offerings;
- Internships with private and public sector organizations, both domestic and international
- UC Davis-hosted conferences; and

Distinguished speaker seminars.

In addition, because of the IGERT award, ITS-Davis can offer three years of guaranteed financial support to highly qualified domestic Ph.D. students in transportation programs at UC Davis.

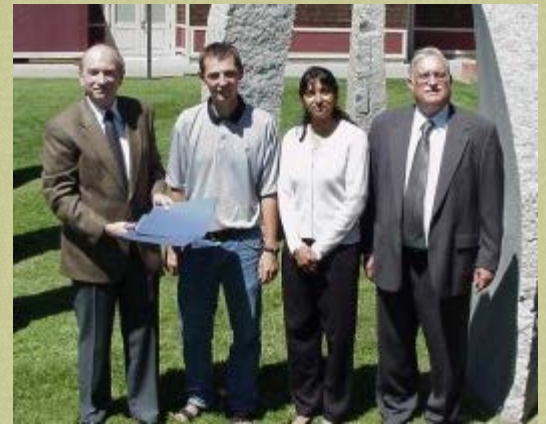
GATE (US Department of Energy's Graduate Automotive Technology Education Program) fellowships, as well as other financial aid are also available through the Fuel Cell Vehicle Center. Information about all of the financial assistance programs can be provided upon request.

Applications are now being taken for fall 2001. Contact Joan Tolentino at jstolentino@ucdavis.edu for application information or you can refer to our web site located at <http://www.its.ucdavis.edu>

CHEVRON FELLOW NAMED FOR 2000-01: Student Specializes in Modeling Fuel Processor System Components

The 2000-01 Chevron Fellow is Meena Sundaresan. Sundaresan joined UC Davis' Transportation Technology and Policy (TTP) graduate program in Fall 1999. She is part of the Institute's Fuel Cell Vehicle Modeling Program (FCVMP) and is working toward two Master's degrees: one in TTP and one in Mechanical Engineering. As part of the FCVMP she specializes in modeling fuel processor system components. After graduating she plans to seek a position in the fuel cell vehicle industry.

About the honor, Sundaresan said: "I thank Chevron and appreciate the support the company has given to our program. I hope Chevron will continue to encourage other students by recognizing them for their interest in this industry and their contributions to our research effort." Before coming to UC Davis Sundaresan worked for Ford's fuel-handling division, which is now part of Visteon, and for an environmental consulting firm.



Chevron Fellows Karl Hauer (1999-2000) and Meena Sundaresan (2000-2001) with (L to R) , Harry Sigworth (Chevron Research & Technology) and Steve Welstand (Chevron Products)

Chevron has funded a special fellowship for ITS-Davis graduate students since 1990. Because there have been multiple recipients in some years, 17 students have been recognized with the award. ITS-Davis Director Dan Sperling is grateful to Chevron: "Our students are our most important resource. With generous fellowships like this, we are able to attract and retain the very best students. This consistent support from Chevron has been exceptionally valuable to many of our most promising students."

NOVEMBER IN PARIS: Graduate Student Spends Fall in Europe

ITS-Davis graduate student Deborah Salon is off to Paris this fall, working with the International Energy Agency. Salon is designing an approach to calculate baselines for greenhouse gas emissions from the transport sector in developing countries. These baselines will be used for project-based emissions trading activities defined under the Kyoto Protocol.

[Top](#) | [New Initiatives](#) | [Research Results](#) | [Education Highlights](#) | [ITS-Davis and Campus Highlights](#) | [e-news archives](#) |

ITS-Davis and Campus Highlights

FAWCETT HONORED



Professor W. Ronald Fawcett

W. Ronald Fawcett, UC Davis professor of chemistry, was elected a fellow of the Electrochemical Society, the society's highest honor. The recipients are distinguished by outstanding contributions to the advancement of science and technology in the areas of electrochemistry. The international society was founded in 1902 to advance solid-state and electrochemical science and technology. Prof. Fawcett conducts research on high-energy density advanced batteries for electric vehicles.

