A TEN YEAR RETROSPECTIVE ON THE NATIONAL STATION CAR ASSOCIATION

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1. Introduction

The National Station Car Association (NSCA) will be ten years old this fall.[1] It is time to look back and document what we have accomplished and learned. This retrospective report begins with a brief history of the Association. It documents the Association's major accomplishments, the main station car projects, and the lessons we have learned from the projects. To conclude, future markets and recommended directions for the Association are proposed. A summary of the status of all past and current projects is appended.

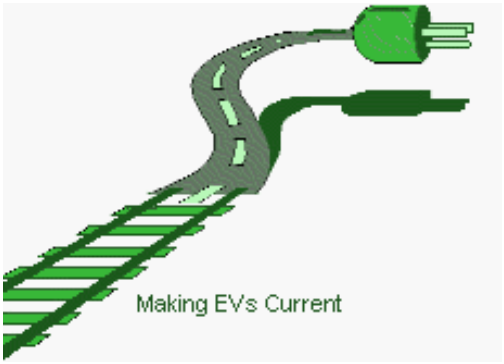

Figure 1: National Station Car Association Logo

The Association's logo (Figure 1) depicts our original concept of station cars as battery-powered electric cars (requiring "plugging in" to periodically recharge the batteries) used by commuters and others to access urban rail systems. This report shows how that concept has evolved to become much broader to include many other types of trips and users. Expanding the concept was necessary if a service provider was to develop an economically viable business. The broader name for the concept has become "shared cars."

The decade saw much change that affected the development of the station car concept. The electric utility industry was deregulated. Major automobile manufacturers began producing prototype electric cars that would be ideal for station car/shared car services, but then decided not to produce them. Much

[1] We actually began working on the station car concept, deciding what we wanted to do and be as an organization, in 1991.

of this had to do with advances in other automotive technology and the revisions (many would say "softenings") of the California Air Resources Board's Zero Emission Vehicle (ZEV) regulations. Interest from the transit industry correlated highly with budgets that were less than stable during the decade. Finally, in the last five years, neighborhood carsharing has taken hold in many cities. Yet, 301 electric station cars have been put into service, and with two-thirds still in service. A couple of dozen non-electric cars have also been used in a couple programs. The need for clean, shared cars in our cities has only grown in the last ten years.

Thus this retrospective is a documentation of how a multi-industry (electric utility, transit, and automotive) non-profit association was established and functioned during a decade of change and of how a seemingly simple task of deploying a technological (i.e., electric vehicles and charging infrastructure) and social (i.e., driving habits) change became a very interesting and difficult challenge—a challenge many of us intend to continue to pursue.

2. Early History

The station car concept of using electric cars for access and egress to mass transit stations is decades old (see Figure 2 for first known instance).[2] Almost all the efforts over the past dozen years can be traced to Aaron Weinstein, a planner at the Bay Area Rapid Transit District (BART). In 1991 he brought the concept to BART's General Manager, Frank Wilson, who immediately rejected the idea of electric cars (he shared the myth held by many that EVs were underpowered and couldn't go very far), but relented after Mr. Weinstein argued that these cars were fully city street capable and would bring additional riders to BART. The work of developing the concept was assigned to Victoria Nerenberg, a new project manager at BART, who used the term "station cars" to reflect a transit-related concept.

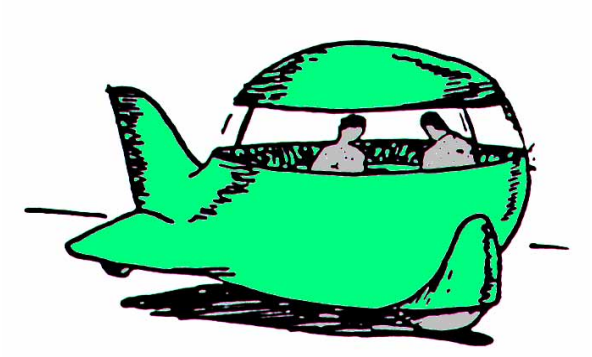

Figure 2: A 1940 version of an electric station car drawn by architect Richard Bennett for a futuristic novel by Granville Hicks.

[2] For the first five years of the Association's existence, the executive director often got phone calls from people saying they had just invented a new idea—station cars. One caller said the Association had "stolen" an idea he had patented in 1977. After a short talk with the man's lawyer, the threatened lawsuit disappeared.

A key meeting between Ms. Nerenberg and representatives from Honda America Research and Pacific Gas and Electric (PG&E) took place late in 1991. Honda's researchers were interested in mobility systems, such as station cars. The relationship between BART and PG&E was forged at that meeting and was the beginning of the pairing of transit agencies and utilities working together to develop station car projects. BART's interest—and soon the U.S. transit industry's interest—in station cars was to enhance access and egress from its rail stations. BART took the early lead for the transit industry.

Concurrently, the electric utility industry was looking for markets for battery-powered electric vehicles and knew that a highway-capable battery powered EV with a range of at least 100 miles (between rechargings) and a speed of at least 70 mph would be very expensive for years to come due to the cost of the large battery necessary to meet those performance requirements. However, the mission of a station car was a perfect match for an electric car with a range of 50 miles and a top speed of 50 mph. Such an electric car was expected to be reasonably priced if manufactured in volume and was expected to become available in the mid 1990s.

In 1992 the Electric Power Research Institute (EPRI) joined with BART to form what the following year would formally become the National Station Car Association. Members would be from the electric utility industry, the mass transit industry, and the automotive industry. EPRI funded the startup until the first members began paying dues. Annual dues were set at $5000 and have not changed.

Several relevant meetings were held in late 1992 and early 1993. The Transportation Group at EPRI had an advisory task force that met quarterly to review and monitor research projects. Task force members were from utilities with a strong interest in electric transportation. It was through this task force that the station car concept was introduced to the utility industry. The BART General Manager invited all the general managers from transit agencies that had rail systems to attend a meeting during an American Passenger Transit Association national conference. This meeting introduced the concept to the transit industry. Each interested utility, transit agency, and automobile company designated a project manager. At their first meeting, these project managers decided the Association should be non-profit and that specifications for the type of electric car we envisioned as a station car should be developed.

A Board of Directors was chosen, officers were elected,[3] and bylaws were written and approved to allow NSCA in September 1993 to become a national scientific and educational non-profit (501(c)3) corporation with the purpose of guiding the development, testing, and commercialization of the electric station car concept. The number of members varied over the years; Table 1 gives the all-time roster. The middle columns show how far members succeeded in developing programs, i.e., initial **meetings**, serious **planning**, or implemented **programs**. Reasons for these different levels of progress are discussed in Section 5: "Lessons Learned."

