Car sharing and EVs

Mitsuaki Ota *

1. Introduction

The number of car sharing services has been increasing in recent years. While the majority of cars offered by such services are currently gasoline or hybrid vehicles, electric vehicles (EVs) are also slowly being introduced. The weaknesses of EVs, such as shorter range and long recharging times are less of a problem for car sharing because the vehicles can be recharged while not in use. Car sharing also makes the EVs more accessible to users by removing the high cost of purchase. Furthermore, expected uses for EVs when they are not being driven include use as storage batteries for energy management and as part of business continuity plans (BCP[1]) during disasters.

2. What is car sharing?

Car sharing refers to a service in which multiple cars are shared among the members registered with the service. They are similar to car rental services in that the cars are lent out, but the fees and procedures required differ. (Table 1)

Table 1 Comparison between car sharing and car rental

		Car sharing	Car rental
Fees	Basic monthly fee	Yes (sometimes none)	None
	Fee unit	By minute	By hour
	Distance fee	Yes (after 6 hours)	None
	Gasoline fee	None	Yes *Return w/ full tank
	Insurance	Included	Optional
Procedures	Member registration	Yes	None
	Counter application	None	Yes
	Lending hours	24h	Business hours only
	Cancel fee	Free until reservation start	Incurred days in advance
	Drop-off service	No	Yes

Source: Data compiled from various websites

With regard to fees, car sharing services allow cars to be borrowed in units of 15 minutes, and the fees include the cost of gasoline, insurance, and other costs. In comparison, car rental services lend the cards for longer periods, such as six hours, and the cost of gasoline, insurance, and other expenses is charged separately. Accordingly, car sharing services are less expensive for shorter periods of time, or for short distances over longer periods of time, while care rentals tend to be cheaper for longer periods of time or longer distances. But considering that the costs of gasoline and insurance are not incurred, car sharing may also be cheaper for longer distances as well. With regard to the paperwork required, the lending procedure for car sharing services may be completed online once you have registered as a member. Cars can be borrowed for up to 24 hours, and there are no cancellation fees until the start of the reservation period. Car rental services do not require membership registration, but instead require paperwork to be filled out at the shop. The cars must be returned during business hours, and cancellation fees are incurred for cancellations days before the reservation period. However, whereas car share services require the cars to be returned where they were borrowed, car rental services offer drop off services where the car can be returned to a different branch of the service.

* Senior Researcher, Electric Power Group, Electric Power Industry Unit, IEEJ

[1] Companies and organizations typically prepare business continuity plans (BCP) for emergency situations such as disasters.

To review the above points, car sharing services have the advantage in terms of short rental periods, short distances, and ease of rental procedures, while car rental services have the advantage in terms of long rental periods and use over different routes coming and going.

3. Domestic Car Sharing Market Trends

According to the Foundation for Promoting Personal Mobility and Ecological Transportation (the Eco-Mo Foundation), car sharing services in Japan had reached a level of approximately 2.636 million members and 52,000 vehicles as of March 2022. In comparison, car rental services, with their longer history, included approximately 490,000 vehicles (passenger cars[2]) as of March 2022, representing a larger market. Meanwhile, in terms of market growth, car sharing services grew significantly by approximately 36 times in terms of members and 13.2 times in terms of vehicles between 2011 and 2022, whereas the number of vehicles for car rental services grew slowly by approximately 2.3 times between 2009 and 2022. One of the possible reasons behind the rapid growth in car sharing services is the global emergence of the sharing economy from the 2010s, under which individuals and companies began lending their unused assets via the Internet for exchange or use by other individuals, which also garnered attention in the automobile industry.

