The 6th IEVE 2019

The status & plan of EV charging standardization in Korea

9 May 2019

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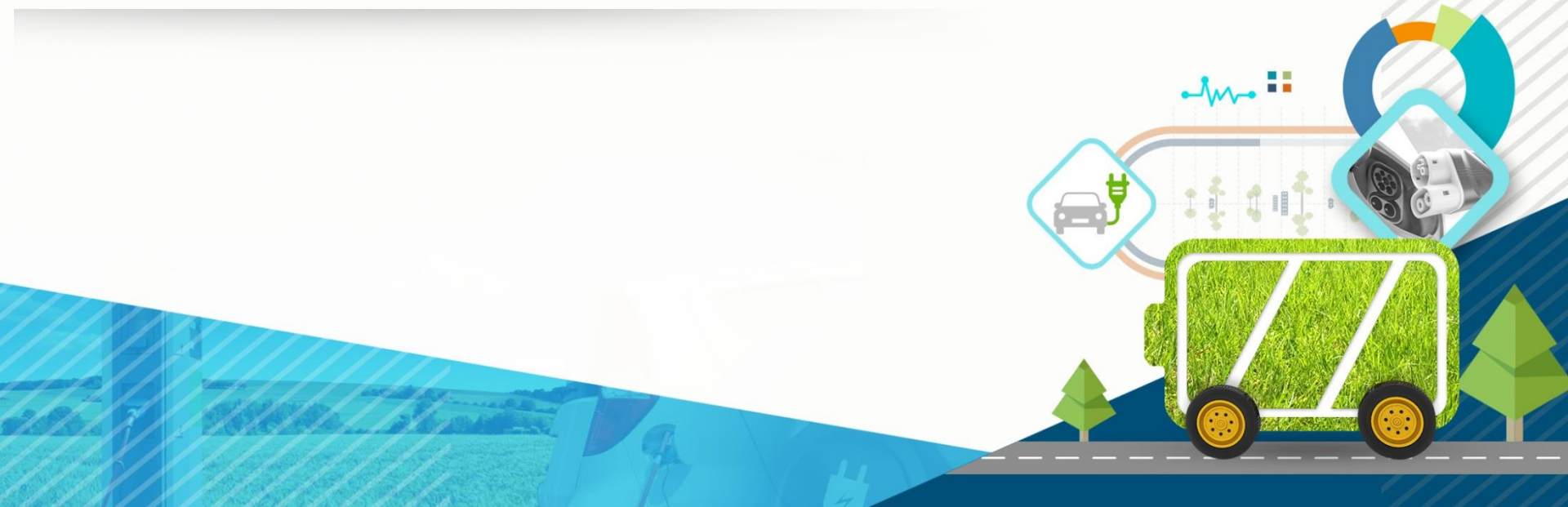
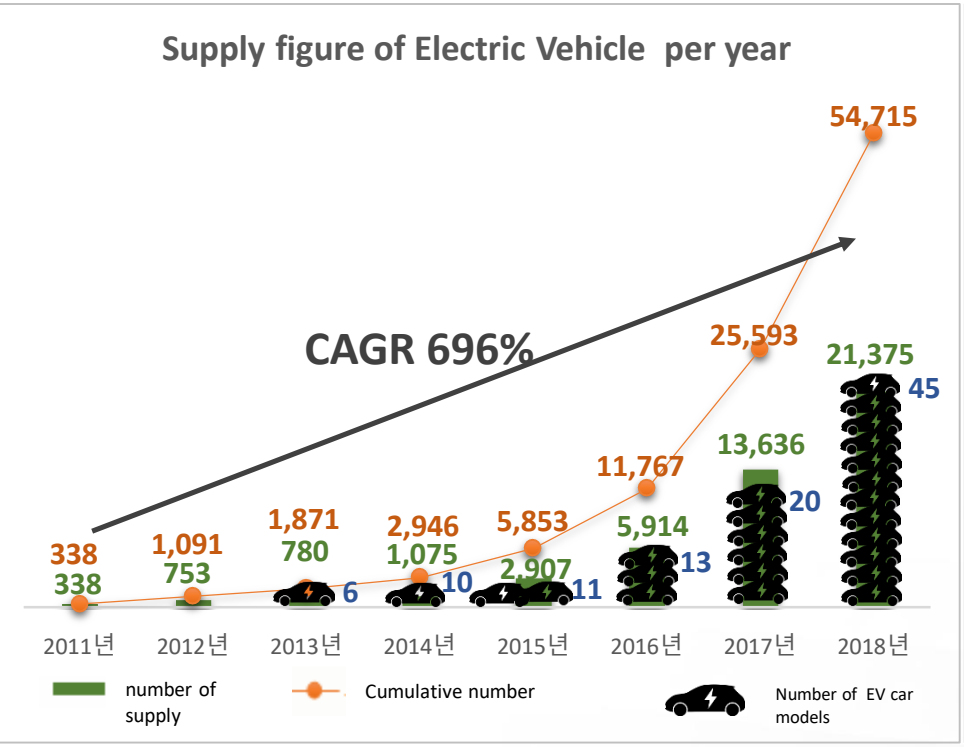
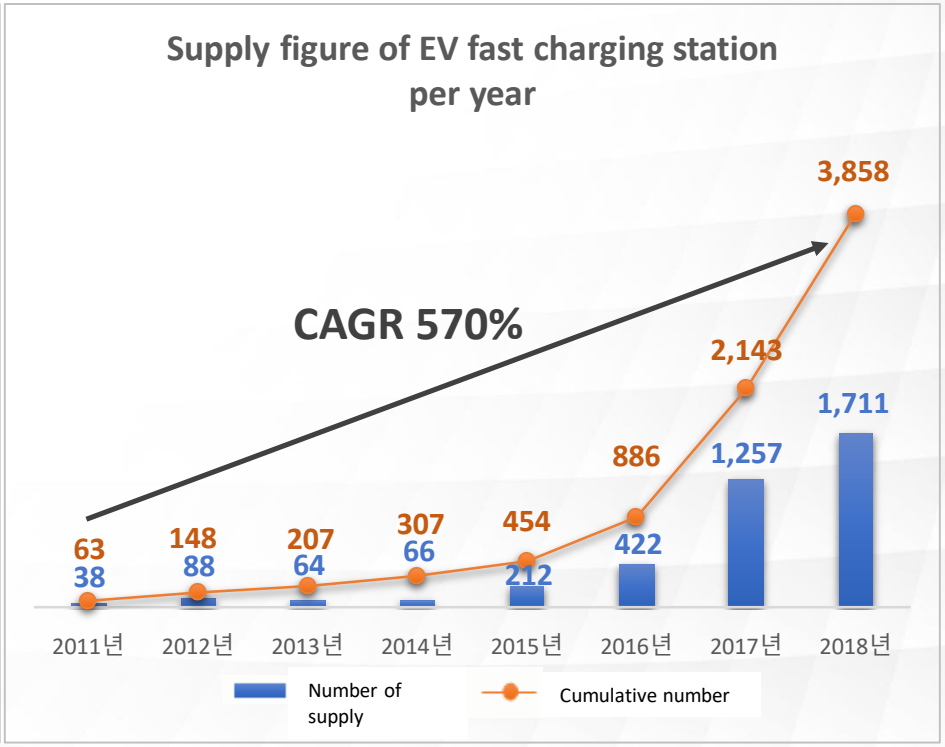
1 Status of EV supply in Korea



