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Key Factors Driving Electric Vehicle Dissemination and Use in Jeju Island, South Korea

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Summary

Jeju Island, South Korea, has disseminated a large number of battery electric vehicles in recent years. The number of battery electric vehicles has largely increased from 190 in December, 2010 to 15,480 December, 2018, accounting for approximately 4.0% of the total number of registered vehicles. This paper provides key factors driving the dramatic growth of battery electric vehicles as well as the easy use of battery electric vehicles from the local government's policy perspective. Factors presented in the paper will be useful reference for policy makers who are interested in disseminating battery electric vehicles.

Keywords: battery electric vehicle, policy, government, Jeju

1 Introduction

Jeju Special Self-Governing Province ushered in the era of 10,000 battery electric vehicles (BEVs) for the first time for a local government in South Korea in March 2018. Jeju is home to the fastest growing number of EVs in the world, with only 302 as of the end of 2013 and 674 at the end of 2014 reaching 10,006 EVs registered in the Jeju region as of March 2, 2018. The share of BEVs accounts for around 2.7% of the overall registered vehicles. Around 71% of the BEVs in the Jeju region are personal vehicles, 25% are commercial vehicles, and 4% are official vehicles. Commercial EVs can be classified into diverse types including rental cars (2,193), taxis (224), buses (63), and freight vehicles (2). Since reaching 10,000 BEVs, the number has continued to grow, with 15,480 BEVs in operation as of the end of December 2018.

In the Jeju region, BEVs are not simply something residents have experienced but are an integral part of their daily lives. While there were only four types of BEVs in 2013, the number has increased to 25 in the second half of 2018 (21 types of high-speed BEVs, three types of micro BEVs, and one type of freight BEV) and electric taxis and electric buses are no longer unfamiliar. More than 2,000 rental BEVs are providing Jeju visitors with the opportunity to experience one. Such changes are driven by a strong push for EVs by Jeju Special Self-Governing Province in line with the national EV policies and the participation of Jeju residents in the BEV policies. This paper presents 8 success factors of the dissemination of BEVs in Jeju, focusing on the EV policies of Jeju Special Self-Governing Province.

- Factor 1: High BEV subsidy and tax breaks
- Factor 2: Reinforced dissemination of BEVs for the public sector and businesses
- Factor 3: Continuous increase of charging infrastructure in response to the increase of BEVs

- Factor 4: Improvement in convenience of using BEVs-BEV call center operation and safety education
- Factor 5: BEV users' participation in policy and BEV-centered environment education programs
- Factor 6: BEV dissemination policies in link with energy and environment plans
- Factor 7: Establishment and use of mid-/long-term BEV plans with a strong drive for implementation
- Factor 8: Providing diverse opportunities to experience BEVs

2 Key Factors

2.1 High BEV subsidy and tax breaks

The high BEV subsidy has largely driven the success of the programs to provide EVs to the private sector that started in the second half of 2013. Despite a lack of awareness on BEVs, the limited BEV models available for purchase, and the short driving distance on a single charge, the high EV subsidy made it possible to purchase BEVs at the same price level of internal combustion engine vehicles (ICEVs), which created the initial demand for BEVs. Jeju Special Self-Governing Province matched the largest BEV subsidy with the BEV subsidy from the central government, driving the success in the dissemination of BEVs in the private sector. For the BEV subsidy from 2013 to 2014, 23 million won (approximately 23,000 US dollar), was supported, consisting of 15 million won of the government subsidy and 8 million won of the Jeju Special Self-Governing Province subsidy. As of 2018, the current EV subsidy stands at 18 million won, with the government grant at 12 million won and the Jeju Special Self-Governing Province subsidy at 6 million won. Jeju Special Self-Governing Province is offering an additional subsidy of 1.5 million won for the scrapping or export of used cars when purchasing EVs to promote the replacement of ICEVs with EVs.