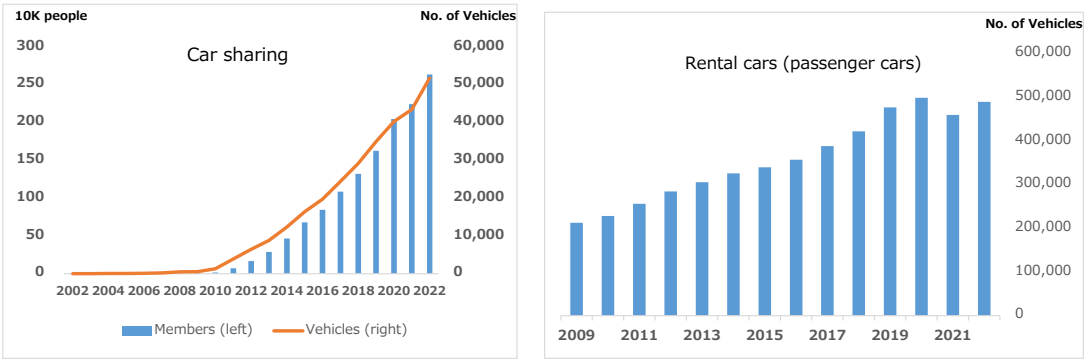

Figure 1: (Left) Changes in car sharing members and vehicles in Japan.
(Right) Changes in car rental vehicles in Japan.

Sources: (Left) Prepared based on Changes in Car Sharing Vehicles and Members in Japan, the Foundation for Promoting Personal Mobility and Ecological Transportation. (Right) Prepared based on Changes in Rental Vehicles per Type, the All Japan Rent-A-Car Association.

The car sharing market is predicted to continue to expand, with a 2020 survey by Fuji Keizai forecasting an increase in vehicles to 320,000 by 2030. Furthermore, while roughly 70% of users in the current market are private individuals, car sharing operators are aggressively pushing corporate sales, and corporate customers are expected to exceed 40% by 2030. There is also high demand for car sharing as a mobility solution for daily living, such as shopping or commuting to work or school, and many car sharing stations are installed near major train stations and parking areas near populated residential areas. Convenience stores are also attracting attention as possible car sharing stations due to the number of people that gather there.

To find out which specific consumers are utilizing car sharing services, we will examine a member survey[3] conducted by Careco Car Sharing, one of the leading car sharing services, in 2017. The survey asked the 5,959 members at the time for information on their (1) gender and age, (2) living situation, (3) family structure, and (4) household income. The results showed that in terms of (1) gender and age, men in their 30s comprised 27.0%, men in their 40s comprised 21.8%, men in their 20s comprised 15.9% and men in their 60s comprised 9.6%, while women in their 30s comprised 8.0%, women in their 40s comprised 7.2%, and women in their 20s comprised 3.8%, showing that many men in their 20s through 40s used

[2] While car rental services also cover categories other than passenger cars, such as trucks and microbuses, car sharing services primarily lend passenger cars, so that is what we will focus on here.
[3] Notification of Member Survey Results 2016, Careco
https://www.careco.jp/wp/wp-content/themes/careco/images/page/news170612.pdf

the service. The breakdown of (2) living situation was 46.7% living in rented apartments, 35.6 living in owned apartments, 13.0% living in owned detached houses, and 3.0% living in rented detached houses, showing that many apartment dwellers used the service. The breakdown for (3) family structure was 41.9% with cohabitant children, 24.9% single, 21.4% couples only, and 8.1% living with parents, showing high usage among families with children in addition to singles and couples. The breakdown of (4) household income was 24.9% between 5 and 7.5 million yen, 21.8% between 7.5 and 10 million yen, 20.4% under 5 million yen, 16.9% between 10 and 15 million Yen, and 8.4% over 15 million yen, also showing usage by high income households over 10 million yen. Next, we will look at the number of vehicles[4] per prefecture for the top five car sharing services (Times Car, Careco, Orix CarShare, Cariteco, and Honda EveryGo) to see where the cars are being used. The breakdown by prefecture of car share vehicles as of December 2022 was 40.7% in Tokyo, 12.4% in Osaka, 11.5% in Kanagawa, 4.7% in Hyogo, 4.6% in Saitama, 4.4% in Chiba, and 4.2% in Aichi, showing that the majority are being used in major metropolitan areas.