KUDOS TO MOKHTARIAN: ITS-Davis' Former Acting Director

ITS-Davis Director Dan Sperling, who recently returned from sabbatical, reports that he could not have been gone for a year without the support and commitment of his colleagues in Davis, especially Pat Mokhtarian, the 1999-2000 academic year's Acting Director.

"I am deeply indebted to Pat for willingly taking over for a year, and for doing it so well," Sperling says. In addition to furthering his research overseas (see next story), Sperling says he picked up lessons and tips on how to be a better director by watching Mokhtarian from afar.

"It's obvious she has a natural flair for management -- though she made me promise I wouldn't take another sabbatical for a long time," he says with a smile.



Last year's Acting Director Pat Mokhtarian

SPERLING RETURNS FROM SABBATICAL: Hard Work (and a Little Play) in Paris

For the last year, Sperling has worked with the European Conference of Ministers of Transport, the transport arm of Organization for Economic Cooperation and Development (OECD). OECD is an international think tank whose participants include western Europe, North America, Japan, Australia, New Zealand.

Sperling studied smart car sharing and its role in creating sustainable transport systems, and lessons learned from the U.S. Partnership for New Generation Vehicles and its relevance for Europe. He also helped create a policy framework for dealing with freight transport deregulation.

Sperling also helped the transport research arm of the Swedish government formulate a strategy for electric-drive vehicles. He lectured at universities in Stuttgart and Stockholm, and at conferences in Berlin, Cambridge, Paris, and Dublin; and gave presentations to a variety of companies (BP-Amoco, Renault, Shell, Volkswagen, DaimlerChrysler, GM-Opel) in Europe on "Future of the Car," "New Mobility" and "Overview of ITS-Davis."

Finally, Sperling also supervised a UCD-based international study of greenhouse gas strategies for transport sectors of developing countries for the Pew Center for Global Climate Change.

Sperling notes that all of his work was "made possible by the wonders of modern communication." He spent over an hour a day on e-mail with his colleagues at ITS-Davis.

How does it feel to be back in Davis? Sperling admits that making the jump from the freedom and flexibility of a sabbatical and the Parisian lifestyle -- no car, walking everywhere, great cafes and restaurants, culture, and the stunning ubiquitous beauty of the city -- has been difficult. But he adds, "California is the best place in the world to live, and I truly missed everyone at ITS-Davis."

A STEADY HAND: Board of Advisors Helps Direct Activities of ITS-Davis



ITS-Davis' 1999 Board of Advisors

ITS-Davis would like to recognize the accomplished and acclaimed Board of Advisors who volunteer their time and expertise to guide the Institute in its academic and research endeavors:

Chairwoman:

Ms. Jananne Sharpless
Consultant; former Chair, California Air Resources Board; former Member, California Energy Commission

Members:

Dr. Geoffrey E. H. Ballard
Founder, Ballard Power Systems
Chairman, General Hydrogen
<http://www.generalhydrogen.com>

Mr. James D. Boyd
Chief of Staff
California Resources Agency
<http://ceres.ca.gov/cra/>

Mr. Norman Bryan
Retired Senior Vice President
Pacific Gas & Electric

Mr. Jack Collins
Vice President, Marketing
Nissan North America
<http://www.nissan-na.com/>

Mr. James V. DeStefano
Java Automotive Applications
Sun Microsystems
<http://java.sun.com/.../automotive>

Dr. Anthony J. Finizza
Retired Chief Economist
ARCO

Mr. Michael Gage
President and CEO
Calstart, a WestStart Company

Dr. Chung Liu
Deputy Executive Officer
South Coast AQMD
<http://www.aqmd.gov/trans/>

Dr. Hani S. Mahmassani
Professor
Civil Engineering
University of Texas at Austin
ce.utexas.edu/prof/mahmassani/

Dr. Paul B. MacCready
Chairman of the Board
AeroVironment, Inc.
<http://www.aerovironment.com/>

Dr. Ferdinand Panik
Vice President
DaimlerChrysler AG
<http://www.daimlerchrysler.com>

Dr. Eldon B. Priestley
Corporate Strategy and Research
ExxonMobil Research & Engineering
http://www.exxonmobil.com/exxon_research/

Mr. Howard (Bud) Ris
Executive Director
Union of Concerned Scientists
<http://www.ucsusa.org/>