Moreover, there are also tax benefits, including the exemption of special consumption taxes, educational taxes, and acquisition taxes, up to 4 million won (approximately 4,000 US dollar), which secured the clear economic competitiveness of BEVs compared to ICEVs.

Table1: Size of BEV subsidy by year (1,000,000 won/unit)

	2013	2014	2015	2016	2017	2018
National subsidy	15	15	15	14	14	12
Local subsidy	8	8	7	7	6	6
Total subsidy	23	23	22	21	20	18

2.2 Reinforced dissemination of BEVs for the public sector and businesses

The increased dissemination of BEVs in the Jeju region is the result of a focus on the dissemination of BEVs for the public sector, businesses, and the private sector. The Ordinance on the Promotion and Revitalization of BEV Dissemination in Jeju Special Self-Governing Province stipulates that public institutions in Jeju Province should make efforts to purchase BEVs as their business vehicles. Through such efforts, official vehicles in Jeju island are continuously being replaced with BEVs. Among the official vehicles in the Jeju region, the number of BEVs has increased from 200 in 2016 to 363 in 2017 and 426 as of October 2018. The official vehicle of the Governor of Jeju Special Self-Governing Province was also replaced with a BEV and is still in operation.

The dissemination of electric rental cars is also actively pursued. The number of electric rental cars was found to be 113 in 2016, 2,107 in 2017, and 3,339 as of the end of December 2018. From 2016 to the present, Jeju Special Self-Governing Province has been supporting EV purchase financing as well as EV subsidies for corporate tourism companies and rental car businesses. The terms for the loans are redemption by instalment for three years at a floating rate, which was 1.52% in the first quarter of 2018. The operation of electric taxis is also on the rise. The number of electric taxis was 101 in 2016, 224 in 2017, and 503 as of December 2018. For electric taxis, a subsidy of 3 million won is additionally offered on top of the existing subsidy. As of December 2018, there are 83 electric buses in operation in the Jeju region. At first, the battery-switching type of electric bus was introduced in Seogwipo-si through the central government's battery lease program. However, currently, the plug-in type of bus is supplied. Mid-sized electric buses have also been introduced and are in operation on Udo island, which is an annexed island of the Jeju region.

2.3 Continuous increase of charging infrastructure in response to the increase of BEVs

In line with the continuously increasing number of EVs, Jeju Special Self-Governing Province is continuously expanding the charging infrastructure. As of the end of 2014, the scale of charging equipment in the Jeju region was 992 units, but this number has increased to 10,082 units as of the end of October 2018, and the number of high-speed charging units has increased from 79 to 667. There are 0.7 charging units installed per EV and 1 high-speed charging unit per 25 EVs.

The cost for installing a charging unit is subsidized by the central government so that low-speed charging equipment can be installed at resident areas after the purchases of an EV, and there are programs to establish public high-speed charging equipment pursued by the Ministry of Environment and to establish charging infrastructure at multi-unit dwellings pursued by public corporations. At the same time, Jeju Special Self-Governing Province continues to expand the public charging infrastructure by securing a separate budget. So far, it has been difficult to establish charging units at multi-unit dwellings due to the shortage of parking spaces and the need to occupy a parking space to install the charging equipment. The program to establish charging infrastructure at multi-unit dwellings is expected to greatly contribute to EV dissemination. In addition, private charging companies are induced to install charging equipment.

Table2: BEV and charging infrastructure by year (vehicle, charger)

	2014	2015	2016	2017	2018
BEV	674	2,369	5,613	9,258	15,480
High-speed charging equipment: Level 3	79	106	163	537	724
Low-speed charging equipment: Level 2	913	2,382	3,837	6,735	10,367
Total charging equipment	992	2,488	4,000	7,272	11,091

2.4 Improvement in convenience of using BEVs — BEV call center operation and safety education

Jeju Special Self-Governing Province has developed and pursued diverse policies for the convenience of BEV users. There were needs for guidance on ways to respond to possible troubles as there was a shortage of information about BEVs and charging equipment. In particular, there was a pressing need for information on the location of charging equipment, etc. To this end, Jeju Special Self-Governing Province has operated the BEV and charging equipment call center since 2015. Currently, the charging equipment call center receives inquiries mostly about the location information of charging infrastructure and its operation methods, etc., and there are many inquiries from electric rental car users since the dissemination

of electric rental cars has increased. In August 2018, there were 1,698 calls received, with 70% of them from electric rental car users and 26% from BEV users who are Jeju residents. Of the total inquiries, 86% were about public charging infrastructure.

