

EV Battery Reuse ESS

pmgrow

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Europe

2020.12

Proposed a new Batteries Regulation.
(Based on the GBA's Battery Passport)

2022.04

Started trilogue negotiations toward an agreement on the final text. (Incl. Mandatory battery recycling)

* GBA : Global Battery Alliance, a public-private collaboration platform founded in 2017 under the auspices of the World Economic Forum.



China

2018

Established 'EVMAM-TBRAT,' a gov-led platform to collect and manage EV battery information.

2021.08

Mandated battery reuse companies to provide relevant information.

* Consumers should provide 'EVMAM-TBRAT' relevant information to be subsidized.

* Information gathering is a prerequisite condition for collecting/reusing/recycling batteries, utilizing big data and responding to the EU battery passport scheme.



Germany

2020.10

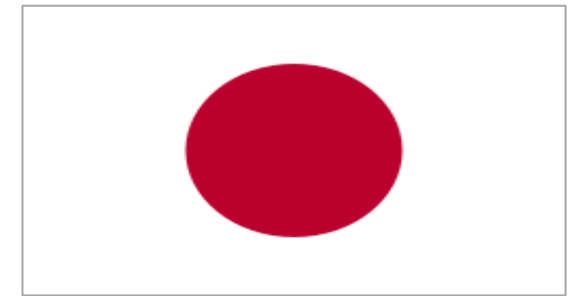
Initiated the 'ReCircE' project: a cloud-based AI-combined system for product lifecycle management.

2021.06

The Ministry for the Environment organized 'Sprint for Green' with battery cell/module producers, recyclers, and technical experts.

2022.04

Provided 820M€ to develop the world's first battery passport.



Japan

2022.04

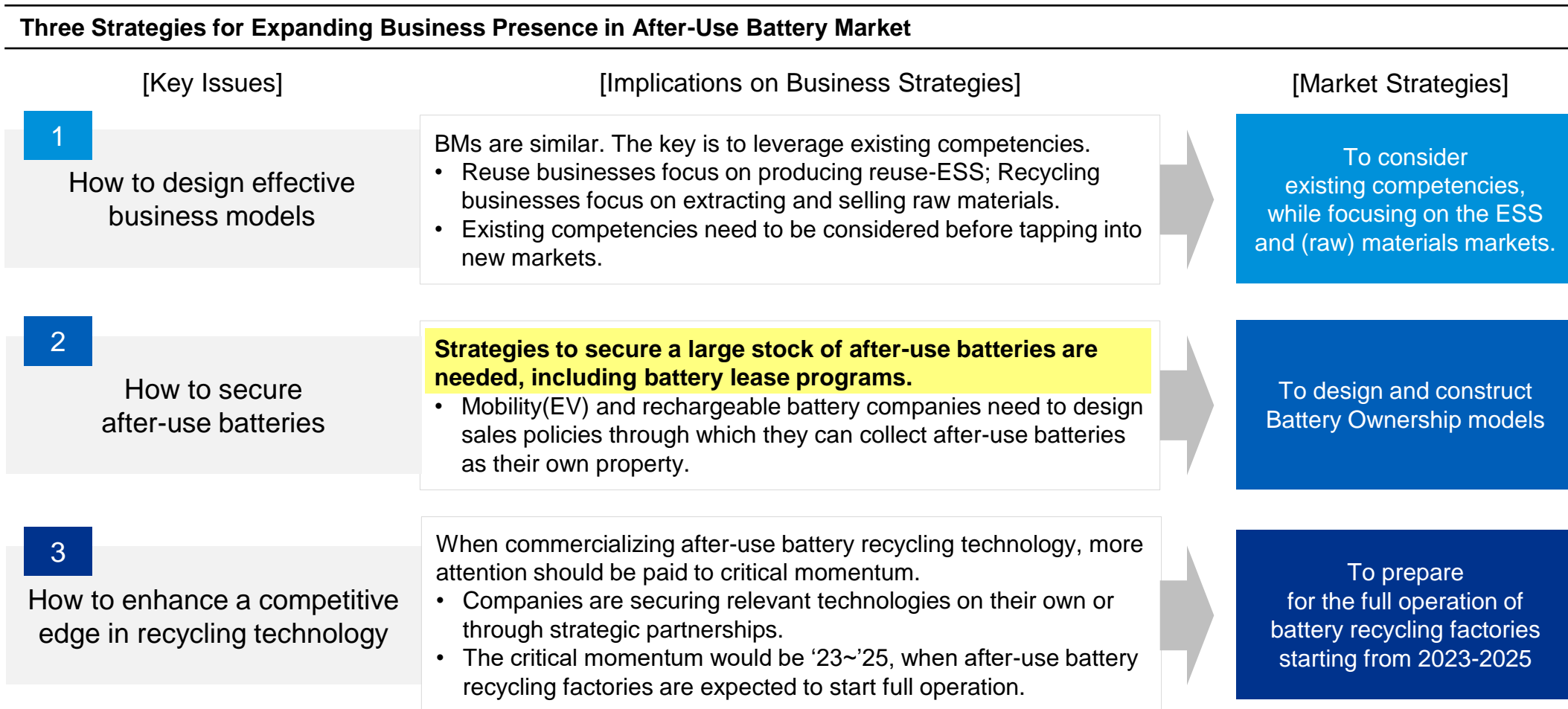
BASC(Battery Association of Supply Chain) proposed to design a digital platform for battery supply chain.

