

EV CARSHARING/RENTAL PILOT PROJECT IN KYOTO: AN OUTLINE OF THE PROJECT

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Abstract

An EV carsharing demonstrate project is being staged in the City of Kyoto, an ancient capital and a major tourist attraction of Japan. The project will initially involve about 35 two-seater EV's, which will be shared primarily by workers and visitors for business-related trips on weekdays, and by tourists on weekends. Carsharing will be in principle short-term for a single trip or a few successive trips. An EV can be checked out and returned to any of the service depots which will be placed at railroad stations, major business centers and tourist attractions for user convenience. Advanced systems will be developed for reservation, vehicle check-out and return, and fleet operation and management. Information and reservation service will be accessible through the Internet and mobile phones.

Introduction

As is the case in many industrialized countries, there are increasing levels of concern in Japan with the environment, in particular, with pollutant and greenhouse gas emissions by the automobile. There are also concerns with materials and fossil fuels consumed by the production and use of automobiles. As the environment, energy, and natural resources are expected to become even more binding constraints in the next century, it is crucially important that both production and use of conventional automobiles be significantly reduced while assuring adequate levels of mobility for people. Converting the existing vehicle fleet to electric vehicles (EV's), which produce no tailpipe emissions, is viewed as one of potential solutions. Adding to this, it is possible to substantially reduce the materials consumed and greenhouse gases emitted during vehicle production by having the same EV's shared by a group of people.

A pilot project of EV-sharing is being staged in the City of Kyoto. Kyoto is an ancient capital of Japan with a population of about 1.4 million. It is a major tourist attraction in

Japan with 17 historical buildings on the World Heritage list, numerous ancient temples, shrines and monuments scattered across it, and with 39 million tourists visiting them annually. In terms of land use development, it is a compact city whose residential and commercial area is approximately 77 km², lying in a valley defined by mountains on three sides. Land use is dense and mixed, with a larger than typical number of residents in the central city. It has a relatively well developed rail networks and dense bus routes. Road networks are less well developed with a limited number of arterials, and with streets that are mostly narrow and not quite suitable for automotive traffic. The city is overwhelmed by automobiles during peak tourism seasons; streets are clogged for many hours and bus service becomes dysfunctional.

Kyoto was selected by the Japan Electric Vehicle Association (JEVA) as the pilot project site for several reasons. Firstly, the City of Kyoto hosted so-called COP-3 in 1998 and has been staging programs for sustainable development with collaborations among citizens, corporations and governments. Secondly, it was expected that the project would gain a strong visibility in Kyoto because of its status as an internationally renowned tourist destination. Thirdly, the narrow streets and dense and mixed land use development in Kyoto make compact EV's quite a suitable means of travel.

The project has officially started in the spring of 2000, with services to general public to commence late in the fall. The project will involve about 35 "smart" two-seater EV's equipped with an in-vehicle navigator and supported by advanced reservation, check-out and return, and fleet management systems. The project will initially involve about 10 service depots and a total of 56 recharging units.

The objectives of the project are four-fold. The first is to examine the feasibility of the EV carsharing/rental system with its smart EV's, advanced fleet management system, and rental transaction administration system. The second objective is to test whether the service can be extended to the general driver population with a variety of travel needs and different levels of familiarity with and knowledge of EV's. The third objective is to determine whether carsharing is socially acceptable and the proposed system is a workable concept in Japan. The fourth objective is to evaluate the economical viability of the proposed car sharing system as a commercial undertaking.

Features of the Project

There have been several EV carsharing demonstration projects in Japan. Carsharing by a group of residents in a residential development can be found in a demonstration project in a bedroom community of Inagi, Tokyo. Projects in Yokohama and Osaka have targeted work-related travel and catered to travel needs of central city workers and visitors. Planned in Ebina, Kanagawa, is a carsharing park-and-ride (P&R) experiment in which EV's will be used by residents for P&R commuting in the morning and evening, and by government agencies and other organizations for business-related trips during the day. All these projects employ smart EV's jointly with ITS technologies and advanced fleet administration systems. Another commonality in these projects is that they each involve a relatively small number of group users, and that an EV is shared only by a few users on any given day.

The service offered in the Kyoto project is a mixture of car rental and carsharing. The system will cater to residents of Kyoto and its visitors during weekdays, taking on a form of carsharing using primarily railway stations and as its bases. EV depots will be built at major destinations in the city such as universities, research complexes, and collaborating company headquarters.

Tourists visiting Kyoto will be the primary users of the system on weekends and holidays. EV's will be rented for short periods for users to travel between service depots, some of which will be located at prime tourist attractions. Attempts will be made to locate charging units at prime parking locations. To make the system easily accessible for general tourists and visitors, a prospective user with a valid driver's license and a credit card will be able to register on site, and an IC card, which functions as the key to an EV, will be issued to the user once he qualifies. A vehicle will be rented after confirming that the person is not intoxicated.

By having these two types of users, it is anticipated that the EV fleet can be fully utilized throughout the week, and will be shared by a large number of users. These would be the most important features of the pilot project which distinguish it from the preceding projects. Because the project caters to general drivers who may have no knowledge of EV's, efforts will be made to promote "EV literacy" through a project homepage, mass media, government publications, and other means. Safety information will be provided to each first-time user at the EV depot using the monitor on the recharging unit. Possibilities of implementing advanced driving assistance is being sought.