Jeju Special Self-Governing Province is providing safety education on driving BEVs for Jeju residents, current BEV users, and people related to rental car businesses. The program started with 536 people and four rounds of education in 2016, with a total of 13 rounds of safety education for 1,800 people through the present in 2018. The education focuses on the types and advantages of BEVs, understanding of BEVs for efficient use, ways to respond to breakdowns or accidents in preparation for flooding, fires, and other accidents involving the vehicles; proper methods of using charging equipment; etiquette in using EV/charging equipment; and FAQs at the Jeju BEV call center, etc. There are also lectures by experts in the respective areas. This education is meaningful as a practical policy to create a safe driving culture in line with the expansion of BEV dissemination and charging infrastructure.

In addition, incentives by Jeju Special Self-Governing Province for the use of EVs include the exemption of parking fees at public parking areas and free admission to public tourist destinations. Based on the Revised Bill on Installment and Management of Parking Lots in Jeju Special Self-Governing Province, EVs are exempted from parking fees at public parking lots until December 31, 2018, and are freely admitted to 25 public tourist destinations on Jeju Island.

2.5 BEV user participation and EV environment education programs

It would not have been possible to usher in the era of 10,000 EVs in Jeju if it had not been for the role played by the private sector in terms of EV dissemination and culture. Official EV Supporters were designated to participate in diverse activities including the revitalization of EV dissemination and the inspection of open-type charging equipment and to make efforts to establish proper etiquette for the use of EVs and charging equipment, thus contributing to creating a user-oriented EV culture and the respectful use of charging equipment. In October 2016, Jeju Special Self-Governing Province declared the launch of the EV 2.0 era and announced that it will shift the existing EV dissemination policy that focused on offering subsidies to policies focusing on infrastructure, ecosystem, culture, and tourism. It declared the era of EV 2.0 on October 4, 2016, as the ratio of EVs climbed above 1% or more of the overall vehicles in the province. The EV 2.0 era, in which the EV dissemination policy has been further upgraded, signifies a shift of dissemination policies from those focusing on subsidies to those focusing on infrastructure, ecosystem, culture, and tourism and from those led by the government to those based on open innovation through the interest and participation of EV users.

A forum for EV users (Evuff, EV user forum & festival) has been held regularly since the first one in Jeju in 2016 and Korea Electric Vehicle User Association (KEVUA) has been established in the Jeju region, holding frequent seminars, preparing environment-friendly EV stickers, and proposing user-oriented policies. EV users are participating in the EV Revitalization Committee of Jeju Special Self-Governing Province as members and are delivering users' opinions through the Committee.

2.6 BEV dissemination policies in link with energy and environment plans

The era of 10,000 EVs in Jeju was achieved through the strong BEV dissemination policies by Jeju Special Self-Governing Province, which are based on Carbon-Free Island Jeju by 2030 plan (CFI Plan) established in 2012. The key aspects of CFI Plan are to produce 100% of the required electricity on Jeju island as renewable energy by 2030 and to replace 100% of the vehicles with BEVs in the province. At the same time, CFI Plan seeks to store electricity in the EV battery and energy storage system (ESS) through the smart grid and utilize the stored electricity. Ultimately, it aims to reduce carbon emissions and drive green growth. Based on CFI Plan, the province is seeking to replace 10% of all vehicles with BEVs by 2017 and 30% by 2020.