* EU is building a battery passport system based on the Catena-X data ecosystem as a component of the Gaia X cloud computing system.

* BASC platform will be equipped with compatibility and expandability with the EU battery passport system.

Strategies for market leadership: setting up business models, preoccupying after-use batteries, and developing recycling technology.

(Samjong KPMG "Battery Circular Economy, Rise of Electric Vehicle Waste Battery Market and Corporate Response Strategies", March 21, 2022)



Resolutions to foster battery circular economy ecosystem through regulation improvement in ROK (Sep. 2022)



Ministry of Land,
Infrastructure and Transport

Revision of “Auto Mobile Management Act”

- Allows two separate registrations of an EV and an EV battery for ownership.
- Enables separate circulations of EV batteries to foster battery lease and reuse businesses.



Ministry of Trade,
Industry and Energy

Construction of a safety inspection system for second-life batteries

- Examines each after-use EV battery, whether it is safe and suitable for re-use.
- Guides to reuse second-life EV batteries for appropriate purposes in proper manners.



Ministry of Land,
Infrastructure and Transport



Ministry of Trade,
Industry and Energy



Ministry of Environment

Construction of an EV battery lifecycle management system and a data-sharing system


- Builds an “EV battery lifecycle management system” to provide accurate data for reuse and recycle
- Constructs a public database that covers the whole battery lifecycle – EV battery production(MOTIE), registration(MOLIT), operation and removal(MOLIT), reuse(MOTIE) and recycle(MOE).
- Opens some of the gathered (non-private) dataset to related industries for use.



Ministry of Environment

Exemption of waste regulation on after-use EV batteries.

- Revises “Framework Act on Resources Circulation” to introduce pre-authorization system in 2023.
- Designates certain items as reusable-recyclable resources, exempting additional application processes. (Currently, there are about 200 after-use battery handling establishment – they can reuse and recycle after-use batteries only according to the permitted methods and purposes.)

 산업통상자원부 보 도 자 료 <i>다시 도약하는 대한민국 함께 잘사는 국민의 나라</i>			
보도 일시	2022. 10. 11. (화) 11:00 < 10.11. (화) 석간 >	배포 일시	2022. 10. 10. (월)
담당 부서	제품안전정책국 전기통신제품안전과	책임자	과 장 이 용 로 (043-870-5440)
		담당자	사무관 진희철 (043-870-5445)

**「전기용품 및 생활용품 안전관리법」 일부개정법률
공포안 10.11(화) 국무회의 의결**

- 사용후전지의 안전한 재사용을 위한 안전관리 운영기반 마련 -

- Partial revision of “Electrical Appliances and Consumer Products Safety Control Act” has been passed at the Cabinet meeting. It will be executed in October next year, after a year of preparation.
- This revision includes the legal foundation for after-use battery safety examination system to ensure its reuse as in reuse-ESS.