Using the GPS unit mounted on the EV, the location and status of each EV will be continuously monitored for effective fleet management. Prospective users will be able to check the availability of an EV at the desired EV depot, and make reservations through the Internet, mobile phones, and other telecommunications media. An EV can be returned to any depot which the user specifies when making the reservation.

Once in vehicle, the user will be able to utilize a built-in advanced traveler information system (ATIS) unit for route guidance and other information. Warnings will be issued to the user when the battery gets low or the vehicle starts moving out of the service area. Since the EV's will be rented for relatively short periods, a price schedule will be developed accordingly (e.g., per-minute rental charge) and the amount of hypothetical charge for EV rental will be shown to the user for evaluation purposes. (To be able to charge the user, the pilot project must obtain a license for rental car operation from the government, which may not be possible given the nature of the service to be rendered. Consequently it is likely that the EV's must be rented without actually charging for them, at least initially.) The features of the proposed carsharing system, which shall be called the "Public Car System," are summarized in the table below.

Table 1
Features of the Public Car System

Chasharing on weekdays, trip-based car rental on weekends
Use of micro two-seater EV's
Fleet management using ITS technologies
Check-out and return at any station
Short-term lease
Full use of information and telecommunications technologies
Partnership with other service providers (e.g., rental cycle businesses)

There have been two approaches to fleet operation and management adopted in the demonstration projects mentioned above. One is to exchange information on reservation, vehicle check-out and return, users, and fleet management through two-way communications

between the vehicle and the operation center. The other is to rely on dedicated communications links from the operation center to the terminal and the charger at a depot, and the charger to the vehicle, for most information, and adopt the communications functions of the in-vehicle navigation unit only for vehicle location and other real-time information.

New technical features to be introduced in the Kyoto project will include:

- Internet-based user registration and reservation systems
- Real-time information service via the Internet
- Use of mobile phones to communicate with the system
- Enhanced capabilities of depot terminals for:
 - processing driver's license information and user identification,
 - issuance of vehicle use details, and
 - provision of educational information on EV driving safety

Project Tasks and Schedules

The pilot project is scheduled for three years from fiscal year 2000 to 2003, in which period the social acceptance and financial feasibility of the Public Car concept will be evaluated. Scheduled tasks during the first three years are as shown in Table 2. In short, the system will start out with a minimal configuration in fiscal year 2000, then will be expanded in 2001.

Table 2
Project Task Schedules

<i>Fiscal Year 2000</i>	
Develop an initial Public Car System	
Establish a system with a small number of EV's and stations	
Establish an administrative/operation body	
Introduction of information and telecommunications technologies	
Solicit partners	
Design and execution of evaluation studies	
Identification of problems and establish objectives for fiscal year 2001	
<i>Fiscal Year 2001</i>	
Expand the initial system	
Expand the system with more EV's, stations and extend the service area	
Expand the administrative/operation body	
Enhance the information and telecommunications technologies	
Expand the partnership and introduce partnership management schemes	
Design and execution of evaluation studies	
Identification of problems and establish objectives for fiscal year 2002	
<i>Fiscal Year 2002</i>	
Modify the system for commercial operation	
Solicit partners for commercial operation	
Complete the evaluation study	
Develop recommendations for commercialization	

It is intended that the Public Car System will commence its commercial operation in fiscal year 2003. The know-how of EV carsharing accumulated through the pilot project is anticipated to be of value for those who wish to develop similar systems. This body of knowledge will be disseminated through consulting services by the System.

Partners will be actively sought for the development and operation of the Public Car System.

For example, the system may be linked to a rental cycle operation offering users options of using an EV or a bicycle. Associations of stores and businesses may offer space and labor for recharging depots in exchange for added visibility the introduction of EV's into their business territories will bring to them. Environmental groups may aid by staging publicity campaigns for the project as well as by operating charging stations and using EV's for their business trips. Evaluation studies will be carried out throughout the project period.

Evaluation Studies

For the evaluation of the system, surveys will be designed and data will be collected as part of the pilot project with respect to:

System operation

- utilization of the EV fleet,
- user waiting time,
- recharging frequency and durations,
- system function (vehicles, fleet management system, rental administration system, telecommunications functions),
- incidents

User satisfaction

Local residents' perceptions of and attitudes towards the system

The evaluation studies will involve user surveys through which data will be gained on: user profiles, use patterns, satisfaction levels, suggestions for improvements, attitudes toward environment, etc. Of particular interest is to determine how much the user will be willing to pay for the use of Public Cars. Appropriate survey methods will be used to determine willingness-to-pay prices.

Conclusion

The Kyoto EV carsharing project features advanced systems for EV reservation, check-out and return, and fleet operation and management. It will take advantage of the Internet and advanced mobile phones with Internet capabilities, whose user population is rapidly expanding in Japan. Involving a large number of users is probably the most unique feature of this carsharing project; in fact the system will operate as a mixture of carsharing and car rental. The project is anticipated to show whether the Public Car System is an economically viable option for the 21st century.