1.1 Supply figures of EV and Fast charging station

by year





Incentives on EV purchase

** **Price example** in Korean won*

Purchase subsidy (max 1,900만원)	Individual consumption Tax exemption (max 300만원)	Education Tax exemption (max 90만원)	Purchase Tax exemption (max 140만원)	Parking fee discount (over 50%)

1.2 Supply figures of EV and Fast charging station

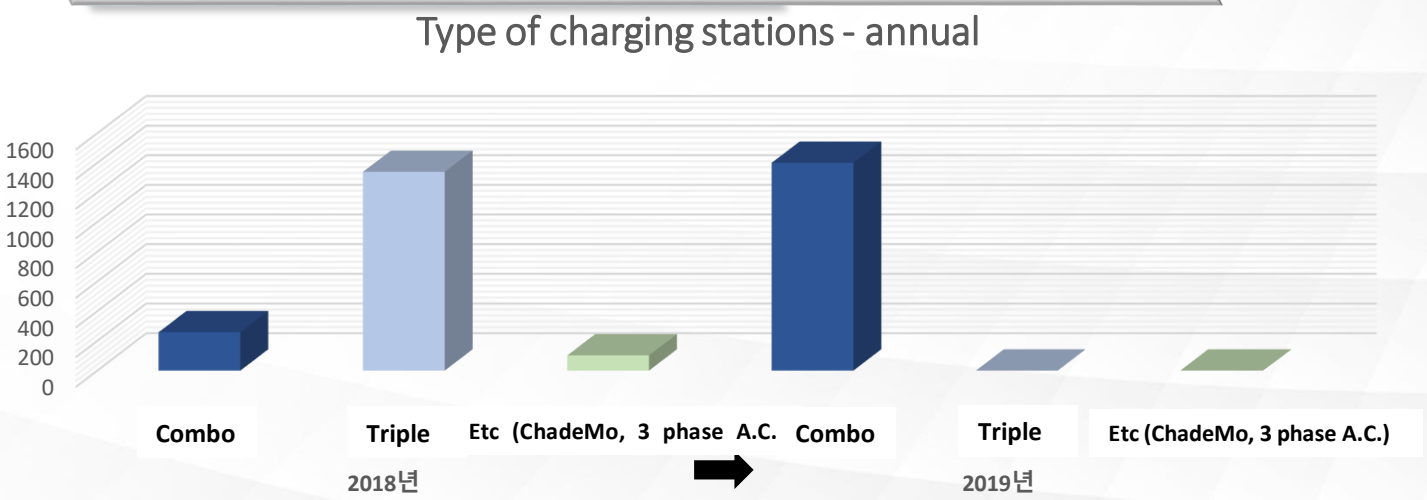
by region (as of Dec. 2018)

EV 54,715대

Public charging station

3,858기

by charging type (since recommendation for standards unification in Dec. 2017)



1.3 Installation direction of Public fast charging station 2019

Increase of battery capacity :
installation of high-powered charging station (50kW→100kW+)

Unification of connector type :
Triple(DC combo, ChadeMo, 3 phase A.C.) → DC combo

Installation of 1,200 Fast charging stations

Increase of users
(two or more additional installation per charging point, highway service area)

minimization of installation site
(single-charging → N multiple-charging)

2 Status of EV technology & market

EV charging infra technology road map of smaller enterprises

Time Span		2018	2019	2020	Final goal
Annual goal		High capacity of Charging power	Automated charging system	Response for IS	Development of User friendly charging infra
Key technologies	EV charging station	High capacity, Fast charging Connecting to V2G and Smart Grid Optimization of Power transmission communication Interface responding to IS			Technology development of High capacity fast charging and Connecting to Smartgrid
	Infra installation	Automated charging Multiple charging system			Technology development of Charging system For Multi dwelling Units and Plug&Charge
	Wireless charging system	Automated positioning system of Charging power T/RX device			Technology development of Park&Charge
Technology/Market Needs		Realization of High capacity, Fast charging and charging system For Multi dwelling Units	User convenience Maximization	conformance and compatibility securement of IS	

2.2 Status of EV technology development

Standardization

- Common application of EV car parts
- High-powered charging interface (400kW level)
- Strengthening of response for International Standardization