□ 최근 전기차 보급 확대에 따른 사용후전지 시장의 급격한 성장 전망과 사용후전지 재사용에 대한 경제성이 긍정적으로 평가되는 등 업계의 관심은 증가하고 있으나, 그동안 안전성 검사제도 부재로 관련 업계의 애로 호소가 많았다.

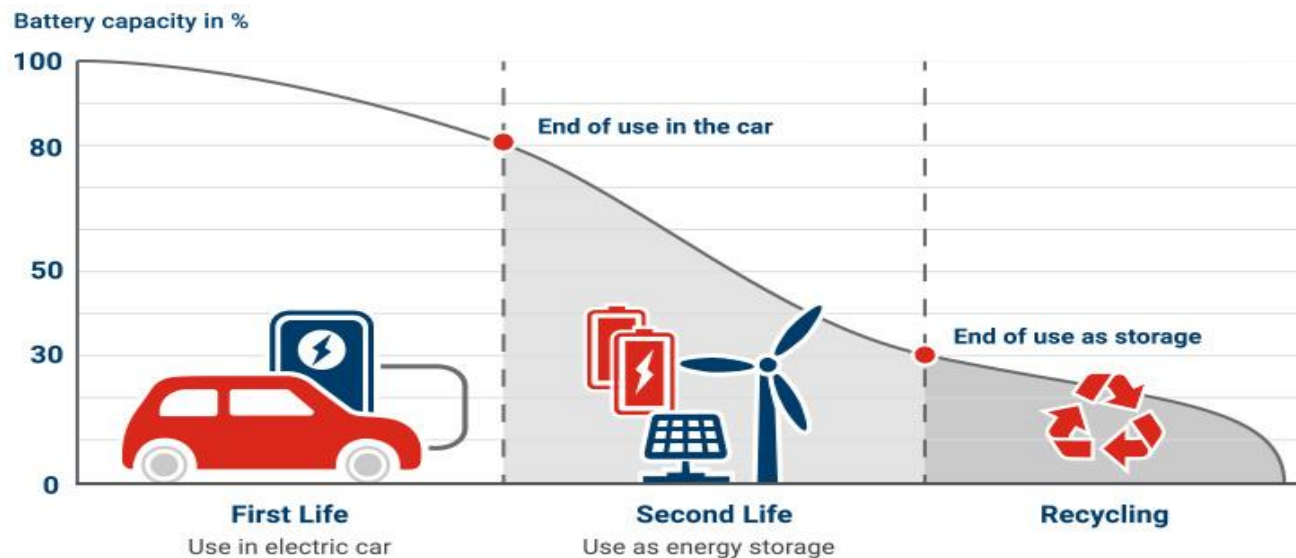
* 전 세계 사용후전지 시장은 '25년 3조원에서 '50년 600조원 규모로 확대 예상(SNE리서치)