Table 1: All-time NSCA Member Roster and Member Efforts *(see Appendix A for additional details)*

Association Members	**Efforts Resulted In**			
Transit Agencies	**Meetings**	**Planning**	**Programs**	**Comments**
Bay Area Rapid Transit District (San Francisco area)	✔	✔	✔	Three demonstrations in cooperation with members PG&E, PIVCO, Toyota, THINK! Mobility, Honda, and others (see Section 3).
Metropolitan Atlanta Rapid Transit Authority	✔	✔	✔	After years of effort with Georgia Power, an RFP was issued in 2002 and a vendor chosen.
Northeastern Illinois Regional Transportation Authority	✔			Had no champions. See Section 5: Lessons Learned for details.
Orange County (Southern California) Transportation Authority	✔	✔	✔	A station car project is finally underway in Orange Co., after earlier efforts.
Southeastern Pennsylvania Transportation Authority (Philadelphia area)	✔			Had no champions. See Section 5: Lessons Learned.
Electric Utilities	**Meetings**	**Planning**	**Programs**	**Comments**
Commonwealth Edison (Northern Illinois)	✔			Worked with Northeastern Illinois Regional Transportation Authority. See Section 5: Lessons Learned.
Cleveland Electric Illuminating	✔			Had no champions. See Section 5: Lessons Learned.

[3] Victoria Nerenberg of BART was elected President of the Association; Robert Suggs of Florida Power and Light, Vice President; and Robert Kahn of PG&E, Secretary and Treasurer. Marty Bernard was appointed Executive Director.

Florida Power and Light (South Florida)	✔	✔		Had technology problems. See Section 5: Lessons Learned.
Georgia Power	✔	✔	✔	Has its own program that includes a university and several government agencies. Also see comments above for Metropolitan Atlanta Rapid Transit Authority.
Long Island Lighting	✔	✔	✔	After years, program finally under way with New York Power Authority.
Los Angeles Department of Water and Light	✔	✔	✔	Small program early on with Southern California Edison and others.
New Jersey Power and Light (Newark)	✔			Had no champions. See Section 5: Lessons Learned.
Pacific Gas and Electric (Northern California)	✔	✔	✔	See description of BART's first demonstration in Section 3.
PECO Energy Co. (Philadelphia)	✔			Had no champions. See Section 5: Lessons Learned.
Potomac Electric Power Co. (Washington, DC)	✔			Had no champions. See Section 5: Lessons Learned.
Sacramento Municipal Utility District	✔	✔	✔	One very small program in mid 1990s. In the planning stage for an additional major program.
Southern California Edison	✔	✔	✔	See Los Angeles Department of Water and Light above.
Car Companies	**Meetings**	**Planning**	**Programs**	**Comments**
Honda	✔	✔	✔	Provided vehicles and support for two BART demonstrations.
Personal Independent Vehicle Company, a Norwegian EV maker	✔	✔	✔	Provided electric cars to first BART demonstration.
TH!NK Mobility (Ford)	✔	✔	✔	Provided electric cars to several programs.
Toyota	✔	✔	✔	Provided electric cars to several programs.
Other	**Meetings**	**Planning**	**Programs**	**Comments**
New Jersey DOT	✔	✔	✔	See description of New Jersey's demonstration in Section 3.

By 1992, BART and Pacific Gas and Electric (PG&E) were already doing the initial planning of a station car demonstration (referred to as the "first BART demonstration" from here on since it was the first of three by BART).[4] Other transit agencies and their local utilities also began planning activities, but BART/PG&E took the lead.

One of the early activities of NSCA was to specify in detail what the characteristics of the ideal electric station car would be for projects that NSCA members were planning. Our thought was that station cars would become a viable industry and one or more manufacturers would build cars for that industry—such was our optimism. In 1994 the Association issued a Program Opportunity Notice (PON) asking electric vehicle manufacturers to respond to the vehicle specifications with their own specifications and price of the vehicle they would want to supply as station cars. At that time many small companies were planning to produce electric cars. A dozen responded, offering their versions of what they would build as station cars. During the mid-1990s, station car demonstrations bought vehicles from two that responded, both converters (U.S. Electricar[5] and Solectria), and from PIVCO (see Figure 3) that did not respond to the PON and was not asked to out of lack of knowledge of their efforts. Of those dozen companies, not one is building EVs today.

Another early activity of the Association was to develop an evaluation methodology for the demonstrations to determine if they met their goals (impact evaluation) and how they achieved what they accomplished (process evaluation).[6] Unfortunately no process evaluation has been done since the evaluation of the first BART demonstration, which used the methodology. Because how each demonstration was developed and implemented and the relationships among organizations is quite useful in planning future projects, this retrospective report attempts to do as much process evaluation of what has occurred as possible.

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[4] As transportation systems engineer, the executive director of the Association was in a position to be quite active in the planning and implementation of all stages of this demonstration and evaluation of its impacts. It was a learning experience that allowed him to assist others in planning and implementing station car projects throughout North America and elsewhere.

[5] No U.S. Electricar vehicles ever made it into station car service—see Section 5: Lessons Learned below on the Florida attempt.

[6] Collins, N.E., 1994-95 Station Car Demonstrations Evaluation Plan, National Station Car Association, Q[4] Associates (Sept. 1994).

The next two sections continue the Association's history: its goals and the effort to achieve them, and key demonstrations and field studies.

Figure 3: Victoria Nerenberg in a PIVCO CITI built in Norway which was the electric vehicle used in the first BART demonstration. Ms. Nerenberg was BART's Station Car Project Manager and President of the National Station Car Association until March 2000 when she retired from BART. A charging port and an "EV only" parking sign can be seen at the left edge of the picture.

3. NSCA Goals

The bylaws of the Association state that it is a national, not for profit, technical corporation incorporated in the State of California with the purpose of:

- guiding the development and testing of the concept of using battery powered cars for access and egress to and from mass transit stations
- eliminating local emissions associated with using conventionally fueled vehicles driven during short trips to and from stations
- making mass transit a convenient door-to-door service

Further, the bylaws state that the Association will accomplish its purpose by:

- encouraging a working relationship between local transit agencies and electric utilities
- providing technical support for the development and implementation of local demonstrations

- performing R&D of station car program concepts including the unique infrastructure required for large scale programs
- developing specifications for purchases of vehicles and related equipment
- developing data collection and testing protocols
- analyzing data generated by local demonstrations
- disseminating information among members
- educating the general public by developing and disseminating educational and media materials
- providing general technical leadership in the field of electric transportation
- raising funds to support its activities

In 1995 the Association's Board set the following specific goals for the Association:

1. Obtain a variety of practical, cost-effective, electric vehicles.
2. Prove the multiple-user concept (more than one user per car per day).
3. Show the market is sufficiently large to attract major private sector players.
4. Develop/guide development of telemetrics.
5. Develop/guide development of unique hardware.
6. Interest key players to form teams in metropolitan areas.
7. Show that the concept will be economically viable.