Charging method

- High-speed charging system (400kW level)
- Wireless charging system
- Strengthening of response for International Standardization

Operating system

- Construction of charging infra operation center
- charging demand modeling and Grid effect analysis
- Development of Micro EV-related charging system technology

Charging service

- Simple and easy charging service platform
- Charging station faults self-diagnosis ·system
- Micro grid for charging station

EV market trends and future outlook

Government, pushing for early setup of Eco-friendly vehicles market ecosystem

Target : 3 million EV, 0.2 million charging infra (by 2030)

- **EV Purchase subsidy Expansion**

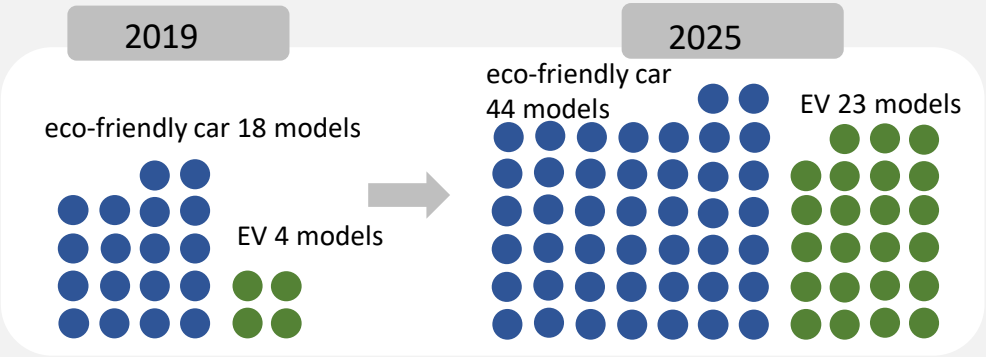
** **Price example** in Korean won*

- For boosting domestic market with EV purchase subsidy (max 900만원/private car , 1억원 /bus , 1800만원 /truck) and Tax exemption, Compulsory purchase system in public sector and etc.

- **Building a base for growth and Job creation through the EV industry innovation**

Investment planned for increasing the EV share → EV's influence to market is expected to expend.