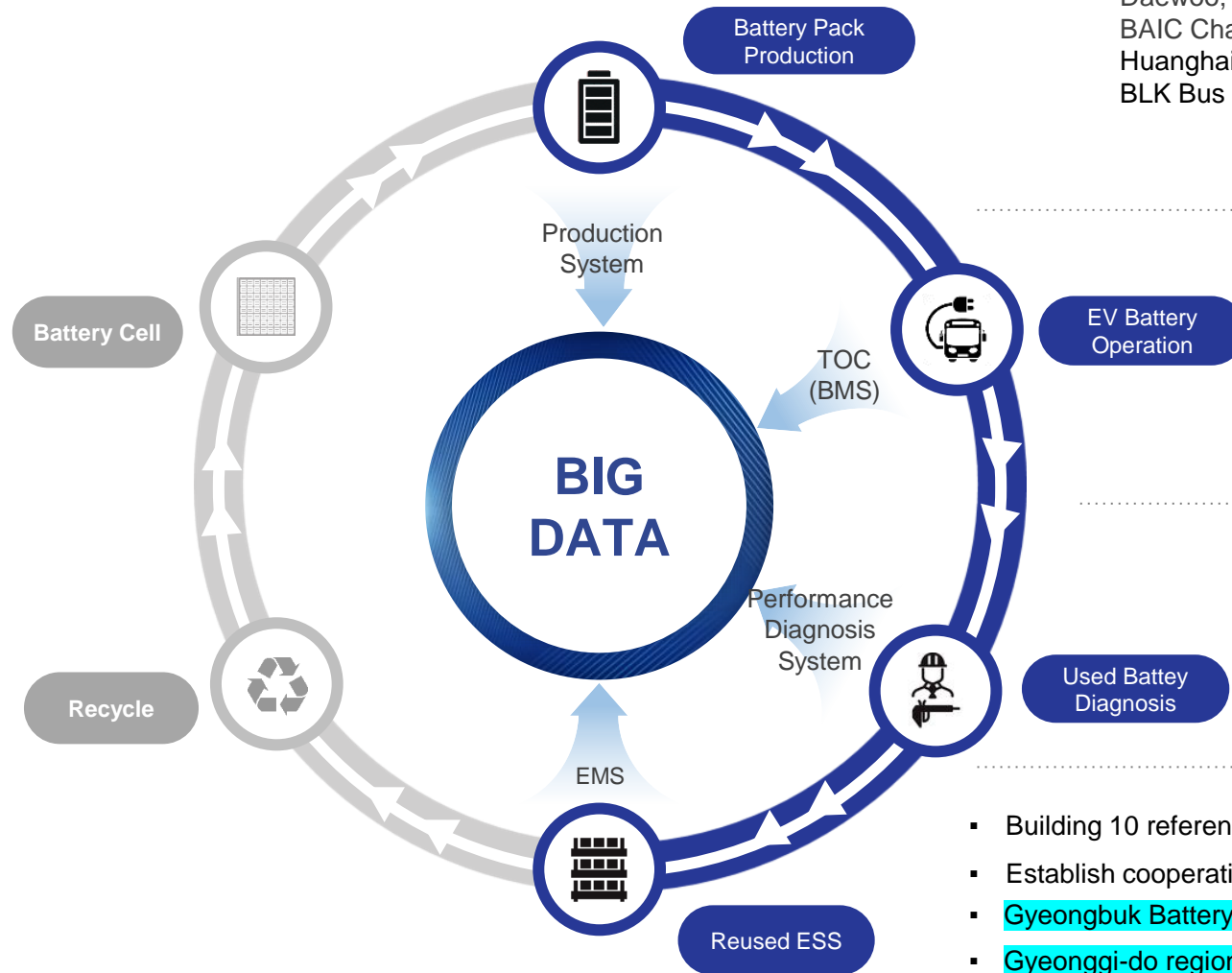
'23.10~ Reuse-ESS can be sold without regulatory sandbox

Currently, there is no legal foundation of safety examination for after-use batteries that government authorization is required through regulatory sandbox.

[Ways to repurpose after-use EV batteries]

- To reuse original battery packs as they were
- To disassemble battery packs and re-assemble selected modules





▪ BUS :
Daewoo, Zhongtong
BAIC Changzhou,
Huanghai Automobile
BLK Bus



▪ Truck :
Tata Daewoo



▪ Small EV :
Myungshin (MVL)
Daelim motorcycle



- TOC + Charging Infrastructure
- 104 buses in operation (Sep. 2022)
 - ✓ Total Millage 21.5 million km,
 - ✓ Total Charging Amount 19.09 million kWh
 - ✓ Gathering all relevant data










- 1st and 2nd construction of Jeju TP -> 1st construction of Gyeongbuk TP
- Building the largest number of sites in Korea
- Selected as "Recycling Free Special Zone Operator" in Pohang



- Building 10 reference system, the largest number in Korea
- Establish cooperation system for power generation companies
- Gyeongbuk Battery Re-C Special Zone : Construct reused ESS
- Gyeonggi-do regional energy business: Selected as a regulatory sandbox operator (Built a 1.4Mega electric bus charging station at Sunjin Group)



“ Experiences in various types of battery cell, capacity, cooling method and vehicle customization ”