Goal 1: Obtain a variety of practical, cost-effective, electric vehicles

In 1995, three major automobile manufacturers seemed serious about making two-seat electric cars with a range of about 50 miles and a top speed of 50 mph. They were Ford with its TH!NK *city*,[7] Nissan with its Hypermini, and Toyota with its e.com, all shown in Figure 4.[8] Also on the horizon were some low-speed neighborhood electric vehicles which may be appropriate for some station car applications. We were confident we would have vehicles. Toyota brought its full e.com design team to the U.S. to understand the potential uses for the car. The team discussed with us what technology at what performance and price would be ideal for station cars. The resulting e.com was an excellent fit. PIVCO, which designed the TH!NK *city* shown in Figure 4, gained much experience during the first BART demonstration resulting in a vehicle far superior to the PIVCO CITIs. Nissan also entered into discussions with us, but at a less formal level that Toyota did. However, Toyota and Nissan never made more than 100 each of e.coms and Hyperminis. The NiMH batteries in the e.com and the Li-Ion batteries in the Hypermini were so expensive that cost competitiveness would never occur because there seemed to be no economy of scale for these batteries. The preproduction TH!NK *city* also had expensive batteries (NiCd), but the production car promised for 2002 was to have Advanced PbAcid batteries and be cost competitive. Ford closed its TH!NK Mobility Division before the first production vehicle was built.

Figure 4: L to R: TH!NK *city*, Nissan Hypermini, and Toyota e.com, July 2001

Despite all these setbacks, 301 electric station cars have been in service, and two-thirds remain in service.

[7] Ford purchased PIVCO (factory and rights) and renamed it TH!NK Nordic. Ford also created a new division, TH!NK Mobility (to develop and deploy electric vehicles), and a new brand "TH!NK."

[8] The California Air Resources Board (CARB) Zero Emissions Vehicle (ZEV) regulation seemed strong and manufacturers needed the credits these cars would bring. Each major manufacturer had to obtain a certain number of credits by selling or leasing ZEVs in California, or pay a penalty, or leave the California market. Credits could be traded or purchased from smaller EV manufacturers. The fairly complicated regulation changed over time; e.g., number of required credits and which vehicles qualified for how many credits.

Now, in 2003, with no station/shared car type EV manufacturers and with the CARB ZEV regulations no longer requiring battery-powered vehicles, we again find ourselves without a suitable vehicle. In retrospect, not having access to good electric vehicles was a major barrier to further developing the concept. There is hope on the horizon, however, with eMotion Mobility in Atlanta. The vehicle will be a battery-powered vehicle based on the Smart Car built in Europe with no drive train or fuel system, with e-Motion adding the electric drive train and batteries in Georgia.

Goal 2: Prove the multiple-user concept

The concept was that each station car would have more that one user per day, e.g., home-side and work-side users. To keep our early demonstrations simple, we attempted little multiple use.

A few multiple-user field tests have been deployed with some success. Multiple-use was achieved in the waning months of the first BART station car demonstration and in CarLink I and II (two of the other Northern California programs, described in Appendix A). While these experiments might be considered a success in that they proved the concept, none was meant to achieve permanence except possibly for CarLink II.[9]

Goal 3: Show the market is sufficiently large to attract major private sector players

We always thought station cars was a niche market—one of several niche markets urban EVs would fill. The combined niches would constitute sufficient vehicle demand for EV makers to produce cost-effective cars, i.e., small e-cars that would compete on life-cycle cost with small conventional cars. The niches never developed at least in part because they were never marketed. Thus it is fair to say that investors have not seen the station car niche, by itself, as sufficiently large to attract their attention, and even though there are a quarter of a million parking spaces at U.S. urban rail stations, achieving a return on investment in station cars remains illusive. How large must the station car market be? At least 75 cars and 1,100 participants in a metropolitan region in many regions is a best estimate. But regional numbers varies greatly with geography (e.g., having vehicles on both sides of San Francisco Bay prove tedious for the managers of the first BART station car demonstration) and types of services provided. And 75 cars with 1,100 participants in many regions may not be sufficient to allow production of cost-

[9] Note: the UC-Riverside project (see Appendix A) is a highly controlled engineering experiment with successful multiple use, but it is unique and not generalizable. The first success may be the Emory University project that has just started.

effective electric cars without other urban vehicle markets demanding similar EVs. See the discussion of Goal 7.

Goal 4: Develop/guide development of telemetrics

This goal resulted in a 1999 paper describing the on- and off-vehicle smart electronics necessary to operate effective station car services, including reservations, vehicle access, vehicle return, data collection from the vehicle, and queues.[10] About the same time, three organizations[11] began working on and have developed smart electronics systems having all the functions just mentioned except for the smart queues, which are unique to electric station cars. The executive director has met with the technical staff of all three organizations to discuss the development of the smart technology. Today we are about to have six different, and somewhat incompatible, systems in the U.S. and another in Canada. Five of these systems can, or are about to be able to, handle EVs that require a certain amount of downtime every day to recharge. While the Association cannot take credit for these developments, many interested people have asked about telemetrics and gone to the 1999 paper on the web site.

Goal 5: Develop/guide development of unique hardware

This goal is to develop/guide development of mainly EV docking and queuing. The executive director has discussed the need for these technologies with many parties including EPRI and the Association's members. He has also sought funds to do the initial design. The concepts were also introduced in the Denver shared car study.[12] The consensus is that the station car market is developing so slowly that this hardware will not be needed for some time.

[10] Bernard, M.J., Charging, Smart, and Queuing Infrastructure Requirements for Station Cars, 1999 North American EV & Infrastructure Conference and Exposition, Atlanta (Nov. 17-19, 1999). The paper can be found at http://www.stncar.com/naevi99.html. Queues are when station cars are parked bumper to bumper. This eliminates many aisles and other wasted space with traditional parking. 3.5 station cars can be parked in the same square footage as required for on traditionally parked car. See the referenced web page for details.

[11] UC-Riverside, City CarShare, and Zipcar.

[12] Bernard, M.J. and N.E. Collins, Denver Union Station EV Hub Feasibility Study, prepared for the Union Station Transport Development Company, Q^4 Associates (June 2001).

Goal 6: Interest key players to form teams in metropolitan areas

The executive director has encouraged the formation of teams of stakeholders; teams have been formed and implemented for the current New York suburbs project and similarly in Atlanta. The team in Sacramento has been very active. On the carsharing side,[13] the stakeholder team in Seattle has successfully launched a carsharing service and the team in Denver promoting a true combination of shared car services is in the final stages of planning and funding.

Goal 7: Show that the concept will be economically viable

Within the last few years, the realization that traditional station cars cannot become a profitable business in and of itself for a vendor has made the Association rethink this and other goals. The reason why traditional station cars, in most instances, will not be profitable is because of low vehicle utilization and thus, insufficient revenue. This has led the Association to develop methods to have the cars serve other users, such as neighborhood car sharers and business pool car users. The Association has fostered the concept of shared cars in every possible market niche, including station cars; short-term renting by visitors to a town; neighborhood carsharing by residents, local business, and institutions in the neighborhood; and business pool cars.