4. Domestic Car Sharing Operator Trends

Next we will compare the trends of car sharing operators. The top domestic positions in terms of vehicles and members are occupied by operators that launched their services in the 2000s (Table 2). The top three companies that began in the 2000s, namely Times Mobility, ORIX Auto Corporation, and Mitsubishi Fudosan Realty, comprise 94% of all members and 87% of all vehicles. While some of these operators offer EVs, the vast majority are existing gasoline and hybrid cars. For example, Times Mobility, occupying the top place in terms of vehicles, had only adopted 99 EVs as of October 2021[5], suggesting it is cautious about investing in EVs before they are fully adopted.

Beginning in the late 2010s, the number of car sharing services operated by automobile manufacturers began to rise, such as E-Share Mobi by Nissan Car Rental Solutions (launched 2018) and Toyota Share by the Toyota Motor Corporation (launched 2019). These operators differ significantly from existing car share operators in that they offer their own vehicle models (including EVs.)

The Toyota Motor Corporation had already been operating a sharing service called Ha:mo RIDE using their own ultra-mini-EV COMS vehicles. This service was tested beginning in 2012, and launched in 2016. Car sharing stations were installed at locations throughout Toyota City, including train stations, event facilities, and convenience stores, to cover the last mile of commuter travel in support of public transportation services. The service was ended at the end of 2021 and is currently offered as part of Toyota Share. Launched in 2019, Toyota Share offers gasoline and hybrid vehicles for use throughout Japan, but recently, EVs have also been added to the lineup, such as the mass produced bZ4X and the ultra-mini C+pod EV for two. Furthermore, an ongoing one year proving test using the C+pod was launched in Toyota City in February 2023, and expectations are for a service that will cover the last mile of transportation needs like the Ha:mo RIDE.

E-Share Mobi, launched by Nissan Car Rental Solutions in 2018, offers only the EVs from the Nissan lineup, such as the Nissan Leaf and the Note e-power. Initially launched only within Kanagawa and Tokyo prefectures, the service uses a pricing scheme similar to their competitors, and garnered attention as an easy way to experience driving EVs. It has currently expanded coverage throughout Japan. It was announced in November 2021 that the service would be added to d Car Share®, a service provided by NTT Docomo that combines access to multiple car sharing and car rental services. This addition makes it possible to search for e-Share Mobi stations using d Car Share, which is expected to lead to a further increase in members.

[4] 360° Car Sharing Comparison, Car Sharing Market Trends Q4 2022: Top 5 Services, https://www.carsharing360.com/market/quarter/

[5] "Times Parking and Car Sharing Business, Slow EV Adoption - Popularity a Bottleneck", Bloomberg https://www.bloomberg.co.jp/news/articles/2022-03-15/R8I410DWX2PS01

Table 1 Overview of leading car sharing operators (as of March 2022)

No.	Operator	Service name	Launched	Region	Vehicles	Members (10K people)
1	Times Mobility Co., Ltd.	Times Car	2005/2	National	**36,855**	**181.3**
2	ORIX Auto Corporation	ORIX CarShare	2002/4	29 prefectures	**2,591**	**34.6**
3	Mitsui Fudosan Realty Co., Ltd.	Careco Car Sharing	2009/1	15 prefectures	**5,735**	**32.2**
4	Toyota Motor Corporation	**Toyota Share**	2019/11	42 prefectures	713	4.7
5	Meitetsu Kyosho Co., Ltd.	Meitetsu Kyosho Car Share Cariteco	2009/11	7 prefectures	492	3.9
6	Nissan Car Rental Solutions Co., Ltd.	**E-Share Mobi**	2018/4	National	270	2.5
7	Earthcar Co., Ltd.	Earthcar	2011/3	National	192	2.2
8	Nishio Rent All Co., Ltd.	Mobi-system	2008/10	National	4,200	0.9
9	Nippon Car Service Development Co., Ltd.	Ecoloca	2008/7	Tokyo, Osaka, etc.	400	0.6
10	Adachi Industry Corporation	Car Share TOP24	2012/9	Nagasaki	13	0.2

Source: Compiled from the National List of Car Sharing Case Studies, Foundation for Promoting Personal Mobility and Ecological Transportation.

