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Zeroing in on Irvine

ZEV station cars provide a living lab for ITS researchers.



A new shared-use station-car project launched on April 18 in Irvine will help researchers at the Institute of Transportation Studies at UC Irvine study the economic and practical feasibility of shared-use and station-car programs and measure how they can change commuters' travel habits.

A key question is whether shared-use station cars, which are based at transit hubs and participating businesses, can induce drivers to switch from private cars to transit for line-haul commutes and use shared vehicles for their travel at trip ends.

The project, called ZEV•NET (short for Zero Emission Vehicle Network Enabled Transport) has 50 vehicles, the nation's largest fleet. Three different Toyota models—e-com and Rav4EV zero-emission SUVs, and Prius hybrid sedans—are slated for its initial phase, which is still being implemented.

ZEV•NET is a non-profit endeavor managed by the National Fuel Cell Research Center and ITS Irvine, which are both associated with The Henry Samueli School of Engineering at UC Irvine. Other partners include the City of Irvine, the Irvine Company, Toyota, the Orange County Transportation Authority, the California Air Resources Board, and the California Institute for Telecommunications and Information Technology.

ZEV•NET makes extensive use of advanced technology, including:

- a Web-based reservation system;
- keyless access;
- real-time monitoring of vehicles' locations using Global Positioning Systems (GPS);
- geo-location tools to map cars' paths instantaneously and provide navigation services;
- on-board monitors to continuously track the cars' operating systems, including the charge remaining in the batteries of the fleet's electric-powered, zero-emission vehicles; and
- charging stations that generate electricity from photovoltaic solar panels and fuel cells.

As an added boon to researchers, the extensive monitoring system permits them to use an adapted version of REACT!, a Web-based and GPS-based travel survey developed earlier at ITS Irvine. It was created under the auspices of the

[The ZEV•NET Web site](#)

[The Web site of CarlinkII a similar program backed by Caltrans, Honda, the ITS Berkeley PATH Program and ITS-Davis, serving the Palo Alto area](#)

[The home page of the California Air Resources Board's Zero-Emission Vehicle Program](#)

[A map of California showing fueling and charging stations and other facilities related to "clean cars"](#)

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Center for Activity Systems Analysis (CASA), which seeks to improve the models used to analyze transportation patterns by drawing closer connections between people's activities and their travel behavior.

"The GPS tracing lets the driver see where he or she went, so it can serve as a memory jog. After you've finished the trip, you can go back over your route and annotate it for the survey," explained Mike McNally, Associate Professor of Civil Engineering at UC Irvine and one of the investigators on the project.

How It Works

For now, ZEV•NET is being offered exclusively to corporate users in order to ensure that each car will be driven enough to have measurable effects. "Five active drivers per car is the absolute minimum," McNally said. "On average, there are about 10 drivers per car." For each vehicle they sign up for, companies must identify at least one employee who commutes by rail to the Irvine station.

The initial deployment distributed cars to four local businesses, including a unit of UC Irvine, at no cost. In the second phase, ZEV•NET is selling corporate memberships in two- and four-vehicle commitments, at \$5,000 and \$10,000 a year, respectively. That covers all expenses, including maintenance and insurance, and guarantees a car will be available around the clock and on weekends.

As an added attraction, ZEV•NET cars are also given reserved parking spaces in the station's lot, which fills up during peak hours, McNally said. "One of the goals of ZEV•NET is to relieve that parking problem. When someone drops a car off, and someone else picks it up, you eliminate the need for that parking space while the car is in use, so that our 50 cars are using a small fraction of the spots.

"On weekends and at night, more than 30% of the parking spots are full, mostly with cars owned by people who commute into and out of the station by rail. They are de facto station cars," McNally said.

A typical scenario would look like this: Every morning Commuter A drives the two-person, Toyota e-com from his home near Irvine to the city's railroad station. There, after plugging the car into an electric charger, he boards the train for work in Los Angeles. At some point before he leaves for work, Commuter B in Riverside logs onto a Web site and reserves a car to be picked up at the station in Irvine. She then boards the train in Riverside and rides to Irvine, where she unplugs the car and drives it to work. During the day she can drive her co-worker and herself to a meeting on the other side of town, or other co-workers can reserve the car for use during the day. At the end of the day, Commuter B drives back to the railroad station and plugs in the car and gets on the train home. Shortly afterward, Commuter A leaves work, rides the train to the station, unplugs the e-com and drives home.

Watching the Wheels Go Round and Round

Throughout the day, researchers at ITS will keep tabs on the whereabouts of each vehicle, when it starts or stops, when the doors lock and unlock, when seat belts are fastened or unfastened, and the status of the car's electrical charge. As fleet managers of the program, they need some of this information for daily operations. "The data will tell us if a vehicle is coming in, say at noon, with a low

charge,” McNally explained. “If someone wants the car at 12:30 and it takes an hour and a half to charge, we’ll know that person will need a different vehicle.”

More importantly, ITS researchers will use the sophisticated monitoring systems to learn more about travel behavior—from how commuters choose their route to whether or not they eliminate a household car.

“The point is, we’re trying to relieve congestion. Does a system like this do that? Or will we be putting another car on the road that wasn’t there before?”
—Mike McNally, researcher at ITS Irvine

For example, McNally said, if a commuter who usually takes a train and then a bus to work can pick up an electric car at the train station, will that person choose to go out to lunch instead of eating at his or her desk? “The point is, we’re trying to relieve congestion. Does a system like this do that? Or will we be putting another car on the road that wasn’t there before?”

In another scenario, a commuter who keeps a polluting junker at the train station to get to work may use the electric car instead. But if the driver passes the old car on to a teenaged son or daughter, it is likely to be driven more and cause more congestion and pollution than it would have if it remained sitting at the train station.

Why Orange County?

The station-car concept is best suited to situations where a station-car/rail link can take the place of lengthy car commutes on freeways, which describes the travel patterns of many commuters in the region, McNally said. “The Riverside-Orange County corridor is the most impacted in terms of traffic congestion. SCAG [Southern California Council of Area Governments] figures show more than 110,000 solo drivers traveling to Orange County every day from Riverside and San Bernardino. Irvine is located in the center of Orange County, so basically anyone traveling from north to south passes through Irvine, which makes it an ideal place to start the program,” McNally said.

Irvine is also a likely place to test the concept because of its high concentration of research parks occupied by corporate tenants, McNally said. And because many of them are engaged in advanced technology development of their own, they are more likely to embrace the idea. “Companies have to be enthusiastic about it, and they have to understand that first and foremost this is a research project,” McNally said.

Eventually, researchers hope to test ZEV•NET as a going commercial concern, albeit one that receives a nudge toward profitability from government policies that encourage automakers to manufacture and deploy zero-emission vehicles.

“Toyota’s been a close partner,” McNally said. “California’s ZEV mandate assigns credits to manufacturers for zero-emission cars that they sell and also gives credits to programs that use these vehicles. A program can give its credits to a manufacturer in exchange for additional vehicles or research support. But a sustainable business model will require a financial commitment from participating companies, and eventually solo drivers, which ZEV•NET will test in its next

phase.”



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