Customers	Cell type	Manufacturers	Battery capacity	Cooling Method	Pack Image	Bus Type
Daewoo	Square	Samsung SDI	62kWh class	forced air cooling		Low-floor bus High-floor bus
Zhongtong	Square	Samsung SDI	59kWh class	forced air cooling		Low-floor bus
BAIC Changzhou	Square	Samsung SDI	59kWh class	forced air cooling		Low-floor bus
BLK	Square	Samsung SDI	30kWh class	liquid		Low-floor bus
Huanghai Automobile	Square	Samsung SDI	30kWh class	liquid		Low-floor bus
WOOJIN	Pouch	ETI	50kWh class	forced air cooling		bimodal tram
Tata Daewoo	Cylinder	Samsung SDI	100kWh class	liquid		5-ton truck

Reference – EV Battery Operation

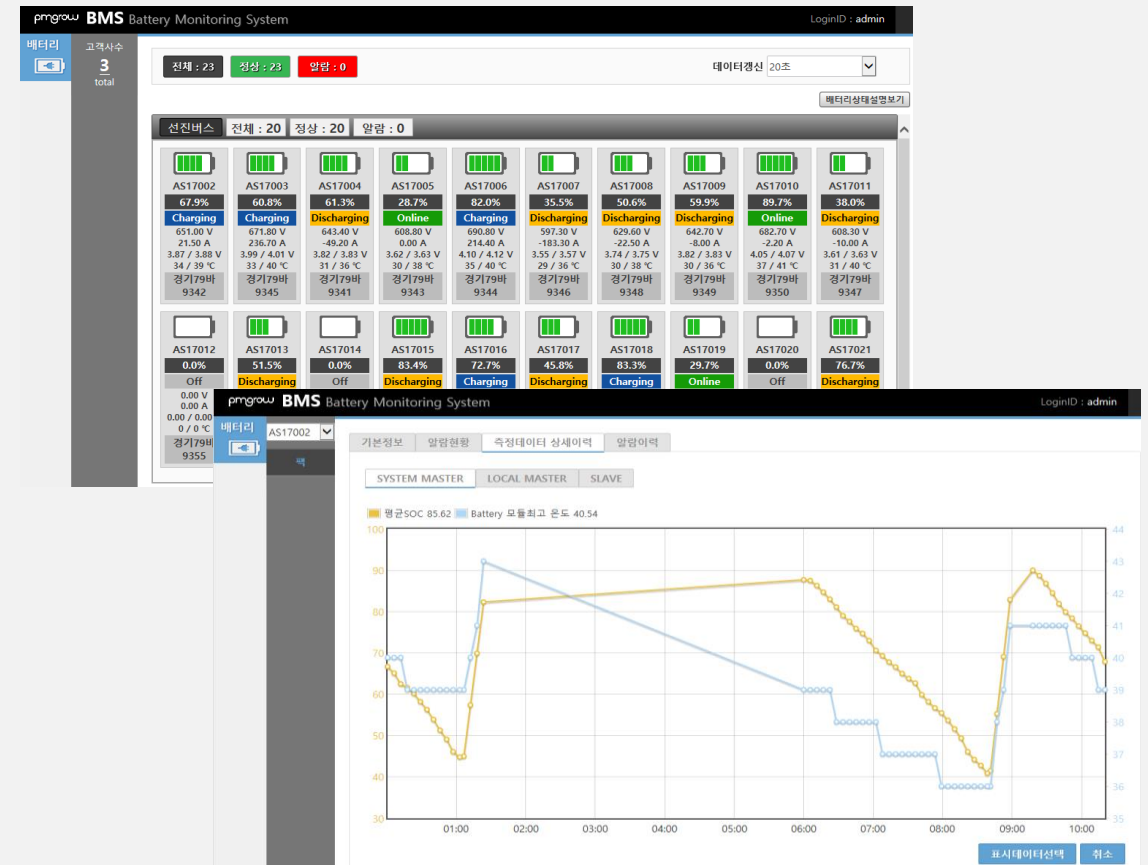
EV Bus Operation Overview (Sep 2022)