This expanded horizon will guide the future work of the Association. For example, two years ago the executive director coordinated the technical agenda for the First International (Canada and the U.S.) Station Car/Carsharing Conference in Atlanta (April 2001). He is working on the next conference to be held in conjunction with the Association for Commuter Transportation's conference in 2004.

4. Description of Selected Demonstrations

The First Two Demonstrations

Independently of NSCA, the State of Massachusetts launched an electric station car demonstration in the Boston area in 1994. Many of the cars were used as regular commuter vehicles, but some served as station cars at an express bus park-n-ride lot and a rail station. The demonstration lasted until 2000. Twenty-six of the vehicles were Solectria Forces, which are converted

[13] In carsharing the vehicles are scattered around neighborhoods for use by residents and local businesses. More on carsharing Section 7.

Geo Metros (i.e., a car with the conventional drive, fuel, and exhaust removed and replaced with an electric drive train). Five other cars were Honda EV Pluses.

In the meantime, BART accumulated $1.14 million in grant money for a two-year demonstration with 40 EV station cars. The grants were from federal, state, and local sources. Initially, the vehicles were to be Geo Prism conversions by the local firm U.S. Electricar, but U.S. Electricar realized BART did not have sufficient funding for 40 Prism EVs and offered to convert small pickup trucks instead. BART and the demonstration sponsors decided that small, purpose-built EVs—vehicles built to be EVs and not conversions—were much more appropriate for the demonstration program. The only small, purpose-built electric cars available were from a Norwegian firm called the Personal Independent Vehicle Company (PIVCO) and the car was a two seater called a CITI (see Figure 3). Because of the slow rate of vehicle delivery, the demonstration was extended an additional half year to April 1998.[14] Later, two more programs supported by BART tested different aspects of the concept (CarLink I and by Hertz, see Figure 5 and Appendix A for details).

Other Demonstrations

The early to mid 1990s saw a great amount of planning activity by transit agencies and utilities. Some succeeded in demonstrations or programs; some did not. A couple did not use EVs. A few demonstrations were by non-NSCA members. Appendix A also summarizes demonstrations being actively planned.

Frank Wilson, the BART General Manager (GM), moved to New Jersey just as the first BART demonstration was beginning and became the State's Commissioner of Transportation. He initiated a station car program (see Figure 6). The next BART GM during most of the demonstration, Dick White, became GM of the Washington, DC, transit agency and started a station car program there. Thus at

Figure 5: TH!NK Mobility *city* battery-powered cars at the BART Fremont Station, December 2000. Hertz was about to begin a station car service.

[14] Details of the demonstration and its evaluation can be found at http://www.stncar.com/ba.html.

least some of the lineage from the first BART demonstration can be seen. This first demonstration had a large number of visitors from around the world, including representatives from electric utilities, transit agencies, automakers, various levels of government, and environmental groups.

Figure 6: Five retrofitted Geo Metros charging at the Morristown NJ Transit commuter rail station in the NJ DOT station car demonstration called *Project: PowerCommute.* Solectria did the retrofits and calls each a "Force." Charging ports are behind the cars.

5. NSCA Accomplishments

The accomplishments of the Association may also be measured in what would ***not*** have happened had it not existed. Early on, the Association set up a web site which explains the concept, describes the Association, gives case studies, and provides a variety of other resources. It is a well-visited site. The current Table of Contents of the web site is:

1. Home page.

2. The 2002 Annual Report by the Association's Executive Director. Includes a list of all on-going station car projects with links where available.

3. Station Cars vs. Carsharing: What's the Difference? Describes the similarities and differences. Has a link to an excellent car-sharing example.

4. Extending the Concept in Denver. Describes the plan in Denver to combine and extend the station car and car-sharing concepts with small shared-use EVs in the downtown and surrounding neighborhoods with two stations and many pods and several submarkets of users.

5. Shared, Small, Battery-powered Electric Cars as a Component of Transportation System Sustainability. Think piece describing the social and technical trends toward use of these types of cars.

6. New York Station Car Program Press Release. This 100-car station car program was kicked-off in October 2001. Includes a link to more information.

7. The Station Car Concept Includes descriptions of the concept, the potential markets, and the expected impact on mass transit and land use. Answers the common question, "Why electric cars?"

8. About the National Station Car Association. Includes the Association's

plan for commercializing the concept during development Phases II and III.

9. Study Says More Parking is Required at Rail Stations--But Station Cars Would Be a Better Solution. Here are our reasons.

10. Charging, Smart, and Queuing Infrastructure Requirements for Station Cars (Revised with Comments on Carsharing Added). This is a paper prepared for the 1999 North American EV Infrastructure Conference and Exposition.

11. The San Francisco Bay Area Station Car Demonstrations. The initial demonstration officially ended at midnight March 31, 1998 after two and a half years. But the program lives on. A link is provided to the *Executive Summary* of the demonstration's evaluation. A second link is provided to a description of the multi-user field test recently completed and a third to the recent press release for a new Hertz and BART project.

12. New Jersey's *Project:PowerCommute*. This station car demonstration was kicked-off May 19, 1997.

13. Georgia Power and Emory University/Atlanta Project.

14. At the University of California – Riverside. 25 Honda EV-Pluses are being shared by about 350 subscribers from three stations. 11 GEM Neighborhood Electric Vehicles are about to be added to the system for on and off-campus use.

15. Status of U.S. Station Car Demonstrations and Pilot Programs. Where, how many cars and stations, when, funding, and comments.

16. Station Cars and the Shady Grove Metrorail Station in Montgomery County, Maryland. The plans are to build another parking garage in the massive parking lots surrounding this station. Station cars could easily eliminate the need for that expenditure, not to mention the positive environmental impacts. Many suburban rail stations fit this scenario.

17. A Station Car Solution for Las Vegas. The Las Vegas Valley has the fifth worst air pollution in the country. It ranks eighth for deaths attributed to air pollution.

18. Station Cars, CyberTran, and Colorado Skiing. Describes how to reduce the time from Denver International Airport to one hour to major ski areas and have pollution free transportation at the ski areas.

19. Schaumberg, Illinois:--A Sample Application. A scenario of how station cars might be implemented in this Chicago suburb.

20. Station Cars, Orlando, and the Miami/Orlando/Tampa High Speed Rail System. Since Orlando is not a typical city, station car use would probably be very different. Here is a scenario of how station cars might be implemented. For the time being, building high-speed rail in Florida is on hold, but it's still an interesting case study.

21. Thumbnail Photo Gallery

22. Transit Oriented Development, Parking, and Shared Electric Cars: The Whole is Greater than the Old Sum. Transit Oriented Development means using the land around transit stations for residential and commercial space instead of for parking. Station cars allow this without reducing access to the station.

23. Station Car Queuing and Land Productivity. Presents a simulation of how queues work and shows how, if parked in queues, 196 of the two-seat station cars can be parked in the same space as 29 conventionally parked cars

bringing 292 riders to the station instead of 29.