- HYUNDAI·KIA will expand to more than 44 models of eco-friendly car by 2025



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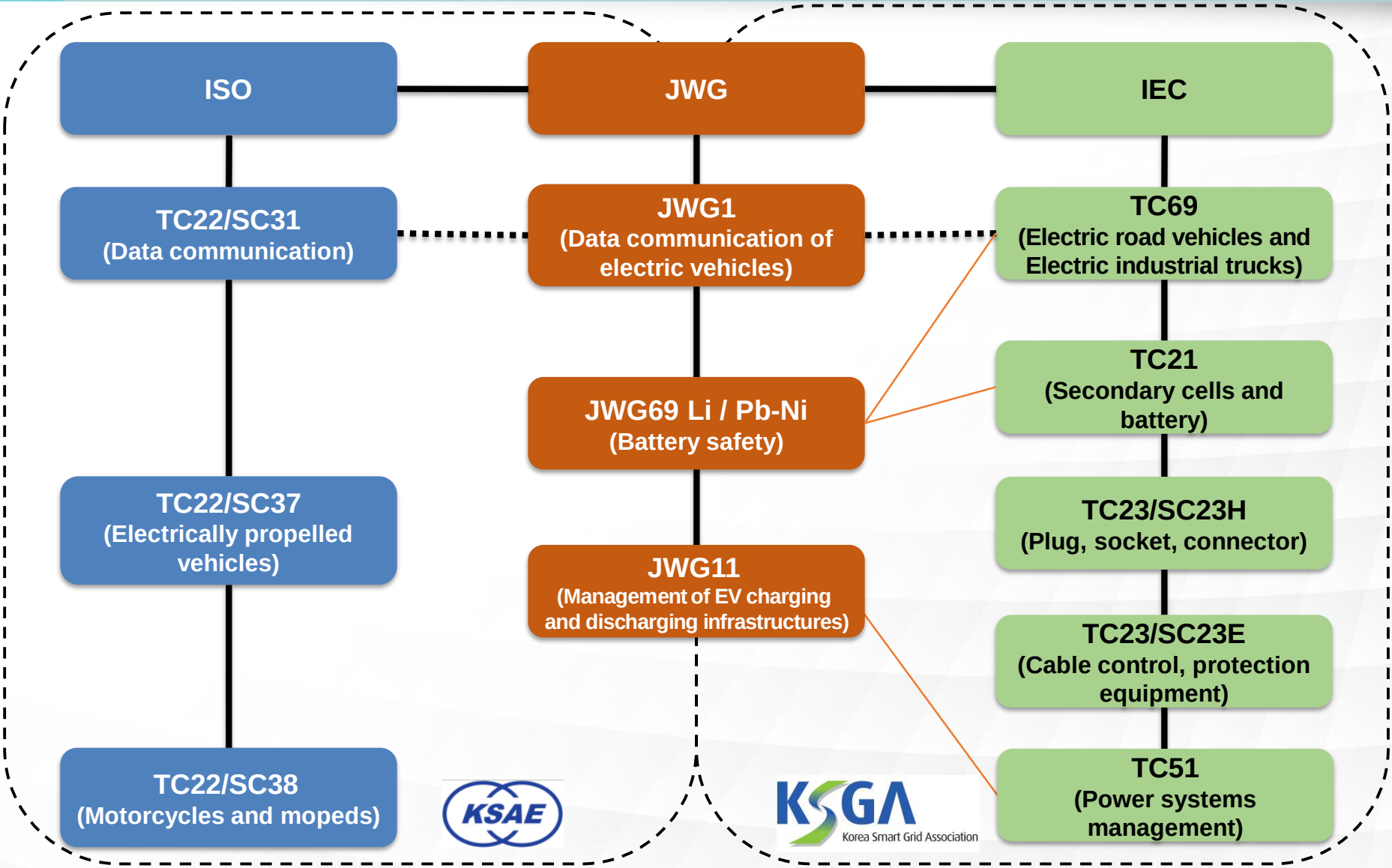
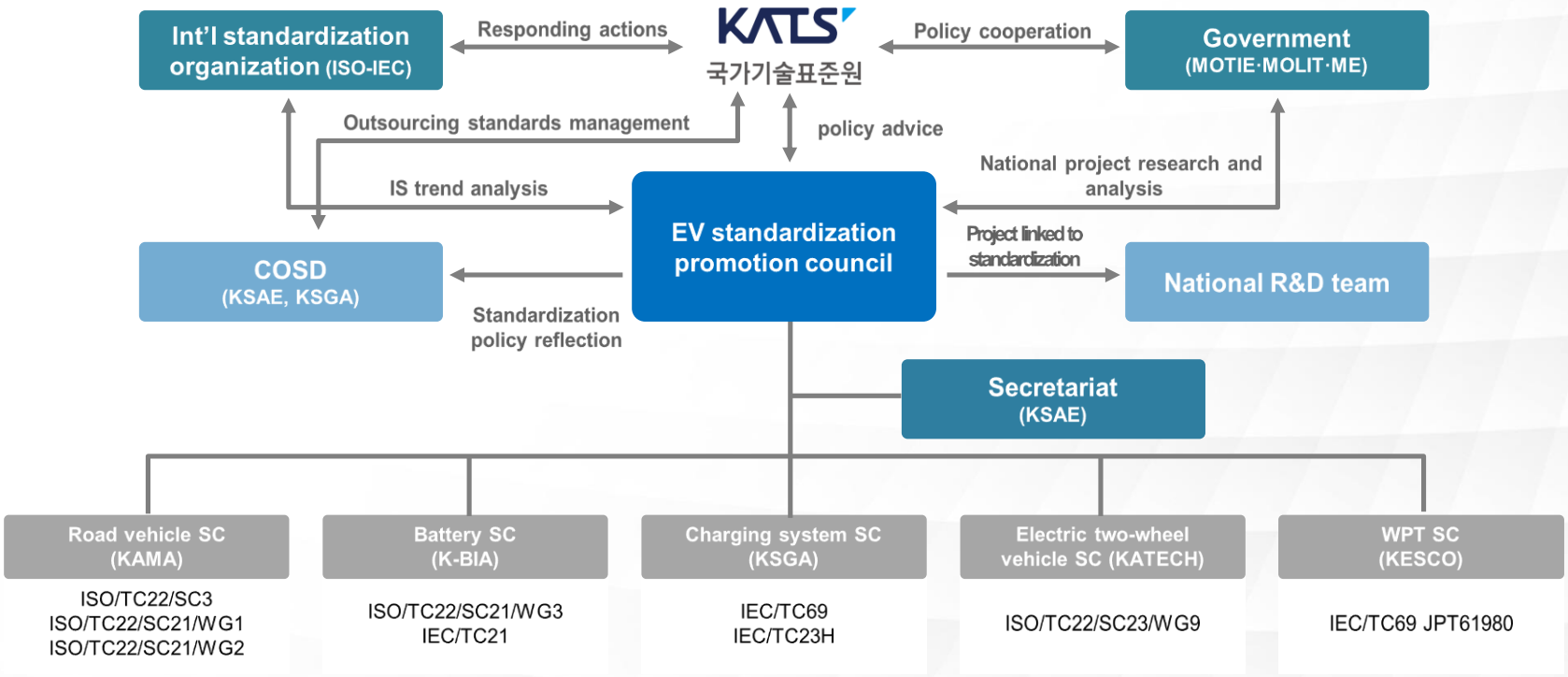
3 Status of Standards & Certification

Current status of EV Standardization



Standardization collaboration system

- **Operate a consultative body for systematic response of standards**
- **Strengthening collaboration system between industry academic**



3.3 KoChaT (Korea EV Charging Technology)

Background

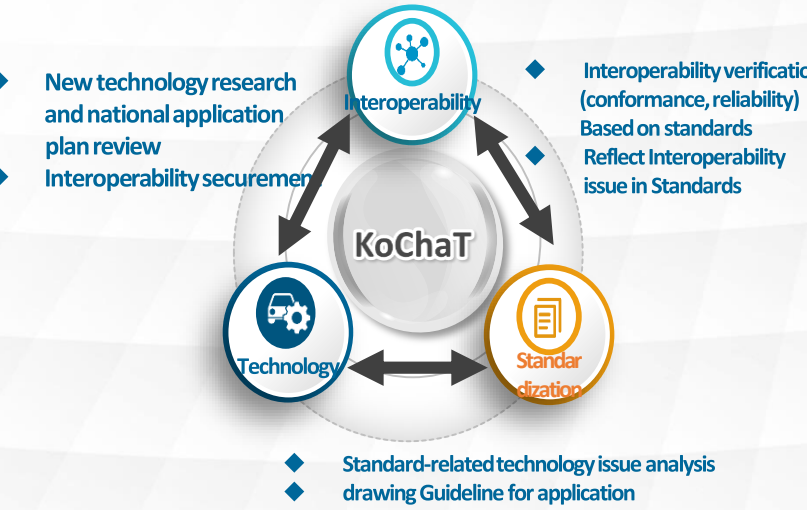
- **(Overseas)** the appearance of new powerful private associations
  : CharIN, CHAdeMO, OCA (influence on EV charging technology like standards, R&D and education, etc.)
- **(Domestic)** No communication channel between various stakeholders

