CARSHARING IN THE UNITED STATES: EXAMINING MARKET POTENTIAL

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ABSTRACT

The automobile is the dominant travel mode throughout the U.S., while transit accounts for less than four-percent of market share. Between these principal modes, niche markets exist for other transportation services, such as transit feeder shuttles and carsharing. Carsharing, in which individuals share a fleet of vehicles distributed at neighborhoods, employment sites, and/or transit stations, could potentially fill and expand one such niche; complement existing services; and develop into an economically viable transportation alternative. While most transit modes rely heavily upon governmental support, carsharing has the potential to become commercially sustainable. Nevertheless, carsharing is a relatively new development in the U.S. and will require more time to develop into a sustainable and widespread transportation alternative.

This paper includes a brief discussion of carsharing history in Europe and an overview of U.S. carsharing developments. It also highlights CarLink—the first *smart* commuter-based carsharing program in the San Francisco Bay Area—to examine the market potential and viability of one U.S. shared-use vehicle model in greater detail. (For more information on CarLink go to www.gocarlink.com.) Finally, the author concludes this paper with a discussion of the complementary niche potential of carsharing to fill existing gaps between traditional transit and private vehicles.

Key Words: Carsharing, advanced technologies, market niche potential, and economic viability

INTRODUCTION

Over the last century, the automobile has grown in popularity and dominance, while transit has lost market share. Despite the distinct benefits associated with the auto and traditional transit, service gaps remain between these modes. A shift in local transit policy, fostered by federal ISTEA and TEA-21 legislation, suggests an opportunity may exist for more sustainable market niche services to emerge (1), such as carsharing. Indeed, carsharing is gaining popularity internationally (1, 2, 3).

The principle of carsharing is simple: Individuals gain the benefits of private car use without the costs and responsibilities of ownership. Instead of owning one or more vehicles, a household accesses a fleet of shared-use vehicles on an as-needed basis. Carsharing may be thought of as organized short-term car rental. Individuals gain access to vehicles by joining an organization that maintains a fleet of cars and light trucks in a network of locations. Generally, participants pay a fee each time they use a vehicle (4).

Carsharing is most effective and attractive when seen as a transportation mode that fills the gap between transit and private cars and can link to other transportation modes and services. For long distances, one might use a household vehicle, air transport, rail or bus, or a rental car; and for short distances, one might walk, bicycle, or use a taxi. But for intermediate travel, even routine activities, one might use a shared vehicle. The shared-car option provides other customer attractions: It can also serve as mobility insurance in emergencies, and as a means of satisfying occasional vehicle needs and desires such as carrying goods, pleasure driving in a sports car, or taking the family on a trip (4).

Since 1998, many innovative shared-vehicle (or carsharing) programs have emerged in the U.S. Such services provide a shared community resource at transit stations, neighborhoods, and employment centers that can complement existing transit and feeder services. To facilitate vehicle access and program operations, smart technologies can be employed. In the San Francisco Bay Area, several innovative partnerships between employers and rail transit operators have formed recently to provide transit feeder services, such as the BART Station Car Program and CarLink (1, 5, 6). Furthermore, in May 2000, BART and Hertz jointly launched a commercial, “station car” rental program at the Fremont station and plan to expand to a second station south of San Francisco.

This paper provides a brief overview of carsharing in Europe and the U.S. Next, it highlights the CarLink program—a commuter-based carsharing model linked to transit—and early market findings. Finally, the author concludes that carsharing can fill a complementary niche market (*not* act as a replacement) to traditional transit and feeder shuttles.

EUROPEAN CARSHARING: A BRIEF OVERVIEW

Carsharing efforts emerged largely from individuals who sought the benefits of cars but were ideologically opposed to widespread car use. In the late-1980s and early-1990s, many carsharing efforts were initiated (mainly in Europe) and initially supported by government grants. Most involved shared use of a few vehicles by a group of individuals. Most found it difficult to make the transition from grassroots, neighborhood-based programs into viable business ventures. They miscalculated the number of vehicles needed, placed too great an emphasis on advanced technology, or were ineffective in their marketing. Many failed organizations merged or were acquired by larger organizations.