24. Station Cars and Highway Runoff--a picture worth 1,000 words.

The web site generates substantial e-mail to the executive director from around the world, which generally falls into two categories:

1. "How do I get a station car?" (Usually meaning the writer wants a small EV for themselves but once in a while meaning he or she wants to join a program.)

2. "How do I start a station car project?"

The executive director gives an appropriate answer to every inquiry and, where appropriate, refers the questioner to an EV manufacturer or an NSCA member or other appropriate source. The web pages have been copied extensively and used as tools in planning meetings.

The Association has fostered many relationships between transit agencies, electric utilities, and vehicle manufacturers through meetings, information exchange, and simple things like answering, "Who should I contact about XYZ?" It has kept its members informed as to what is happening in the electric vehicle industry, in station car projects, and, recently, carsharing projects. How many of these relationships would not have occurred if the Association had never existed is, of course, impossible to estimate. Many utility and transit agency staff have reported back to the executive director stating this was the first time a given transit agency had talked to its local utility on any topic other than billing issues and electric service quality. For example, the contact person at member Georgia Power when recently asked replied that "for certain" all the current station car/carsharing activity in Atlanta would never have occurred without the resources provided by the Association.

Over the years the Association's executive director has had meetings around the country with many transit agencies, utilities, other local agencies, and vendors to discuss shared car projects. Meetings were held in New York City, Newark, Philadelphia, Richmond, Charlotte, Miami, Cleveland, Chicago, New Orleans, Seattle, Portland (OR), Sacramento, San Francisco, Los Angeles, and San Diego. The number of phone conversations and e-mail interactions with agencies in these and other cities has been great.

In 1998 Association President Nerenberg was awarded a German Marshal Fund grant to visit and study European shared car programs and to discuss with staffs of those programs related U.S. efforts.

6. Lessons Learned

Given the station car and carsharing activity in the U.S. and Canada during the last decade, a few necessary ingredients for any shared car program to succeed have become obvious. When the reader reads the following list, he or she may think, "of course," but the ingredients were not obvious in the mid 1990s.

1. A viable *public/private partnership* with both sectors making significant contributions

2. *Champions* from both sectors

3. *Hooks* that motivate people to participate

4. The *right services* at the *right locations* resulting in high *vehicle utilization*

5. *Adequate technology*: both the vehicles and the smart electronics that perform reservations, vehicle access, data collection from the vehicle, and billing

6. *Permanence*: if the participants do not see the program as permanent, they will not, for example, sell a household car and really will not change trip habits. Demonstrations are the exception because their goals have to do with testing and learning and not commercialization.

Every carsharing and station car program that has succeeded has had all these ingredients with a few special exceptions mentioned below. By success, we mean the demonstration or program met its goals or is or is about to become a commercial success; i.e., a viable for-profit or non-profit business.

A viable public/private joint partnership with both sectors making significant contributions

The first BART station car demonstration was a partnership between BART and Green Motorworks, the operator of the demonstration.[15] The demonstration in New Jersey had/has a partnership between the state DOT and three (now reduced to one) local Transportation Management Associations (while

[15] The partnership is usually between the transit agency and the vendor, and it is often contractual relationship. But often, as in this first BART demonstration, many other organizations play a funding and/or management role. In this BART case, these included a fairly typical list of the electric utility, the local air quality board, the state energy office, and a regional advanced technology agency.

not exactly private, they operated/operate the service). The partnership for carsharing in Seattle is between the transit agency and City on the public side and the private sector vendor, Flexcar.[16] City CarShare (a non-profit) in San Francisco has many public sector partners, including the Cities of San Francisco, Berkeley, and Oakland.[17] The relationship between Georgia Power Electric Transportation staff and the Director of Alternative Transportation at Emory University is making that project work. Conversely, the first attempt in Orange County, California, by the county transit agency failed because no private sector operator was found.

There are three exceptions to this. One is where a university engineering department is involved, as in U.C. Riverside's[18] and U.C. Irvine's[19] ongoing station car programs. The second is where a highly motivated entrepreneur, as with Zipcar, started a business.[20] (Zipcar has received some help relative to parking from local governments.) Third is the carsharing program by the Center for Neighborhood Technology (CNT) in Chicago, a long-standing community organization; it received grants to operate the program.[21]

"Champions" from both sectors

A champion is someone who devotes substantial (if not full) time and energy to getting the project planned, implemented, and operated. The public sector champion must be someone with decision-making authority and with access to upper management and members of the Board of Directors. In the mid-1990s, a planner at the Regional Transportation Authority of Northeastern Illinois tried to get a station car program going at a suburban commuter rail station. He was clearly handicapped within his own organization and no private sector vendor was found. A similar situation occurred at the Southeastern Pennsylvania Transportation Authority. Interestingly, both Chicago and Philadelphia now have start-up carsharing programs, neither of which has a direct transit industry connection.

[16] See http://www.flexcar.com

[17] See http://www.citycarshare.org

[18] See http://www.cert.ucr.edu/intellishare

[19] See http://www.zevnet.org

[20] See http://www.zipcar.com

[21] See http://www.cnt.org

The first BART demonstration had three champions: Victoria Nerenberg of BART; Bill Meurer, the owner of Green Motorworks; and Bob Reese, Green Motorworks' main technician. The champions in Seattle are easily identifiable: Bill Roach of King County Metro and Neil Peterson of Flexcar.

Sometimes only one champion is needed. Examples are the two University of California projects mentioned above, the Center for Neighborhood Technology, and Robin Chase at Zipcar. But in these cases, the champion controls both the financial and operational aspects of the service.

"Hooks" that motivate people to participate

The hooks we have identified so far for station cars and carsharing (there may be more) are:

- convenience and cost
- alleviate parking problems (availability and/or cost)
- ability to use transit instead of driving all the way
- opportunity to drive an EV (either an interest in technology or air quality)
- have pool cars at places of business at reduced cost
- an amenity to a residential, commercial, or mixed development allowing for fewer on-site parking spaces and thus more productive use of space

The right services at the right locations resulting in high vehicle utilization

Calstart/WESTSTART[22] recently put five TH!NK *citys* at the Bike Station in Long Beach, California (Figure 7)—a location with existing staff at the end of a light-rail line, but unfortunately in the downtown mall where people don't particularly need to use station cars. Vehicle utilization is low as is the chance of success. There is a much better place in Long Beach to have put the EV station cars, but that would have required setting up a whole new operation, which funding did not allow.

[22] See http://www.calstart.org/aboutus/?p=aboutus

Hertz provided a station car service at the BART Colma station for a year, but a nearby Hertz location already served BART patrons and the duplication proved too costly.

Figure 7: TH!NK *citys* at the Long Beach Bike Station.