Necessity

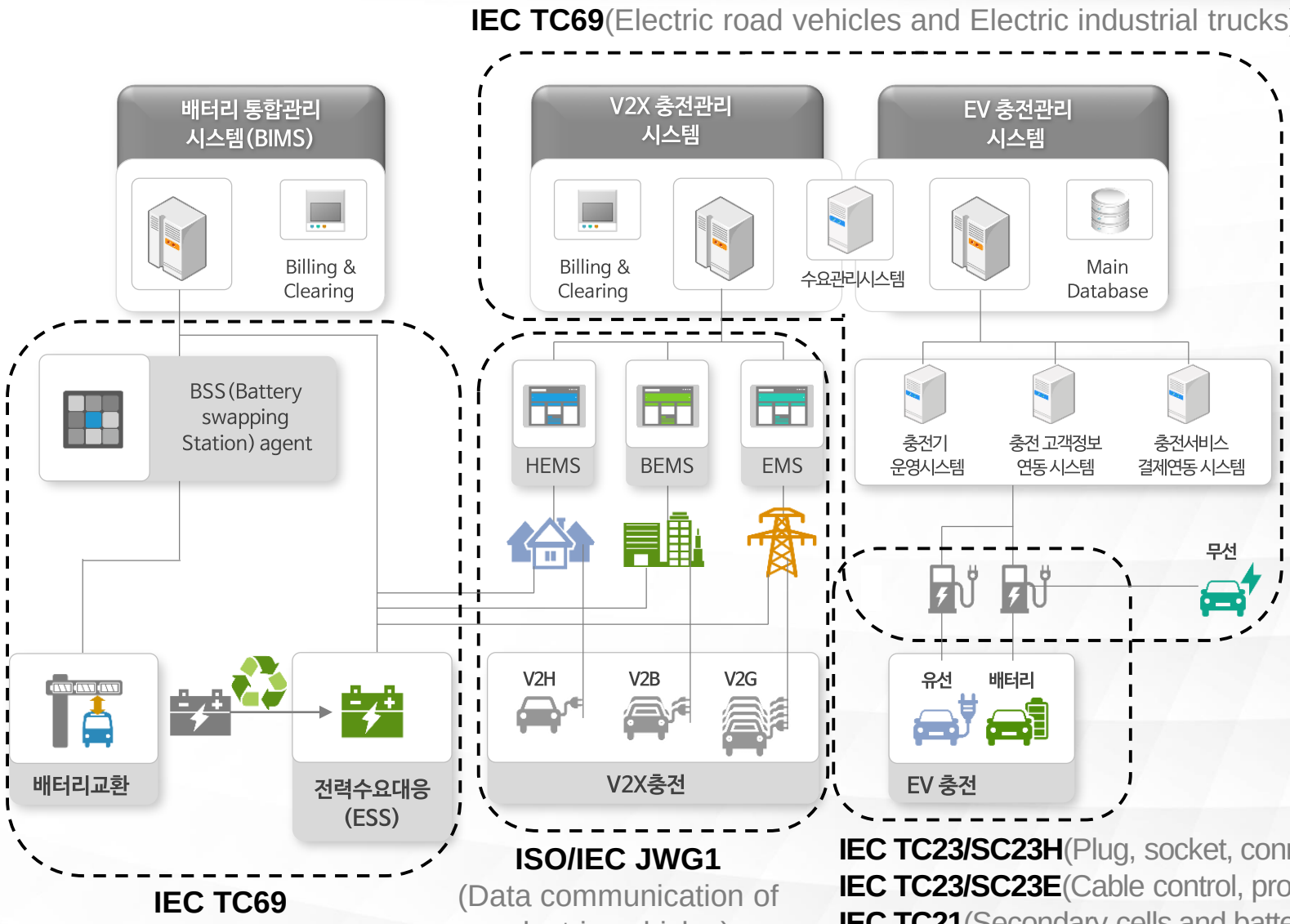
- the appearance of various stakeholders
  → **Growing complexity of market decision-making process**
- Need **a network for government policy support and industry issue discussion**

'Private-Public joint platform' for EV market's Self Sustainable Ecosystem

Category	Participants
OEMs (5개)	BMW Korea, Renault Samsung, SSangyong, GM Korea, Hyundai
EV Charging infra manufactures (6개)	Daeyoung CHAEVi, Signet EV, Ulvackorea, Entechnology, PNE systems, PSN
Other partners(6개)	Kyungshin, Grid Wiz, gloquadTech, PentaSecurity, LG innotek, LS EV
Related organization & academia (7개)	Myung gi Uni., KATECH, KTC, KTL, KSAE, KERI, KEPRI, KSGA



3.4 Configuration of EV charging infra



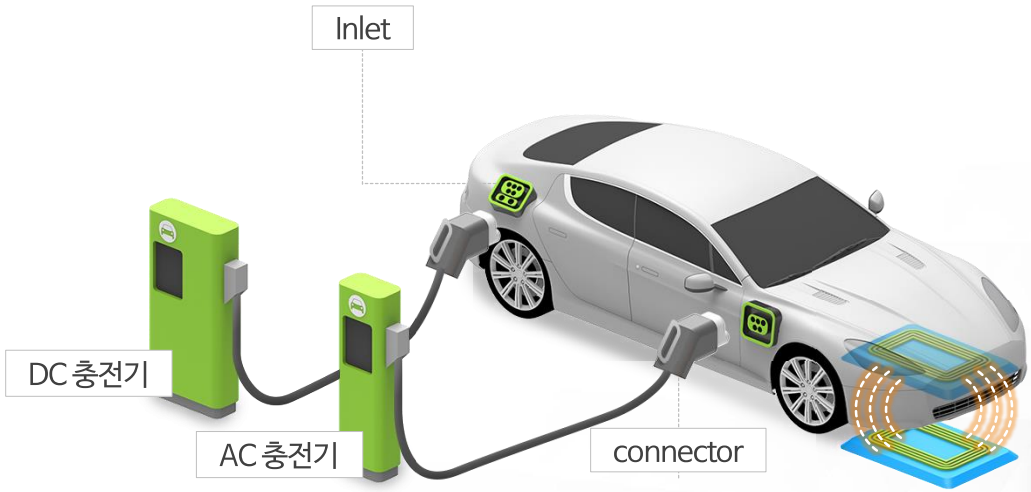
3.5 Standardization of EV charging method