Those that grew and thrived were more professional and integrated advanced electronic and wireless technologies. But even today, their total presence is still small in all but a handful of locations. The largest organization, Mobility CarSharing Switzerland, has 2,000 cars and 50,000 customers in 900 locations and 400 communities throughout Switzerland. In Germany, there are currently about 75 organizations serving approximately 40,000 customers with a collective fleet of 1,500 vehicles. In Europe (collectively), there are over 200 organizations operating several thousand vehicles.

Notable European developments include Italy's (Ministry of the Environment) recent investment of $5 million for a national carsharing program. Operations are planned in four initial cities for the fall of 2001, leading to a total of 15. Further, in June 2001, the German railways announced that they would launch "dbRent"—a shared car and bike ("Call-A-Bike") service throughout the nation. The carsharing fleet will include 10,000 to 15,000 cars. This service will be based on the Mobility CarSharing Switzerland system (e.g., reservations, vehicle access, billing, and accounting).

One of the earliest European experiences with carsharing can be traced to a cooperative, known as "Sefage," which originated in Zurich, Switzerland in 1948 (7). Membership in Sefage was primarily motivated by economics. It attracted individuals who could not afford to purchase a car but who found sharing one appealing. Elsewhere, a series of "public car" experiments were attempted, but failed, including an initiative known as "Procotip," begun in Montpellier, France in 1971, and another called "Witkar," deployed in Amsterdam in 1973 (8, 9).

U.S. CARSHARING DEVELOPMENTS

In the U.S. today, there are eight carsharing organizations, two carsharing research pilots (CarLink and Intellishare), and two station car programs (Hertz-BART program and Anaheim – Metrolink). Most carsharing organizations follow the operational model of the majority of European organizations: Private individuals acquire cars from nearby neighborhood lots and return them to the same lot (i.e., urban carsharing). Several use smart technologies (i.e., smart cards, Internet-based reservations, and vehicle tracking) to facilitate reservations, operations, and key management. Four are run as commercial ventures, and four are nonprofits. As of June 2001, U.S. carsharing organizations collectively claimed nearly 3,000 members and operated 140 vehicles. Recently, developments have been initiated to found the North American Shared Car Association. See Table 1 (below) for a summary of the existing U.S. carsharing organizations.

Strong interest in carsharing and station cars (shared-use vehicles linked to transit) is continuing in other U.S. cities. In 2001-2002, 10 additional efforts are planned in Atlanta, Georgia; New

York City (suburbs); Washington, D.C.; Chicago, Illinois; Berkeley and Oakland, California; Corvallis, Oregon; Fort Collins and Denver, Colorado; and Silver Spring, Maryland.

Two “smart” carsharing research pilots were launched in 1999 in California. The first is CarLink, which is based in Northern California, and highlighted in this paper. The second is Southern California’s Intellishare program, which incorporates 25 Honda EV Plus electric vehicles, smart cards, and on-board computer technologies, under the direction of University of California, Riverside researchers. Faculty, staff, and students of UC Riverside use the Intellishare system.

Organization Name	Location	Start Date	Size	Business Strategy
Dancing Rabbit Vehicle Cooperative (DRVC)	Rutledge, Missouri	July 1997	15 Members 3 Vehicles	Non Profit
CarSharing Portland, Inc.	Portland, Oregon	March 1998 (Merged with Flexcar in April 2001)	500 Members 25 Vehicles	Commercial
Flexcar	Seattle, Washington	December 1999	1,500 members 40 Vehicles	Commercial
Boulder CarShare Cooperative	Boulder, Colorado	January 2000	12 Members 2 Vehicles	Non Profit
CarSharing Traverse	Traverse, Michigan	January 2000	25 Members 3 Vehicles	Commercial
ZipCar	Boston, Massachusetts	June 2000	800 Members 42 Vehicles	Commercial
San Francisco City CarShare	San Francisco, California	March 2001	550 Members 24 Vehicles	Non-Profit
Roaring Fork Valley Vehicles	Aspen, Colorado	May 2001	10 Members 1 Vehicle	Non-Profit

Table 1. Summary Of Existing U.S. Carsharing Organizations

Dancing Rabbit Vehicle Cooperative (DRVC), located in Rutledge, Missouri, has been in operation since July 1997. This organization currently has 15 members, three biodiesel vehicles, and supplies an average of 370 vehicle miles of travel per week to its members. DRVC operates under a nonprofit, cooperative business structure.