5. Entrance into the Car Sharing Market by Energy Companies

Following after automakers, energy related companies, such as oil and electric companies, have been entering the car sharing market in recent years, and these entrants are notable for offering EVs. And while many of these only operate in specific areas, a difference in services compared to existing car sharing operators is emerging.

There are two notable characteristics of the services offered by oil companies (Table 3). The first is a focus on small sized EVs. Idemitsu Kosan is manufacturing ultra-mini low-spec EVs and carrying out proving tests in areas where public transportation infrastructure is weak, such as the mountainous areas that auto makers have not yet developed. The proving tests, carried out in Takayama City, Gifu Prefecture, and Tateyama City, Chiba Prefecture, have demonstrated a demand for the mini-EV among the elderly and individuals with limited driving experience, and among companies requiring easy-to-operate highly maneuverable vehicles for sales activities. Based on the tests, the company announced in April 2021 the establishment of a new company called Idemitsu Tajima EV to develop next generation mobility services, such as ultra-mini EVs, in collaboration with Tajima Motor. The announcement mentioned the establishment of service stations by the company in 2022 to sell mini EVs and for use by their sharing service. ENEOS has also launched a mini-EV sharing service in urban centers such as Omiya Station, Saitama-Shintoshin Station, and Shin Yokohama Station. Rather than developing their own EVs, they have become the first in the country to adopt the FOMM ONE, the world's smallest class of EV developed by R&D-oriented mini-EV manufacturer FOMM, for the purpose of car sharing. Their operations in Saitama City include not only mini EVs, but also the sharing of electric bicycles and scooters.

The second notable characteristic of these market entries is the use of existing service stations. Beginning in April 2021, the Cosmo Oil has been operating an EV car sharing and quick charger service at their service stations in Shinjuku City. The company has also entered into a joint agreement with e-Mobility Power, a joint venture established in June 2020 by TEPCO and Chubu Electric Power, to use the quick chargers provided by e-Mobility Power. Meanwhile, the electricity for the service is provided from the CO_2 free source of wind power by their subsidiary Cosmo Eco Power. In May 2021, ENEOS announced the creation of new services, including car sharing, and expansion of their EV charging network in collaboration with NEC, using their approximately 13,000 service stations throughout Japan, and in June 2022, they concluded a contract with NEC to acquire the EV charging network they operate. One possible reason for this entry into the car sharing market by oil companies is the decline in the number of service stations nationwide. According to the Agency for Natural Resources and Energy, the number of service stations declined from a peak of 60,421 in 1994 to 28,475 in 2021. Therefore, they are likely to enter the EV sharing business and related businesses as new business strategy or growth strategy for their service station networks.

Table 1 Entry into the car sharing market by oil companies

No.	Company	Launched	Region	Services	Customers
1	Idemitsu Kosan	2019/8 -2022/3	Takayama, Gifu Prefecture	• **Mini EV sharing**	• General public • Companies
		2020/4	Tateyama, Chiba Prefecture		
		2021/4	Ichihara, Chiba		
2	ENEOS	2021/3	Omiya Station, Saitama Saitama-Shintoshin, Saitama	• **Mini EV sharing** • Electric bicycle and scooter sharing	• General public
		2021/5	National	Services focused on service stations: • Expansion of EV charging network • Creation of new services through EV charging networks	• Companies • General public
		2021/12	Kohoku Ward, Yokohama, Kanagawa Prefecture	• **Mini EV Sharing**	• General public
3	Cosmo Oil	2021/4	Shinjuku, Tokyo	• EV sharing at service stations • Charging service with quick chargers at service stations	• General public

Source: Prepared based on press releases from each company

Meanwhile, the notable characteristics of services launched by electric companies differ depending on whether their target users of either corporations and organizations (including local governments) or the general public. One characteristic of corporate oriented services is that rather than providing a single EV car sharing service, they combine it with a variety of other services according to the customer's needs. Specifically, there are three such services commonly provided (Table 4)

The first of those is energy management. Four separate companies (Rexev, Kansai Electric Power, Shikoku Electric Power, and Chugoku Electric Power) are providing services to promote efficient energy use. In addition to EV car sharing, they also provide services for charge controlling to avoid peak electrical demand periods at EV adopting facilities, to make effective use of excess solar power to charge EVs, to control electricity demand using excess EV battery charge, and BCP measures to provide electricity during power outages.