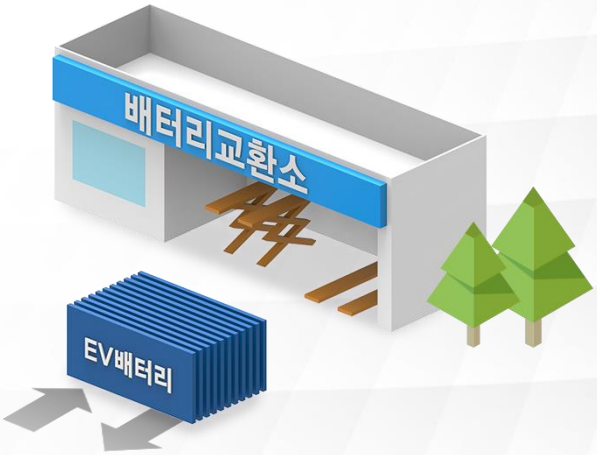
Charging Interface (IEC TC23/SC23H)

- AC connector type and interoperability ✓
- performance test method for AC/DC coupler ✓
- General requirement for AC/DC charging connector ✓

Battery SWAP (IEC TC69, TC21)

- General and Safety requirement s for Battery swap system ✓
- Battery safety requirement s





Charging System and Cable (IEC TC69, TC23/SC23E)

- Safety during EV-EVSE connection ✓
- Fast and On-board charger EMC ✓
- Charging station cable

Wireless Power Transfer (IEC TC69)

- General requirement for WPT ✓
- Communication method, information model, protocol ○
- Specific requirement for magnetic field power transfer system ○

○ Amendment/publication **in progress**

✓ Amendment/publication **completion**

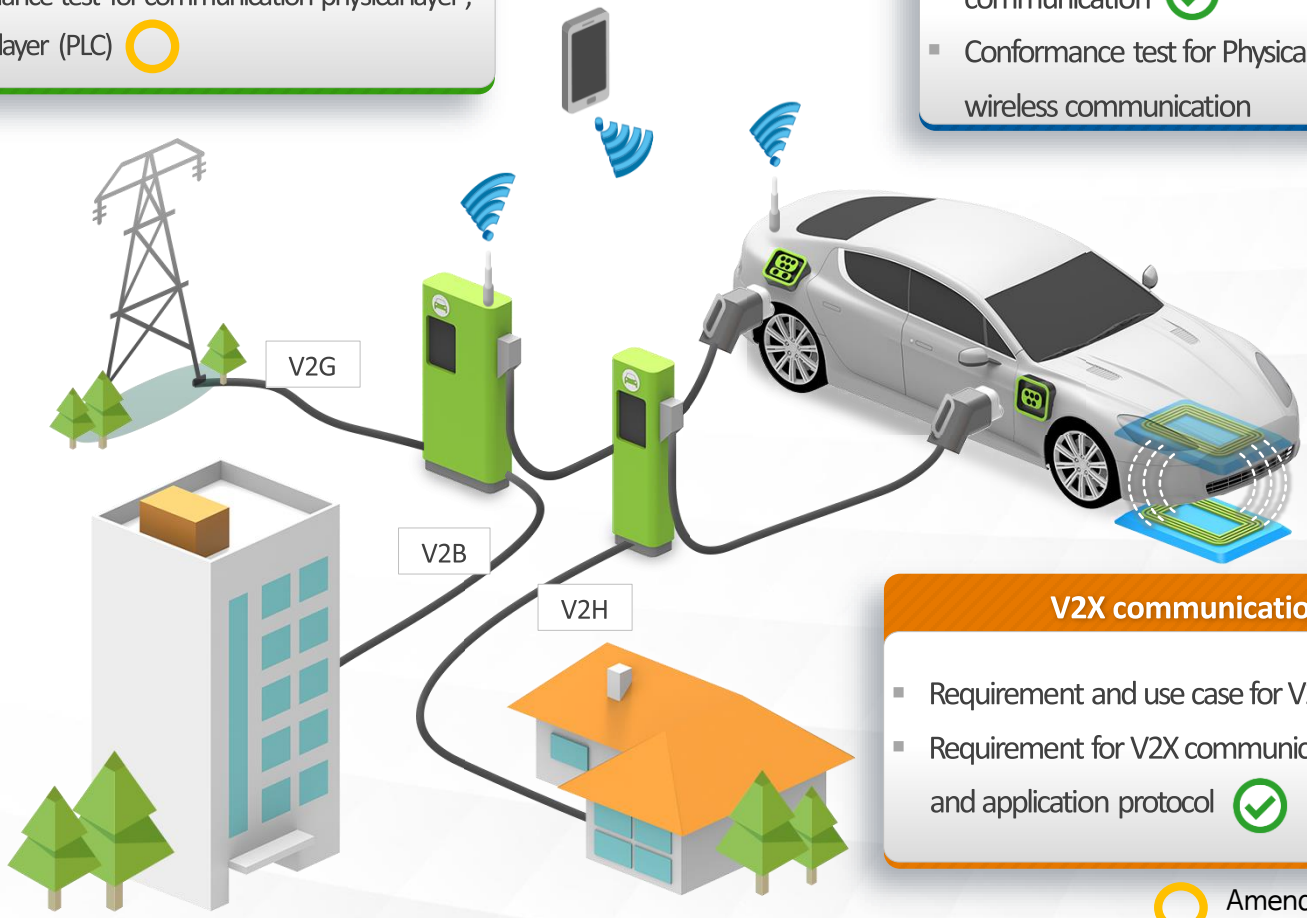
3.6 Standardization of EV charging system communication