The Oregon Department of Environmental Quality and the U.S. Environmental Protection Agency funded a one-year carsharing pilot project in Portland, Oregon that began operation in March 1998. Currently, CarSharing Portland, Inc. has 500 members, 25 vehicles, and 23 locations, and operates as a for-profit business (with government start-up subsidies). In April 2001, Flexcar (described below) acquired CarSharing Portland.

Based on a contract with the city of Seattle and King County Metro, Mobility Inc., launched the "Flexcar" service in January 2000. At present, Flexcar has 1,500 members and 40 vehicles. In part, funding for Flexcar was secured due to the strong interest of Seattle's mayor, the King County executive, and several council members. Flexcar is a commercial venture.

Boulder CarShare launched its non-profit operations in January 2000 in Boulder, Colorado. At present, they have 12 members and two vehicles. The goal of Boulder CarShare is to have at least one car in every Boulder neighborhood.

In January 2000, CarSharing Traverse became a commercial carsharing operator in Traverse City, Michigan. The organization started with private funding. At present, they have 25 members and three vehicles, located in three lots.

ZipCar, a commercial carsharing venture, based in Boston, Massachusetts launched in June 2000. The operation, funded largely with venture capital funds, has 800 members and 42 vehicles. ZipCar also plans to expand into Northern Virginia (Arlington County and City of Alexandria).

In San Francisco, a group of environmental organizations, planners, and transportation researchers, have formed a public-private partnership called City CarShare, consisting of public agencies and nonprofit organizations. City CarShare began seeking funds in late 1997 and launched in March 2001. City CarShare currently has 550 members and 24 vehicles. City CarShare is a nonprofit organization. Initially, the organization plans to focus on dense, transit-rich neighborhoods within San Francisco and will move into outlying city neighborhoods as membership grows.

Finally, Roaring Fork Valley Vehicles, located in Aspen, Colorado, launched in May 2001. This organization is a non-profit and received start-up funding from the city of Aspen. Roaring Fork's first pilot program will run for two to three years with up to five low-emission gasoline and hybrid vehicles. At present, Roaring Forks has 10 members and one vehicle.

To further investigate the market potential of carsharing in the U.S., the next section of this paper highlights the CarLink—*smart* commuter-based carsharing model and findings.

CARLINK I OVERVIEW AND FINDINGS

The CarLink I field test was launched on January 20, 1999, and ended on November 15, 1999. Fifty-four individuals enrolled in the program and shared 12 natural gas powered Honda Civics. The participants were from San Francisco, Oakland, and East Bay communities. The cars were based from premium parking spaces at the Dublin/Pleasanton BART station. The model incorporated traditional and reverse commute travel patterns and a day-use fleet application, tested at an employment center (i.e., LLNL).

The CarLink I field test combined short-term rental vehicles with smart communication and reservation technologies to facilitate shared-vehicle access. The 10-month demonstration was implemented and researched by two teams at the Institute of Transportation Studies at the University of California, Davis. Project partners included the California Department of Transportation (Caltrans), American Honda Motor Company, the BART District, Partners for Advanced Transit and Highways (PATH), and LLNL. INVERS (a Germany-based smart carsharing technology company) and Teletrac provided the advanced carsharing and vehicle tracking technologies.

The CarLink model includes three separate user structures: a "Homebased User" lease, transit links for Homebased Users and "Workbased Commuters," and shared vehicle access at employment sites through "Workbased Day Use." During the field test, each group paid a distinct fee according to the duration of car use. All user fees included fuel, insurance, and maintenance costs. Roadside assistance and an emergency taxi service were also provided. In addition to vehicle support services, CarLink implementation staff supported the program by cleaning and occasionally refueling the vehicles, as well as maintaining e-mail and phone contact with users.