Portland (OR) CarShare has struggled financially since its beginning over four years ago. The market it has reached is mainly higher-than-average-income and highly educated participants. Portland does not have the population density of other cities where carsharing seems to be doing well (e.g., Seattle, Boston, and Montreal). The results of Portland CarSharing's recent merger into Flexcar, possibly changing the economy of scale, has not yet been reported.

Adequate technology

The vehicle and other related technology needs to be adequate for the job—not exceptional, but reliable.

The prototype PIVCO CITIs survived BART's first demonstration largely because of the extensive tender loving care of the Green Motorworks staff. A few times the demonstration was almost stopped because of problems related to vehicle performance.

In the mid-1990s, Florida Power and Light (FPL) attempted a limited EV station car demonstration in Dade County. The vehicles were to be conversions of Geo Metros by U.S. Electricar. For South Florida, air conditioning was a requirement, but U.S. Electricar was unable to successfully retrofit the vehicles with air conditioning to meet FPL's relatively modest performance standards. Attempts to solve the problem went on for over a year. The project was finally abandoned.

Carlink I encountered three technology problems. It was a demonstration of Lawrence Livermore National Laboratory employees driving the cars from an end-of-the-line BART station to the Lab during the day and other commuters who lived in the area of the station taking the cars home at night. The technology problems reduced the planned fully-automated experiment to a manual one with staff present at the station during commute times and at the Lab for refueling. The first problem was that the Honda Civic Compressed Natural Gas (CNG) fueled vehicles used required a higher pressure fueling

than the Laboratory's older CNG station could provide. Thus fueling took 20 minutes instead of a few, and the cars were never completely "full." Second, a smart key box was installed at the BART station. Participants were supposed to use a code to access the box and receive a key for a particular car. The key box never worked correctly. Third, a radio frequency vehicle tracking and data collection system was installed in the vehicles. In the far end of the Livermore Valley, where the Lab is located, the system did not work and much data were lost.

The lesson learned from Carlink I is to pretest all the technology first and, as with the Florida case, until the technology functions properly, do not start the project.

At this point, there is now considerable excellent vehicle and smart electronics technology in use by shared car operators and users.

Related to adequate technology is vehicle service parts availability. Because Solectria was located in the Boston suburbs—immediately available to service and maintain the Forces—the Boston demonstration went well. The lesson learned here is to be close to the parts supplier and company maintenance staff. The first BART demonstration suffered from vehicles being out of service for long periods while waiting on parts from Norway.

7. Identifying New Markets

Our concept of station cars has evolved over the last 12 years. We have learned that, in order to get high daily utilization of each vehicle, the vehicle needs to serve many market niches. Thus, a shared car service provider (vendor) coming into a metropolitan area must market every possible use of the cars.

To maximize the utilization of each car in a vendor's fleet, the vendor will provide a series of services as represented by the continuum of services shown in Figure 8, wherein any car could be serving a different market segment at different times during the day. For example, one weekday morning, a car could provide traditional station car service from a pod near a participant's home to a rail station.[23] Then it might be driven by an arriving com-

[23] A shared car "station" refers to a location such as an urban rail station, a university, and a high-rise mixed-use complex that has a high access and egress requirement. Many shared cars would be available at a station. An shared car system may also have (or have instead) "pods." Pods are places in neighborhoods where one to a few cars are available. The term "neighborhood" includes not only residential areas, but also the mixed-use area along a commercial street and other businesses and institutions in the neighborhood.

muter to the commuter's place of work where during the day it becomes a pool car for the business's employees. At the end of the workday it is driven back to the station and eventually to a pod at a housing complex where it serves as a neighborhood carsharing car in that evening (and weekend if a Friday). If the vendor is a rental car company, the car may periodically be used as a traditional rental car, or a traditional rental car could fill in where shared car demand is high.

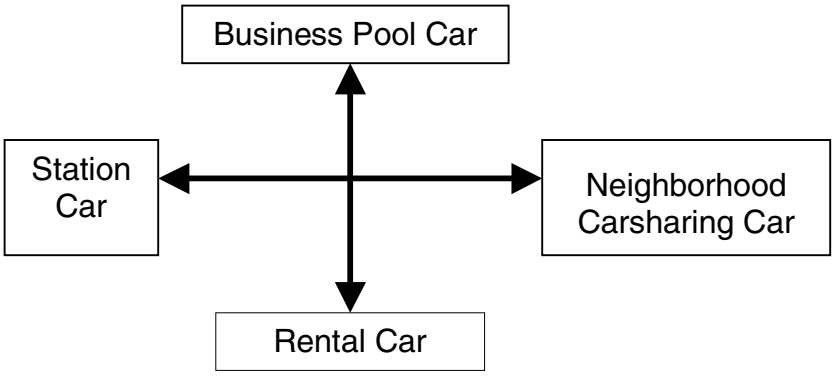

Figure 8: Multiple use of a shared car in different shared car market segments.

Not only does a vendor need high utilization of each vehicle, it needs a sufficient number of vehicles in a metropolitan area to generate enough revenue to sustain a viable business. For example, Flexcar has stated that 50 to 75 vehicles in service after a year-and-a-half of operation are sufficient to meet its business requirements.

The Washington Metropolitan Area Transportation Authority had no difficulty attracting a vendor because of the many non-transit opportunities that augment station car services for shared cars in the Washington Metropolitan Area. A vendor could easily see reaching 100 cars within a couple of years. However, a Charlotte, NC, or a Sacramento, CA, will have to convince vendors that a sufficient market exists for a viable business in a city of such moderate size and relatively low population density.

Station cars and neighborhood carsharing are taking on the characteristics of each other and are clearly being grouped into one concept—"shared cars."

With very few exceptions, shared car organizations have penetrated a narrow market. On the residential side, most participants live in denser urban areas, and have higher than average income and education. Some higher education but lower-income-by-choice participants exist (e.g., artists). Local businesses in neighborhoods with carsharing cars use the vehicles periodically. But the market for local businesses to have shared cars as their pool

cars has hardly been tapped. Such a car would be driven from and to a transit station or a neighborhood pod each day by an employee and used as a pool car during the day at the business and as a station car or carsharing car evenings and weekend.

Here is a current example. A company a couple of miles from the east end of the Portland light-rail line uses a minivan provided by Flexcar to shuttle employees between the light-rail station and the work site. An employee drives a few round trips in the morning and evening. During the day the van is at the business and may be used for business and personal trips by the employees. The company pays Flexcar for this weekday use. Evenings and weekends the van is located in the transit station parking lot for any Flexcar member in the neighborhood or visiting the area to use. Thus the van operates in three of the four market segments shown in Figure 8.

Considerable communications among the North American shared car industry participants (organizations, researchers, funders, and other interested parties) has already occurred trough conferences, professional society committees, *ad hoc* industry committees, e-mails, and a shared car listserve. Little intra-industry cooperation has occurred as a result. For at least three years, an industry-wide organization has been only discussed. Most industry participants agree that if the shared car industry is to grow and fulfill is destiny of having positive economic, environmental, and parking impacts on urban areas, it has to expand the number of market segments and types of customers it serves. How to accomplish this is a subject for future market research and industrial cooperation.