Wire communication(ISO/IEC JWG 1)

- Conformance test for communication network and application layer communication protocol ○
- Conformance test for communication physical layer , data link layer (PLC) ○

Wireless communication (ISO/IEC JWG 1)

- Requirement for Physical and data link layer of wireless communication ✓
- Conformance test for Physical and data link layer of wireless communication



V2X communication (ISO/IEC JWG 1)

- Requirement and use case for V2X communication interface ✓
- Requirement for V2X communication network and application protocol ✓

○ Amendment/publication **in progress**

✓ Amendment/publication **completion**

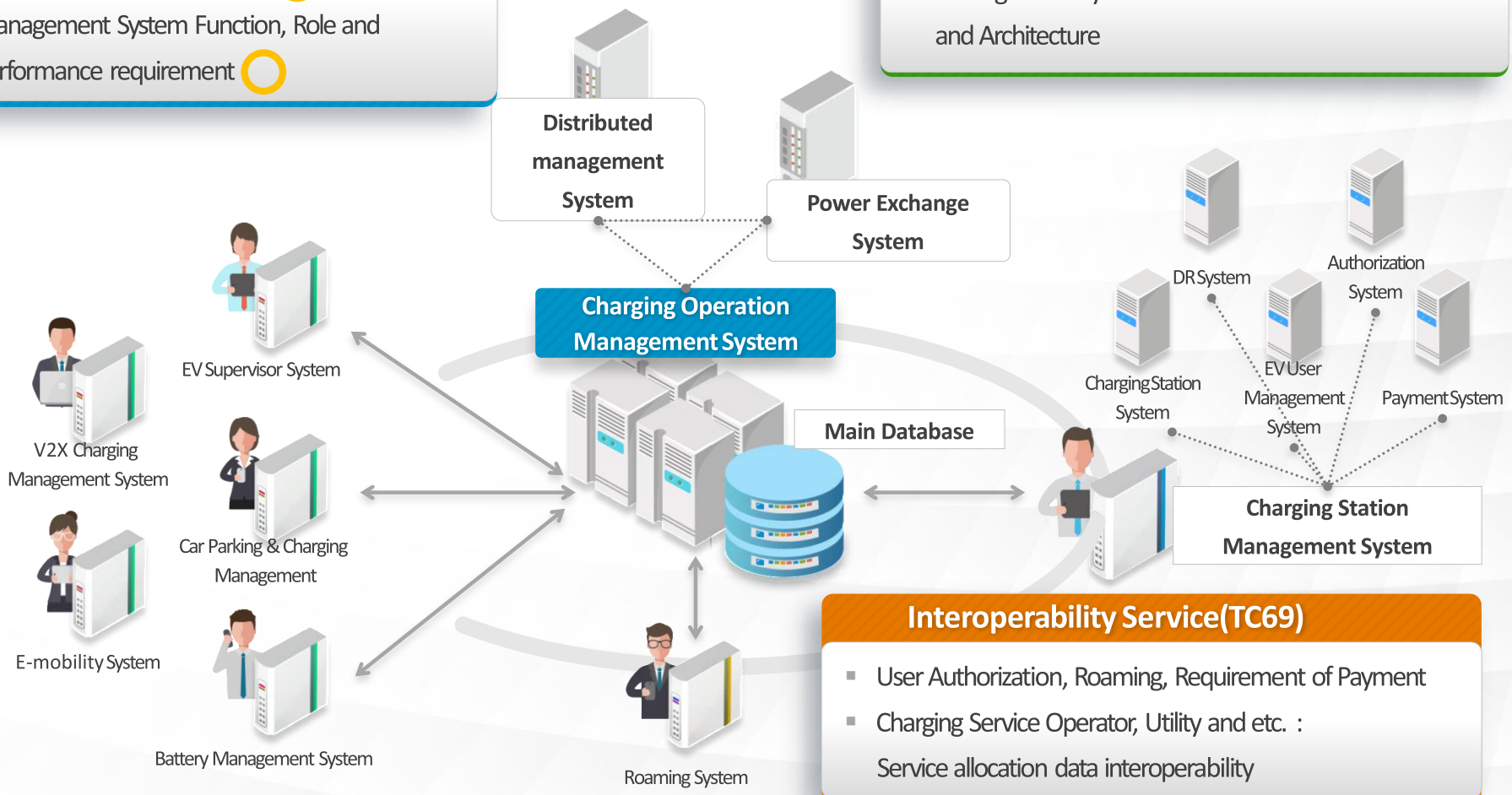
3.7 Standardization of EV charging service

Charging Service Operation(TC69)

- Charging Service Operation and Management System General Requirement ○
- Management System Function, Role and performance requirement ○

Communication information Model (TC69)

- Management System – CSO Communication Protocol
- Management System – CSO information model and Architecture



Interoperability Service(TC69)

- User Authorization, Roaming, Requirement of Payment
- Charging Service Operator, Utility and etc. : Service allocation data interoperability

○ Amendment/publication **in progress**

✓ Amendment/publication **completion**

3.8 Domestic EV-related certification

Korea Certification

전기용품안전인증

- National Compulsory Certification for Safety·Health·Environment·Quality
- certification capacity increase of domestic EV charging station (50kW → 100kW)
- revision of safety standards for the use of EV charging adaptor domestically (28 Feb. 2019)

Korea Energy Agency's high efficiency certification

고효율기자재

- high efficiency material certification for big energy-saving equipment · device
  → initial market formation and supply stimulation
- certificate issue targeting domestic EV charging stations satisfying over 94% efficiency

KEPCO's Reliability Assessment

KEPCO

- bidding after passing the test on KEPCO's standards , targeting EV charging stations supplied by KEPCO
- KERI executing a commissioned test such as EMC, Harsh Environment Testing and etc . by KEPCO GS standards