The second service is the leasing of EVs and charger/discharger. Kansai Electric Power provides a leasing service for EVs and charger/discharger, as well as an EV charge/discharge control system, for use as a BCP measure during power outages and for energy management at business locations. Shikoku Electric Power also provides a service that offers CO_2 free electricity equivalent to the charged EV amount at customer request, in addition to their EV lease service.

The third service is the provision of regular and quick chargers as a sharing service. From November 2021 through January 2022, TEPCO carried out a rapid charger sharing service proving test for corporate customers in Numazu City. This proving test provided 100% carbon free electricity from renewable sources and utilized dynamic pricing, where the electricity prices are relatively low during time periods of low wholesale electricity price and periods when there were fewer users, such as nighttime and weekends. Meanwhile, Kansai Electric Power conducted a proving test of a regular and quick charger sharing service for their partner companies located in Osaka from February through late March 2023.

There are also companies providing local production and consumption services of renewable energy and support services for EV adoption. Rexev, a company established in 2019 to focus on e-mobility, launched an EV sharing service in Odawara City and Hakone Town that maximizes the use of locally generated renewable power in cooperation with the Odawara City government and local power producer and supplier Shonan Power. Chugoku Electric Power is offering a service that provides such services as company car reservation, visualization of creation and management of daily driving reports, optimized vehicle management, and data analysis of vehicle utilization to propose the ideal number of vehicles to operate.

Table 2 Entry into the car sharing market by power companies (for companies)

No.	Company	Launched	Region	Services	Customers
1	REXEV	2020/6	Odawara, Kanagawa Prefecture Hakone, Kanagawa Prefecture	• EV Sharing • (1) Energy management • Local production and consumption of renewable energy	• Companies • Local governments • General public
2	Kansai Electric Power	2020/7	Kansai	• EV Sharing • (1) Energy management • (2) Leasing of EVs, and charger/discharger, etc.	• Companies
		2022/2	Osaka	• (3) Sharing of quick and regular chargers	• Companies
3	Shikoku Electric Power	2020/10	Shikoku	• EV Sharing • (1) Energy management • (2) Leasing of EVs and chargers	• Companies • Local governments
		2022/9	Shikoku	• (3) Sharing of regular chargers	• Companies • Local governments • General public (apartments)
5	REXEV Sumitomo Corporation Nippon Gas	2021/3-2022/2	Kagoshima, Kagoshima Prefecture	• EV Sharing • (1) Energy management	• Companies
7	Chugoku Electric Power	2021/8	National	• EV Sharing • (1) Energy management • EV adoption support	• Companies • Local governments • General public (apartments)
8	TEPCO	2020/10	Numazu, Shizuoka Prefecture	• EV Sharing	• Companies
		2021/1	Numazu, Shizuoka Prefecture	• (3) Sharing of quick chargers	• Companies

Source: Prepared based on press releases from each company

Notable services for the general public are services geared towards apartment dwellers, in addition to the aforementioned local production and consumption of renewable energy and EV adoption support. Compared to detached homeowners, the cost of vehicle ownership is higher for apartment dwellers due to the additional parking costs, suggesting a stronger need to use EV car sharing. The weev service offered by Kyushu Electric Power, originally launched only in Kyushu and Tokyo, has begun extending their service throughout Japan through a joint business contract in May 2022 with Seibii, a company offering on-site auto maintenance and repair services. This service is particularly notable for offering foreign vehicles such as the Tesla Model 3 and the Hyundai Ioniq 5. Meanwhile, Shikoku Electric Power was the first to introduce regular charger sharing in the Shikoku area given the delay in introducing charging infrastructure to housing complexes.