Customers	Public transit (intra- or inter-city buses) operators - Sunjin Bus, Sunjin Sangwoon, Seongnam City Bus, Yeosan Transportation, etc.		
Routes (Regular)	#33 (Gimpo Godani Village – Ilsan Dong-gu Office), about 56.8km #2 (Gwijeon-ri Garage – Songjeong Station), about 60km etc.		
Operating period	From April 2017 - AVIC (Envy On) / jungtong (Magnum) / treatment (BS110)		
Total Number of Buses	Total Mileage	Total Amount of Charge	Average Fuel Efficiency (km/kWh)
104	21,525,014km	19,090,833kWh	1.12
Total Number of Charge	Average Mileage per Charge	Average Amount per Charge	Average Mileage per Bus
360,613	52.94km	46.95kWh	202,769km (Max 330,871km)



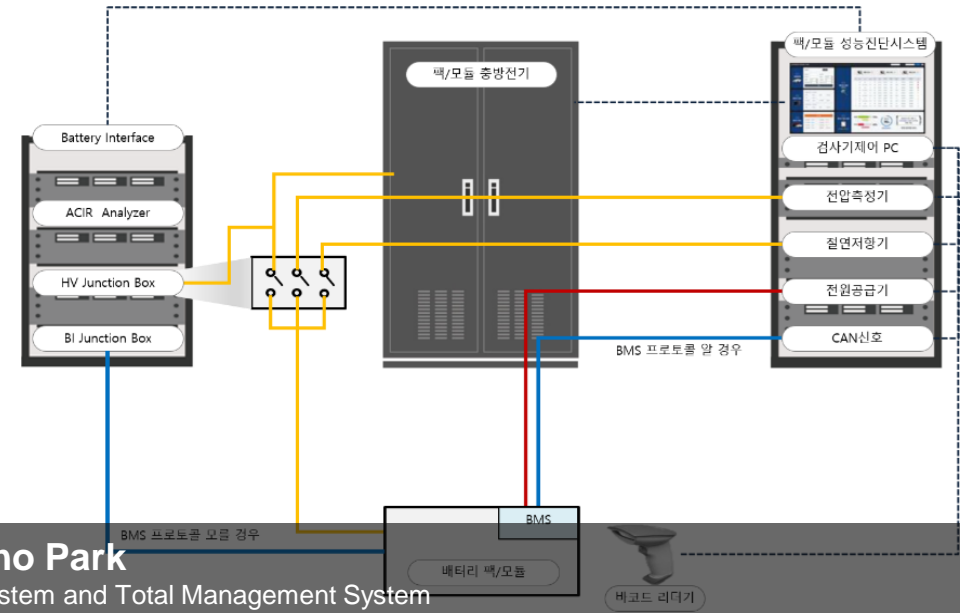
Online Battery Data Monitoring

PMGROW has the largest EV battery operations dataset, in terms of the driving distance and the number of charge/discharge, in South Korea.



- **Used EV battery diagnosis technology** : The first company in Korea that develops and supplies used EV battery diagnosis and evaluation system (GB/Jeju TP)
- **Data-based battery diagnosis technology** : Battery data collection and transmission technology through OBD device/ Development of battery diagnosis technology based on driving history

Item	Ordering organization	Project Name	Build Year
Battery Diagnosis System	Jeju Techno Park	EV Battery Pack/Module Performance Evaluating System for small EV	2018
Battery Diagnosis System	Jeju Techno Park	EV Battery Pack/Module Performance Evaluating System for large EV	2019
Battery Diagnosis System	Gyeongbuk Techno Park	EV Battery Pack/Module Performance Evaluating System and Total Management System	2020