Using questionnaires, household interviews, and focus groups, researchers explored CarLink attitudes and use over time. Although the CarLink I participant sample was small (i.e., 54 enrolled), valuable lessons may still be drawn from the results. CarLink I findings include operational understanding, participant profiles, behavioral findings, preliminary economic analysis, and directions for future research (5). Key study findings are:

- Even though many CarLink users' commutes took longer (on average, approximately 10 minutes longer), they found them less stressful.
- CarLink drivers used personal vehicles less than before they joined the study. Those in the Workbased Commuter group also increased their use of BART for recreational travel, perhaps because they became more familiar with the system and had easier access to it.
- The combination of CarLink, BART, and carpooling resulted in a net commute reduction of approximately 20 vehicle miles (or 32.2 kilometers) per day for CarLink commuters. CarLink also resulted in at least 20 new BART trips daily.
- Participants felt comfortable with smart technologies used for vehicle access and tracking, and preferred them over lower-tech versions (e.g., log books).
- Several Homebased Users said that if CarLink became permanent, they would sell one of their personal cars, which would greatly reduce their transportation costs. Workbased Commuters said they were more hesitant about selling a private vehicle until transit services improved and CarLink supplied more lots and vehicle variety (e.g., minivans and pickup trucks).
- Most Workbased Commuters interviewed said that they would return to solo driving after CarLink ended although some would try to carpool more frequently than they had previously (5).

The CarLink II pilot program builds upon these findings. In the next section, the author describes the CarLink II approach.

CARLINK II PILOT PROGRAM

CarLink II continues the investigation of commuter-based carsharing as developed in the CarLink I field test. However, there are five primary differences between the field test and CarLink II. First, CarLink II is a pilot program that includes a continuation strategy to transition this service to an ongoing carsharing organization, once the initial pilot stage is completed (i.e., summer 2002). As mentioned above, researchers found that many CarLink I users would have continued in the program, sold a household vehicle or forgone a purchase, and increased transit and/or alternative mode use (e.g., carpooling and vanpooling) (5). Thus, a more permanent approach was considered critical by the CarLink II project partners.

Second, the size of the CarLink fleet increased from 12 to 27 vehicles, consisting entirely of 2001 Ultra Low Emission Vehicle (ULEV) Honda Civics. CarLink II's larger size enables researchers to gain a more sophisticated understanding of carsharing's niche potential with greater statistical significance. A third difference is the program's focus on providing commuter feeder and day use services to *many* companies in the region rather than one single employer. Fourth, the participation of multiple employers and employees required the development of seamless carsharing technologies, which coordinate vehicle tracking, data collection, and reservations. "Smart key fobs" now enable instant vehicle access and eliminate the need for multiple "key boxes" at transit stations and work locations. The potential of these technologies to enhance service capabilities and reduce program costs is central to the CarLink II program and to realizing the economic potential of this carsharing model. Finally, CarLink II is located in the Palo Alto region, south of San Francisco, and its chief transit partner is Caltrain (i.e., a commuter rail system that runs for approximately 75 miles between Gilroy and San Francisco). The notable congestion and growth of the South Bay also renders it a prime location for exploring commercial viability.

As in the CarLink I field test, three distinct categories of users share the CarLink II vehicles. First, there are "Homebased Users" who live in or near Palo Alto and drive a CarLink vehicle to the Caltrain California Avenue station each weekday morning, before taking a train to work and home again at night. Second, there are "Workbased Commuters," who are employees of Stanford Research Park businesses, who use the vehicles parked by Homebased Users at Caltrain in the AM, to commute to and from the California Avenue station and their work site. Employers pay for employee access to vehicles and encourage employees to promote carpooling among commuters. Finally, there are "Workbased Day Users" who are employed by business subscribers of the Stanford Research Park (i.e., the same companies as for Workbased Commuters) and use the vehicles for personal and business trips throughout the day. Day Use is provided as a monthly subscription package to employers on a per vehicle basis.

All user fees include maintenance, insurance, and fuel costs. Roadside assistance and emergency taxi services are also provided. The CarLink implementation staff also supports the program by cleaning the vehicles, as well as maintaining e-mail and phone contact with users.

Since the CarLink II program is focused on understanding the commercial potential of commuter-based carsharing, the identification of enthusiastic employers is vital. Attributes that can promote commuter-based carsharing include:

- Traffic congestion and parking constraints;
- Proximity to transit and transit incentives (e.g., reduced fares);
- Innovative corporate philosophies and/or mandates (e.g., transportation demand management programs);
- Potential to integrate carsharing with current transportation alternatives (e.g., vanpooling); and
- Transit feeder service gaps (e.g., shuttles are not available).

During site selection, the CarLink II team chose to work with one group—the Stanford Research Park—in recruiting employer participants. As its name suggests, the Stanford Research Park primarily houses research companies, whose type and size varies widely. The park is spread over 700 acres and houses 10 million square feet of developed facilities, 162 buildings, 150 companies, and 23,000 employees. Employers include high-tech law firms, software companies, pharmaceutical research companies, and several "dot coms."