8. Final Observations and Future Directions for NSCA

Over the years, some organizations joined, left, and rejoined the Association. Some of the founding organizations maintain membership. But what makes the Association work is the person from each member organization assigned to developing station car programs and participating in the activities of the Association. All but one of these participants have changed once or more over the years. The sole constant is Dwight MacCurdy of the Sacramento Municipal Utility District (SMUD). Changes of participants have been due to reorganizations, promotions, and a few retirements. This ebb and flow of organizations and participants in and out of the Association has been healthy. It has brought new ideas and new enthusiasm. Of course, some of the participants have been key to development of the concept and the Association. The participants from Georgia Power have always been strong leaders and, for the past several years, Don Francis has been unwavering in his dedication to the concept and support of the Association. Up until PG&E's bankruptcy, their participation has been strong, even lending the Association use of their

lawyers to write the non-profit incorporation papers (bylaws and IRS requirements). Yet Kent Harris is always willing to help on an issue. The automakers, when they expected to have vehicles, were quite supportive. Without PIVCO of Norway and their plastic e-cars, the concept may have withered. Dwight MacCurdy of SMUD, while struggling to get programs set up in Sacramento, continues to present new ideas to the Association. Without the enthusiasm and efforts of Bob Suggs of Florida Power and Light, the Association may not have happened.

Larry O'Connell of EPRI and Frank Wilson of BART brought their two industries together to form the Association and no one would argue that Victoria Nerenberg of BART that kept NSCA and the concept alive during the early and middle years. (She retired from BART in early 2000.)

Interestingly, participants from organizations were often not "assigned" to station cars; they volunteered because they grasped the potential of the concept. This is what maintains the Association.

A surprising amount of change occurred during the last ten years affecting the station car concept and the Association. Deregulation of the electric utility industry did not necessarily reduce its interest in electric car applications, but reduced utility staff due to new budget constraints. This increased the duties of the remaining staff and the thought and effort put into station cars diminished, with a few exceptions, e.g., Georgia Power, SMUD, and New York Power Authority.

Transit agency budgets fluctuated considerably over the decade. A few station car advocates on transit staffs were laid off or moved to other positions when budgets tightened. Key to a successful station car project initiated by a transit agency is the interest of the General Manager.

When we started the Association, a few start-up—and most importantly, under-financed—companies designed electric cars that seemed like potential station cars, but never they made it past producing one or a few prototypes. One company, Solectria, was successful in placing a few hundred conversions on the road, some as station cars. Solectria has retrenched as an electric vehicle component manufacturer. In the mid 1990s three of the big seven automakers began building two-seat electric cars which fit the station car requirement exactly, except for price. As explained in Section 2, all three have ceased making these cars. The reduction of the CARB ZEV requirement played no small part in their decisions. As the potential availability of electric cars increased, so did interest in station cars, and vice versa.

The current lack of e-cars for use as station cars is also due to the evolution of automotive technology. Gasoline cars are becoming quite clean (air emission

wise) and fuel-efficient. The gasoline cars with large electric accumulators (called hybrids by the automobile industry) are pushing clean tailpipes and fuel efficiency to even higher levels.[24] This not only has effected the viability of electricity as a vehicle energy source, but of other alternative fuels such as alcohol and natural gas.

When the Association began, telephone, faxes, and surface mail were the means of communication. Copy Center bills were relatively high. Today, instead of mailing information to requesters, I refer them to the web site. Instead of having to get reporters doing station car stories up to speed via long phone conversations, I refer them to the web site. Instead of faxing to members, e-mail attachments are now the norm. Instead of leaving voice mail, e-mail messages do it much more efficiently. It is clear that more information is being exchanged faster because of the Internet. The cost of running the Association's office has dropped, even with paying for Internet access and web hosting.

Among the members we have fewer face-to-face meetings, though over any year we talk with each other at various meetings and conferences. We also have fewer lengthy conference calls. One reason is because we know each other better and a multi-copy e-mail thread can accomplish much of what meetings and conference calls did without having to set a side any specific period of time.

The Association's Next Directions

The Board has recently given the executive director a new workscope. It is:

1. Produce a retrospective (this document) on the activities and accomplishments of NSCA. This includes:
    - A concise history
    - What happened that wouldn't have happened if we were not there
    - Lessons learned, both positive and negative from the field tests
    - How to approach station cars in the future
2. Support the emerging shared car industry.

[24] Hybrid means the combination of two or more. Think of hybrid corn. Since the current "hybrid" cars only use one fuel, gasoline, they are not hybrids. Now if you could also plug them in overnight to recharge their batteries, they would be true hybrids.

- Work with ACT (Association for Commuter Transportation) to put together the 2nd North American Shared Car Conference, September 2004, in New Orleans.

- Study other transportation industry organizations, e.g., Electric Vehicle Association of the Americas, Association of American Railroads, American Trucking Association, National Center for Bicycling & Walking, American Passenger Transit Association, Association for Car and Truck Rental Independents and Franchisees, and Intelligent Transportation Systems of America to build a model of what a shared car industry association could look like; i.e., what data it might collect and disseminate, what services it could provide, its meetings and conferences, how it would handle proprietary information, etc.

- Offer the services of NSCA to the industry. Ask them what we could do for them. (The first offer was to facilitate "interoperability"[25] between different shared car organizations and possibly with the local transit agency.)

- Study and suggest new markets for shared car organizations.

3. Develop a simple model that shared car organizations could use to show the emissions difference between using EVs and conventional cars and hybrids (note Flexcar is beginning to use a significant number of Honda Civic hybrids).

4. Continue to maintain the Association's office and web site including monitoring all shared car programs.

Lastly the need for shared cars in urban areas has grown throughout the decade of the Association's existence. We have shown the station car concept is technologically viable and an acceptable commuter mode to at least a small market. We are quite sure on how to integrate the concept into the broader shared car concept to become viable businesses for vendors. The benefits of

[25] Interoperability means that a member of a shared car organization can reserve and use a car of another organization in another city.

shared cars are many—each benefit reducing a negative impact of individually owned cars. The work has just begun.

Appendix A: Status of All Current and Past Station Car Programs

See the list below the table for the meaning of the acronyms.
Updated 6/15/03.