Gyeongbuk Techno Park

EV Battery Pack/Module Performance Evaluating System and Total Management System

Building 10 Battery Reuse ESS Sites in Korea

References of PMGROW's EV Battery Reuse Businesses in South Korea

Location and Purpose	Operator	Cons. Date	Capacity	Reuse Battery Sources
Dangjin Steelworks ESS	Hyundai Steel	Oct 2017	250kWh	IONIQ Electric (10)
Portable EV Charger ESS	Hyundai Motor Group	Nov 2017	50kWh/75kWh	IONIQ Electric (5)
Jeju-area Substation UPS	Korea Electric Power Corp.	Dec 2017	10kWh (2)	EV Sedan (1)
Dangjin Factory large-scale ESS	Hyundai Motor Group	Nov 2018	1mWh	IONIQ and Soul EV (40)
Seoul Energy Dream Center ESS	SK E&S	Dec 2018	200kWh	EPIC Electric bus (5)
Yangcheon Solar Station ESS	Seoul Energy Corporation	Dec 2018	100kWh	EPIC Electric bus (1)
Jeju e-Gopang Charging Station ESS	BMW Korea	Aug 2019	220kWh	i3 (10)
Hyundai Seosan Farm Land ESS	Hyundai Motor Group	Oct 2019	134kWh	IONIQ Electric (6)
SK EV Charging Station ESS	SK E&S	Oct 2019	200kWh	SM3 Z, E (10)



Site	Capacity (Construction Date)
PMGROW Pohang Camp.	280kWh (July, 2021)
Gimpo-si CNG Bus Charging station	800kWh (Dec. 2021)



< Reuse ESS for CNG charging station with participation of Gimpo-si and Sunjin Transportation in December 2021 >

Hyundai Motor Company – Module-based Reuse ESS

Capacity	1MWh	Used pack	IONIQ (EV vehicle)	Application unit	Module	Construction Date	2018.12
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Energy Dream Center – Pack-based ESS (packs from Namsan e-BUS)

Capacity	200kWh	Used pack	Electric Bus	Application unit	Pack	Construction Date	2018.12
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Jeju Techno Park – EV charger + solar power panels + ESS

Capacity	200kWh	Used pack	SM3 (EV Vehicle)	Application unit	Module	Construction Date	2019.10
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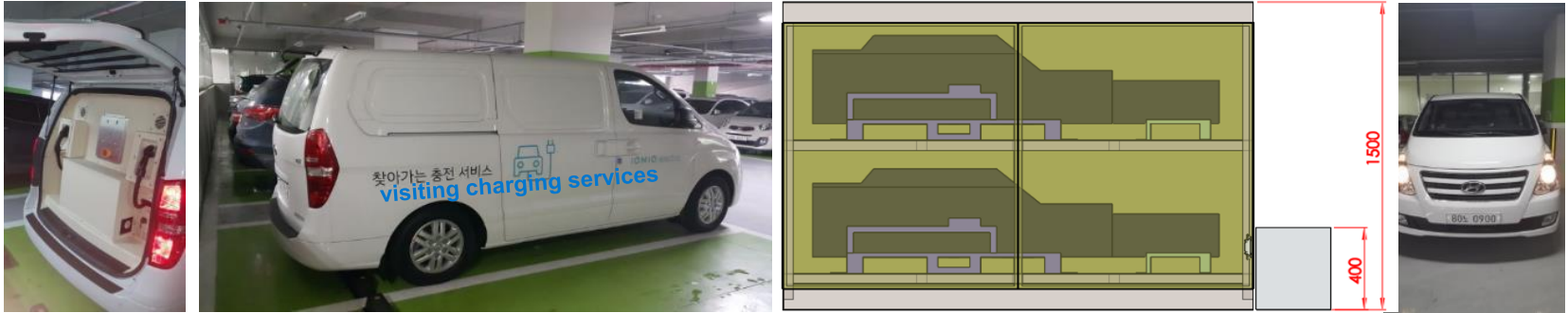
Seosan Solar Power Plant – PV-Reuse ESS (134kWh)

Capacity	134kWh	Used pack	IONIQ (EV vehicle)	Application unit	Module	Construction Date	2019.09
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Hyundai Motor Company – EVs (Solati and Starex) with ESS-based EV chargers for “On-site Charging Service”

Capacity	50/75kWh	Used pack	IONIQ (EV vehicle)	Application unit	Pack	Construction Date	2019.09
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DC Combo



CHADEMO

Thank you

The background features abstract blue geometric shapes. A large, solid blue triangle occupies the upper right portion of the frame. Below it, a thick blue diagonal line runs from the bottom left towards the center. To the right of this line, another thick blue diagonal line runs parallel to it, extending from the bottom left towards the top right.