In the Jeju region, there is more renewable energy production than the total power consumption by BEVs. As of October 2018, the power consumption by BEV charging units totaled 3,484,502 kWh, with 1,509,743

kWh during the light load time zone, 1,507,572 kWh during the mid load time zone, and 798,801 kWh during the max load time zone. It was found that, on average, one BEV consumed 243 kWh. As of December 2018, the generation of renewable energy stood at 81,780,846 kWh in total, consisting of wind power at 71,997,293 kWh (88%) and photovoltaic power at 9,783,553 kWh (12%). Since there is sufficient renewable energy generation, the BEVs in the Jeju region are operated in an environment-friendly way.

Table3: BEV dissemination target based on Carbon-free Island Jeju by 2030 plan

Phase	Target year	Number of units	Proportion
Phase 1	2017	29,000	10%
Phase 2	2020	94,000	30%
Phase 3	2030	371,000	100%

2.7 Establishment and use of mid-/long-term BEV plans with a strong drive for implementation

The Mid-/Long-term Plan to Expand BEV Dissemination and Nurture the Industry (2018, hereafter Mid-/Long-term BEV Plan) is supporting the BEV dissemination policy in the Jeju region. The Mid-/Long-term EV Plan sets out the specific implementation strategies and strategic initiatives to achieve CFI Plan, and currently there are three implementation strategies and nine strategic initiatives being pursued. The Mid-/Long-term BEV Plan sets the EV transition target as 40% by 2022 and presents diverse strategies and implementation plans for not only EV dissemination but also convenience in using BEVs. Moreover, it is creating an BEV industry ecosystem and nurturing related industries based on the supplied BEVs.

Table4: Mid-/Long-term BEV Plan's implementation strategies and strategic initiatives

Implementation strategies	Strategic initiatives
Expanding BEV dissemination and charging infrastructure	□ 100% phased transition of vehicles in operation in the province to BEVs □ Realize zero inconvenience in charging and using BEVs
Creating BEV industry ecosystem and nurturing related industries	□ Reinforce the establishment of the foundation for the BEV industry ecosystem □ Revitalize the local economy through the focused nurturing of BEV-related industries □ Create new industries through linkage with national strategic programs on BEVs and the development of new industries □ Thorough preparation for changes to BEV-based future society
Creating BEV culture and refining institutions	□ Reinforce the roles and image of Jeju as a global center of BEV □ Expand BEV users' participation and lead BEV culture □ Systematically refine BEV institutions/organizations and reinforce collaboration

Source: Mid-/Long-term Plan to Expand BEV Dissemination and Nurture the Industry, Jeju Special Self-Governing Province, 2018.3

2.8 Providing diverse opportunities to experience BEVs

The high penetration of BEVs in the Jeju region has been possible because diverse opportunities to experience BEVs were offered to Jeju residents. At the initial stage of disseminating BEVs, sufficient

awareness on BEVs was lacking. However, opportunities were offered so that people could experience BEVs through test driving, in which people could actually feel the riding quality and use diverse functions including regenerative braking, etc. It was also ensured that consumers were able to become familiar with the charging equipment and the actual EVs and make purchases at the sites. The International Electric Vehicle Expo that has been held in Jeju from 2014 played an important role in improving awareness on BEVs and providing BEV-related experiences. Through EV eco rallies and Jeju EV 1100 Road Parade, the capability of driving on 1100 road, the highest and most winding road on Jeju, was confirmed by the public. In addition, a joint BEV experience/test-driving center was temporarily operated every Friday and travelling BEV experience centers that go out to meet their targets including at English education cities, etc., were held.

3 Conclusions

The era of 10,000 EVs in Jeju Special Self-Governing Province was achieved through diverse efforts. The strong commitment by Jeju Special Self-Governing Province for EV dissemination, the cooperation between the central and local governments, the environment and geographical conditions of the Jeju region, and the participation of Jeju residents in EV policies were the driving forces behind this achievement. This report summarized these efforts and experiences of Jeju Special Self-Governing Province as eight success factors. The success factors presented in this report can be usefully leveraged by diverse local governments that seek to pursue EV dissemination.

References

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