<http://www.calstart.org/>

Ms. Wendy M. James
President
The Better World Group
<http://www.betterworldgroup.com>

Ms. Gloria J. Jeff
Transportation Programs
Parsons, Brinckerhoff, Quade & Douglas
<http://www.pbworld.com>

Dr. Larry R. Johnson
Director
Energy Systems Division
Argonne National Laboratory
<http://www.anl.gov/>

Dr. Robert F. Sawyer
Professor in the Graduate School and
Class of 1935 Professor of Energy Emeritus
Mechanical Engineering Department
University of California, Berkeley
<http://www.me.berkeley.edu/faculty/sawyer/>

Dr. Joseph L. Schofer
Professor, Civil Engineering and Transportation
Chairman, Civil Engineering
Northwestern University
<http://www.civil.northwestern.edu/>

Mr. Hiroyuki Watanabe
Managing Director and Member of the Board
Toyota Motor Corporation
<http://www.toyota.com/>

The next meeting of the Board of Advisors is October 30.

FUEL CELL VEHICLE MODELING WORKSHOP: Real World Input to Research on Tomorrow's Technology

More than 50 students, Fuel Cell Vehicle Modeling Program (FCVMP) participants, and invited experts attended the third annual Fuel Cell Vehicle Modeling Workshop September 19-20 at Buehler Alumni Center on the UC Davis campus. Participants included individuals with combined expertise in fuel processors, air supply, fuel cell stacks, water and thermal management, system integration and fuel upstream energy and emissions analysis. The workshop series was launched to establish performance criteria and other input variables for modeling fuel cell components, systems and fuel options.

This year's gathering focused on the analysis of indirect-hydrocarbon fuel cell vehicle (IHFCV) systems. The workshop featured presentations on the program's approach to modeling the different subsystems of the IHFCV vehicle and an overview of the program's updates to the previously released Direct Hydrogen FCV model and the Indirect Methanol FCV model.

The workshop provided valuable input to the university's modeling program, says FCVMP Associate Director Dr. Sitaram Ramaswamy.

"Overall, the feedback received during the workshop helped validate our approach to FCV modeling and analysis," he said. "We received a number of useful suggestions relating to specifics of the models for some of the subsystems. We also received helpful input regarding the important questions one could answer using the model."

The workshop is one of a series of events ITS-Davis has presented as part of a multi-faceted outreach program designed to inform and influence the public debate over fuel cells and other advanced electric drive technologies. The program has been made possible by a generous grant from the W. Alton Jones Foundation and the FCVMP donors. Read more about the outreach effort in the New Initiatives section, below.



FCVMP associate director Dr. Ram Ramaswamy discusses the ITS-Davis indirect hydrocarbon FCV vehicle model.

To learn more about the FCVMP and the numerous FCV publications available, visit:
http://fcv.ucdavis.edu/fcvprog/FCVMP_Publications_rev1.html.

ELECTRIFYING THE POLITICAL CLIMATE: UC Davis FutureTruck Wows Democratic Convention

UC Davis Engineering Professor Andrew Frank and a team of four students joined the throngs in Los Angeles in mid-August for the Democratic National Convention -- but they weren't there to wave flags and wear funny hats. The team displayed the parallel hybrid-electric sport utility vehicle that recently won the fuel-economy category and placed fourth overall in the nationwide "FutureTruck" contest.

"This opportunity to showcase the truck lends credibility to the UC Davis hybrid electric vehicle research program and allows us to demonstrate to the public what is possible in designing more efficient vehicles," Frank said.

The FutureTruck challenge was to redesign a Chevrolet Suburban, retaining its ability to carry cargo and pull heavy loads but reducing fuel consumption and emissions. The UC Davis team achieved fuel economy of 18.7 miles per gallon, an almost 13 percent increase over the standard Suburban.

The Davis students were in high company at the convention; the FutureTruck was displayed alongside electric and hybrid-electric vehicles developed by the major auto companies.

Special thanks to sponsors U.S. Department of Energy and General Motors, which provided material, technical and financial support for the research project.

For more information on FutureTruck visit: <http://www.futuretruck.org>

Back to the [e-news archives](#) or the [ITS home page](#)