Table 3 Entry into the car sharing market by power companies (for the general public)

No.	Company	Launched	Region	Services	Customers
1	REXEV	2020/6	Odawara, Kanagawa Prefecture Hakone, Kanagawa Prefecture	• EV Sharing • Local production and consumption of renewable energy	• General public • Companies • Municipalities
2	Kyushu Electric Power	2020/12	National	• EV Sharing	• General public (apartments)
3	Chugoku Electric Power	2021/8	National	• EV Sharing • EV adoption support	• General public (apartments) • Companies • Municipalities
4	Shikoku Electric Power	2022/9	Shikoku	• Sharing of regular chargers	• General public (apartments) • Companies • Municipalities

Source: Prepared based on press releases from each company

6. Challenges to EV popularity and EV sharing

Numerous challenges have been raised in the past regarding the popularity of EVs. Here we will list four of those. The first is that EVs are typically higher priced than traditional gasoline or hybrid vehicles. While gasoline driven compact cars start at around 1.5 million yen, and hybrids start at 2 million yen, EVs start at 2.4 million yen for mini car models, and around 3.7 million

yen for full sized passenger cars. The second is their short driving range (the distance they can travel on a single full charge). The current average driving range for EVs is between 300 and 500 km, far short of the average range of 600 to 1,500 km for gasoline vehicles. The third is the amount of time it takes to charge them. It takes more than 10 hours to fully charge an EV using a regular charger, and about 30 minutes using a quick charger, compared to the several minutes it takes to fill the tank of a gasoline vehicle. The fourth challenge is the shortage of charging stations. Compared to the approximately 28,475 gas stations operating in Japan as of the end of March 2022 (according to the Ministry of Economy, Trade and Industry), the number of regular charging stations was only 21,198 (according to Zenrin) for the same time period, while the number of quick charging stations was even lower at 8,265 (also Zenrin).

To address these issues, one likely effective method is to deepen the understanding of users for EVs through sharing services. With regard to the first challenge, sharing services obviously eliminate the cost of purchasing the vehicle. The only costs incurred are the monthly membership as well as time and distance fees. Time based fees are typically set at around 200 yen for every 15 minutes. Distance fees are typically charged per kilometer. There are also numerous plans currently available that do not require a monthly membership or distance fees. Furthermore, many services allow vehicle reservations online, meaning that the cars can be accessed easily when needed. The second challenge, driving range, is less of an issue when using the car sharing for daily needs, rather than for long distances. According to a user survey conducted by Times before the Covid-19 pandemic in 2018[6], car sharing is more commonly utilized for such purposes as shopping, leisure driving, picking up and dropping off family or friends, and carrying items, rather than for long distances such as vacation or travel. Car sharing also eliminates the third challenge, long charging times, because the cars are already fully charged by the time the user makes use of them. Meanwhile, when recharging mid journey is required, such as for long distance travel, quick charge stations are available around the country, such as those provided by Nissan e-Share Mobi. And the cost to use those chargers is low because fees are often included in the car sharing plan. The fourth challenge regarding the number of charging stations is less of a problem when the car sharing service is used for short distances. However, in the event that charging is required when using the vehicle for short distances, then car sharing services need quick chargers rather than normal chargers. As mentioned above, the installation of quick chargers has not progressed as much as normal chargers. However, expectations for further infrastructure are increasing, with the government announcing a goal in June 2021 to reach an installed base of 30,000 units by 2030, similar to the number of gas stations available.

7. Conclusions

The momentum towards a transition to EVs is expected to continue to accelerate to achieve carbon neutrality by 2050. Domestic automakers have announced aggressive strategies, with Toyota adopting 3.5 million EVs by 2030, Nissan shifting new vehicles sold in primary global markets to EVs and HVs in the early 2030s, and Honda shifting all new vehicles sold globally to EVs and FCVs by 2040. However, according to statistics from the Japan Automobile Dealers Association, EVs account for only about 1.4% of new vehicle sales in Japan, though the surpassed 1% for the first time in 2022.

Issues behind that low number include the high price of EVs, their limited range, long charging times and the shortage of charging stations. On the other hand, the number of car sharing service memberships is growing significantly, as stated in this text, and services focusing on EVs have been launched by automakers and energy companies alike. Therefore, using car sharing services to deepen the understanding of EVs among users is likely an effective way to accelerate the adoption of EVs.

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Contact: report@tky.ieej.or.jp