Region	# of Station Cars @ # of Stations	Dates	Funding	Comments
Anaheim, California	10 RAV-4s @ 2 Metrolink (See the list below the meaning of the acronyms.)	May 1, 2000 Start	Federal, regional and local	Used by commuters during the week and visitors to Anaheim on weekends. Operated by EV Rental. Funding from the DOE Clean Cities Program, the South Coast Air Quality Management District, and the Anaheim Public Utilities. Project shut down because of the high cost of insurance but a new proposal has been written.
Atlanta	15 TH!NK *citys* @ 7	Begun December 2002	Federal DOE and local funds	Multiple-user station cars at Emory University (2 stations), and one station each at Georgia Power, Southern Company, Georgia Environmental Facilities Authority, Georgia Department of Natural Resources Environmental Protection Division, and Georgia Department of Administrative Services. Considerable smart electronics is involved.
Boston	31 @2	1994 to 2001	CMAQ and local funds	An EV technology assessment was required by state law. 26 Solectria Forces (Geo Metro conversions) and 5 Honda EV Pluses operating from one commuter rail station and one Park-N-Ride lot, user cost is $200/mo. Note, some cars operate on commutes directly between home and work.
Denver	Many EVs @ 1 (Union Station), but eventually many	Late 2003 or later	Feasibility study complete	Union Station was recently purchased by the Regional Transportation District and will become a major multi-modal center. RTD is preparing a master plan for the center and seeking funds. Station car users would be from the residential and commercial units, riders from the express buses and light rail, and visitors and tourists
University of California - Irvine	30 RAV-4 EVs and 10 Prius @ 1 Metrolink	Begun April 18, 2002	UC-I, City of Irvine, OCTA	Home and work ends of commutes. The program is called ZEV.NET. There are charging stations on campus and at other work places and the commuter railroad station.
Long Beach, California	2 TH!NK *citys* @ Long Beach Bike Station	Begun April 2002	Through Calstart	About 100 participants. The bike station is in the downtown at the light rail and pedestrian mall. Originally had 5 TH!NK *citys*. Two were stolen and wrecked and serve as spare parts.

Region	# of Station Cars @ # of Stations	Dates	Funding	Comments
Los Angeles	3 cars and S10s @ 2 Metrolink	Begun in late 1995, completed 1 year later	SCAQMD and LADWP funded the vehicles	All vehicles electric. LACMTA did day to day management, LADWP provided and maintained the cars, another partner was LADoT.
New Jersey	18 Solectria Forces @ 3 commuter RR stations (see comments)	Begun May 1997	Mainly NJ Transit	NJ Transit, N.J. DOT. EVs are Solectria converted Geo Metros. Initial demonstration ended in 2000, and was restarted in 2001 with fewer cars only at the Morristown Station.
Northern NYC Suburb	6 Solectria Forces @ North White Plains commuter RR station	Nov. 1995 to Nov. 1999	Participant fund and in-kind services	Metro North, MTA, and New York Power Authority reverse commuter car pools (average 2 persons) using Geo Metro conversions. IBM employees car pool between the Metro-North station and IBM.
NYC Suburbs	100 TH!NK *citys* @ 8 commuter RR stations	Begun Fall 2001	State and local CMAQ	Joint New York Power Authority and MTA. The cars are leased by participants from Ford dealers thus they are not multi-use. This is the first phase of a multi-phase program.
University of California - Riverside	26 EVs @ 5 on and off campus	Begun March 1999	Private sector and participants	15 Honda EV Pluses and 11 GEM Neighborhood EVs. This is an important joint research project between the University's Transpiration Systems Research Laboratory and Honda using intelligent technology to operate the system.
Sacramento	3 RAV 4 EVs @ 1 light-rail station	3 RAV 4 EVs @ 1 light-rail station	Local, Toyota lent the cars	Cars used by employees of McClellan Air Force Base. Note, planning for a much bigger permanent project underway.
San Francisco Bay Area	40 purpose-built 2 seater PIVCO CITI @ 3 BART stations	Oct. 1995 to April 1998	ARPA, state, and local funds	This initial demonstration included both home to transit and transit to work with BART, PG&E, a major bank, and other BART patrons.

Region	# of Station Cars @ # of Stations	Dates	Funding	Comments
San Francisco Bay Area	CarLink I: 12 Honda CNG cars @ 1 BART CarLink II: 15 Honda low-emission Civics @ 1 Caltrain	CarLink I: Jan. to Nov. 1999 CarLink II: June 2001 to June 2002	Private/public	Both planned as short duration UC - Davis research projects. CarLink I: Dublin/Pleasanton BART Station. CarLink II: Palo Alto California St. Caltrain Station. In these field tests the same cars were used by both home-end and work-end commuters each week day. Flexcar has taken over CarLink II and a few cars remain in the program.
San Francisco Bay Area	Up to 40 conventional cars and 7 TH!NK *citys* @ 2 BART (Fremont and Colma Stations)	Begun May 2000 at Fremont	Hertz, BART provides free parking space	Hertz is the vendor. These are multiple-use pilot programs (station cars and conventional rentals). The Fremont program has wound down to one EV station car user but many conventional renters of conventional cars. The Colma station car program lasted approximately one year (2002) since a nearby Hertz facility was handling most of the BART business.
Silver Spring, Maryland	Several EVs @ 1 Metro	Still under development	Proposal to DOE Clean Cities Program, local funds	Early planning stages, WAMTA has pledged support. Would be a multiple-use pilot program. Major redevelopment is underway around the Metro station.
Vancouver, BC	Up to 50 @ 3	To begin late 2003	Local and Federal	Funding expected this fall will allow only a start-up at one station. Stations are express bus, commuter rail, and SkyTrain. These are multiple-use pilot programs.
Vandenberg AFB, CA	Up to 30 @ 1	Begun May 2002	Federal	14 electric TH!NK *citys*, 10 Ford Ranger electric pick-up trucks, 4 natural gas Crown Victoria sedans, 2 natural gas Econoline vans. Approximately 15 departments, 250 people are using these vehicles for base and off-base use. The vehicles and system have considerable smart electronics.
Washington, DC	Varies @ Many	Begun 2002	WAMTA	WAMTA issued an RFP and Flexcar won the contract with the goal of placing 200 station cars in the next two years. Flexcar has placed 30 cars, 10 are hybrids. The cars are placed in or near WAMTA rail stations in and outside the District. The cars are used as station cars or neighborhood car-sharing cars. Zipcar has also entered the DC area market and has cars in neighborhoods and at or near WAMTA rail stations, some the same ones as Flexcar.

ARPA = Federal defense funds
BART = San Francisco Bay Area Rapid Transit District
CMAQ = Federal Congestion Mitigation and Air Quality funds
DOE = U.S. Department of Energy FTA = U.S. Federal Transit Administration
LACMTA = Los Angeles County Metropolitan Transit Authority
LADWP = Los Angeles Department of Water and Power
MARTA = Metropolitan Atlanta Rapid Transit Authority
Metrolink = the commuter rail system serving the Los Angeles metro area
Metro North = the commuter rail lines north of New York City
MTA = NY Metropolitan Transportation Authority
NSCA = National Station Car Association
OCAT + Orange County Transportation Authority
PIVCO = Norwegian EV maker
PG&E = Pacific Gas and Electric
RFP = Request for Proposals
TransLink = Greater Vancouver Transportation Authority
WMATA = Washington Metropolitan Area Transit Authority