The companies most interested and suited to CarLink II participation include those with regular work schedules (in contrast to "dot coms") and range in size between 100 to 600 employees. CarLink II includes five to six employers, such as Motorola, SAP, Genencor Inc., Incyte Pharmaceuticals, and Xerox, located throughout the Stanford Research Park. The next section describes the potential of CarLink II to fill a complementary service gap between transit and private autos.

CARLINK II: A COMPLEMENTARY MARKET NICHE?

Today, transit feeder shuttle services continue to gain popularity in Northern California, with over 100 shuttles in the Bay Area (1). In the San Francisco Bay Area, transit feeder shuttles cost approximately $75,000 to $80,000 per year to operate. Typically, they include peak-period services and are often timed with transit schedules to reduce wait times. Although feeder shuttles are quite successful in the Bay Area, service limitations do exist. These service gaps provide a complementary niche for commuter-based carsharing programs.

The Caltrain California Avenue Station, located in Palo Alto, is currently served by a number of shuttles. They consist of the Stanford University Marguerite, Palo Alto Crosstown, Palo Alto Embarcadero/Baylands, and the Deer Creek employer shuttles. The most pertinent to CarLink are the Palo Alto Embarcadero/Baylands and Deer Creek employer shuttles, which were designed to transport employees from a transit station to their work site. These shuttles provide timed transfers with Caltrain and run only at peak times.

The Embarcadero/Baylands shuttle operates from the Caltrain station to the Baylands work site. Initially, there was only one shuttle in operation. In late 1999, however, the city of Palo Alto supported the expansion of this service and a second shuttle was added. Currently, the city deploys the shuttles between 9:30 AM and 3 PM on a second route, known as the Palo Alto Crosstown Shuttle service. The second employer shuttle, Deer Creek, operates between the California Avenue Caltrain station and Deer Creek employment sites, such as Hewlett-Packard and Agilent Technologies. The Embarcadero shuttle cost approximately $250,000 (total) to run in 2000, which is largely subsidized by Caltrain on the commute portion of the route. Approximately 115 people use the crosstown shuttle during the week, and 100 use it on Saturdays. However, funding for the crosstown shuttle will likely be cut after July 2001.

Funding for the Embarcadero/Baylands and Deer Creek shuttles started with employers providing 25 percent of the total cost. Typically, a coalition of companies, led by one employer, funds the shuttle. The Joint Powers Board (JPB) and the Bay Area Air Quality Management District (BAAQMD) cover the remaining costs (i.e., 75 percent). JPB is a three-county agency consisting of SamTrans, the Valley Transportation Authority (VTA), and the San Francisco Municipal Railway (Muni). SamTrans is the San Mateo County transit authority, providing service throughout the county with connecting services to San Francisco and Palo Alto. VTA represents the valley transit authority of Santa Clara County. Finally, Muni provides train, bus, and cable car services in San Francisco. Combined, the three departments form the JPB, and they operate Caltrain in addition to the Palo Alto shuttles.

JPB gets a portion of its funding from the Transportation Fund for Clean Air (i.e., Assembly Bill (AB) 434 funds). AB 434 funds are generated from California vehicle registration fees to support air quality management programs, such as feeder shuttles. It is important to note, however, that these funds are limited. Due to an increasing number of applications by transit organizations in recent years, requirements have become more stringent. The two Palo Alto employer shuttles described above receive enough money from the BAAQMD to alleviate approximately 25 percent of total costs. JPB covers the remaining 50 percent.

There are six main reasons CarLink could provide a complementary service to traditional transit and feeder shuttles. First, many San Francisco Bay Area shuttles include only a single van, circulating from a transit station to one or more employment sites during peak commute periods. Since shuttle capacity is somewhat limited, there is a potential for unmet demand. CarLink could supplement such services and perhaps attract customers who are unwilling to take a shuttle service for a variety of reasons (e.g., flex hours, unpredictable schedules, or preference for personal vehicles).

Second, subsidized funding is highly competitive. Thus, the number of subsidized shuttle services deployed in a region each year is limited. Indeed, it is not uncommon that employers are unable to secure a shuttle service in a highly congested region, such as Silicon Valley. Furthermore, many smaller employers (the predominant model in Silicon Valley) are unable to support a shuttle service. CarLink could serve employers of almost any size (by scaling the number of vehicles contracted) without the level of local subsidy required by a traditional feeder shuttle service. It is important to note that CarLink vehicles could carry up to five passengers (carpooling is highly encouraged and facilitated by advanced CarLink II technologies).

Third, timed shuttles can only provide connectivity to individuals whose schedules are within service hours. Individuals who work late or have variable hours are typically unable to use a shuttle service. CarLink can provide a more demand-responsive alternative to individuals who may need to travel at times different than those covered by the shuttle service.

Fourth, shuttles normally operate only during peak periods; thus, individuals who vanpool, carpool, or take transit are typically restricted to the work site during the day. Even if shuttles do run during off-peak hours, the choice of destinations is restricted. In addition to providing a more demand-responsive alternative, CarLink could also provide a supplementary mobility option to individuals who carpool or take transit by offering an on-site vehicle fleet for business and personal trip making during the day. During the CarLink I field test, researchers found that the fleet increased the mobility options of participants who biked, carpooled, vanpooled, or took transit to work, allowing them to drive alone to work less frequently (5).

Fifth, feeder shuttles mainly serve only one side of a transit commute (i.e., either residential or business). In the case of employer-based shuttles, services are typically limited to a few employees during peak periods. With CarLink, the same vehicle fleet can serve all Homebased Users and Workbased Commuters.

Finally, CarLink offers a parking management solution to transit providers since shared-use vehicles can serve multiple transit customers per day with a single parking space. Hence, CarLink can give transit providers a means of attracting new customers while making more efficient use of their parking spaces.

To support this analysis, researchers also interviewed three local transit providers—AC Transit, Muni, and Golden Gate Transit—to assess whether CarLink might be a complementary alternative to their services. Although interview results are not definitive, respondents stated that when suburban feeder services (i.e., door-to-door services) do *not* exist or commuters refuse to take transit, CarLink could provide a complementary service. Furthermore, if CarLink offered transit customers (e.g., bus riders) access to a vehicle during the day at work sites, encouraging continued transit patronage, it would also be beneficial. However, if CarLink were used to replace existing transit or door-to-door shuttle services, it would be competitive. Based on these arguments, the author supports that a potential niche market for commuter-based carsharing exists, particularly in suburban locations where bus and shuttle services are unavailable.

CONCLUSION

Today, carsharing and transit shuttles are gaining popularity as modal alternatives that provide connectivity and increase transit use. This paper explored European and U.S. carsharing market developments, the CarLink I field test results, CarLink II's role in further understanding this alternative, and the potential of carsharing to fill transportation service gaps. While the CarLink I field test focused on user response and system performance, CarLink II focuses on market and economic potential, as well as the role of advanced technologies in facilitating system use/management and reducing program costs.

Carsharing has the potential to become an economically viable, demand-responsive service to complement existing transit and shuttle services. Carsharing's commercial potential is appealing since shuttle vans rely heavily on subsidies (i.e., approximately 75 percent of total costs). In conclusion, CarLink II will help to test this commuter-based carsharing model's niche potential in two main ways. First, it will evaluate user demand and satisfaction, building upon the findings of the CarLink field test. Second, researchers will assess CarLink II's economic potential based on this deployment. For such carsharing services to expand, they must be able to thrive with minimal outside support. CarLink II provides the next test bed for answering these questions.

In summary, the ultimate market for carsharing, and its derivatives and spin-offs, includes those individuals who value its economic and convenience benefits. The overall market may include many niche markets, such as: less affluent people who do not drive much but want access to a vehicle; wealthier individuals who value access to specialty vehicles; elderly people who do not want the responsibilities of owning and operating a vehicle; commuters who value inexpensive or premium parking spaces at transit locations, shopping areas, and workplaces; and many other target populations upon which one can only speculate. Will the sum of the niches be substantial? Will the air quality and congestion relief benefits be significant? Will mobility packages, such as CarLink (shared cars linked to transit), made possible by the Internet and cellular communications, enhance the attractiveness and viability of transit and carsharing? User data from CarLink and many U.S. carsharing and station car efforts in coming years will be needed to help to answer these questions.

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