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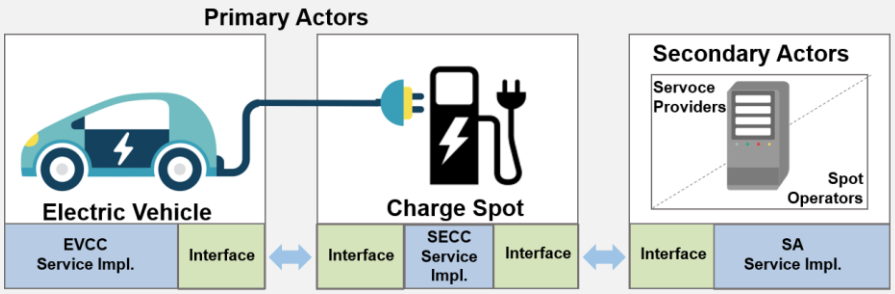
4 Future plan and Expected effects

Utilizing standards for realization of EV-related technology roadmap

Core technology development for V2G

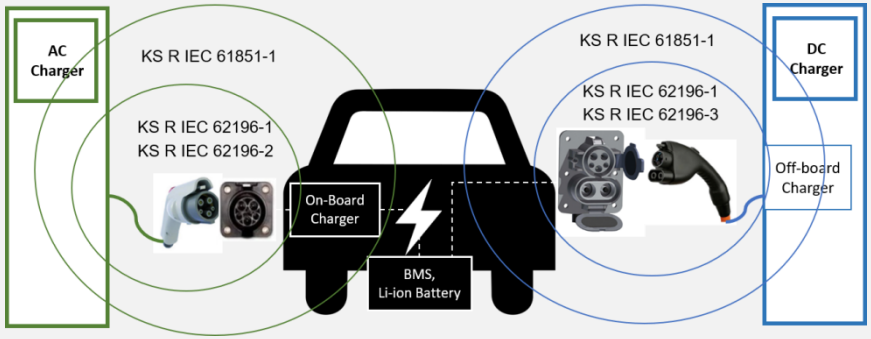
- (major standards) KS R ISO 15118, OCPP series
- (goal) providing interface technical specification for interconnection among charging station, management system and higher level
- (main content) maximizing user convenience by technology application of charging system for multi dwelling units and PnC(Plug&Charg)



< application area of ISO 15118, OCPP >

system implementation for high-capacity, high-speed charging(400kW level)

- (major standards) KS R IEC 61851, 62196 series
- (goal) providing charging interface for high-powered charger by EV battery's high capacity
- (main content) AC/DC charging interface and high-powered charging system, user safety and products interoperability



< EV charging interface, system components and standards >

Standards application for Power aggregating business

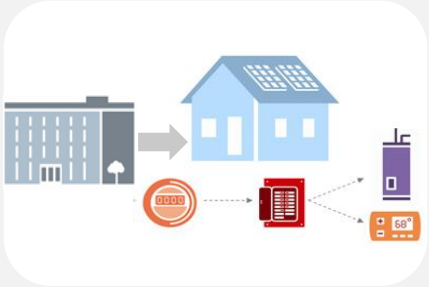
Power(renewables, ESS and EV etc.) aggregating business started in 2019

- Opening & operation of generation aggregator Market supporting electric power exchange, by connecting small generation resources to aggregators

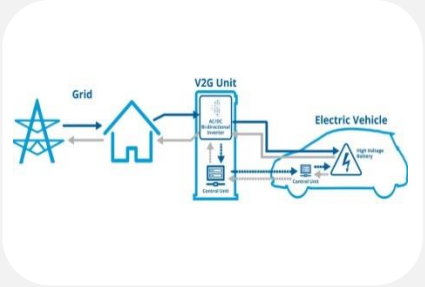
Creating test bed for new smart grid technology · service

- Peak management by utilizing EV battery for DR(Demand Response)
  - needs to develop V2X technology and design DR system with EV usage analysis
- Utilizing **Standard**(ISO/IEC 15118) and **OCPP**(IEC 63110) for foundation setup of generation aggregating business

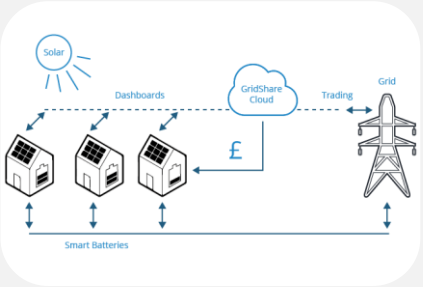
< configuration of smart grid test bed services >



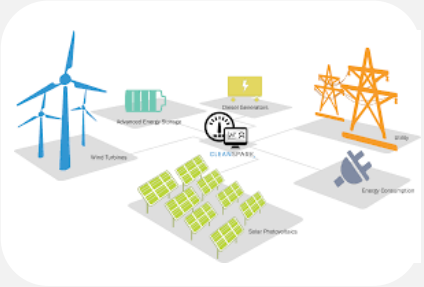
Price-based Home DR management



DR-based V2G



DER integrated generation system



Isolated micro gird

4.3 Future plan

EV-related services development

Electrical Two-Wheel vehicles	Standardization for Electrical of Two-Wheel by performance and components, and for battery sharing station setup
V2G service	V2G market operating rules and trading system setup → expansion of V2X : V2G(Home), V2D(Device)…
P2P DR	Providing incentives for energy saving - DR market participation(ex: smart appliances, V2G..)+ electric charge , energy voucher and etc.

Standardization for EV charging infra

charging interface	① performance of high-powered charging interface and national test (KS R IEC 62196) ② safety, performance and test standard of EV fast charging station (KS R IEC 61851-23)
charging system communication	① requirement and conformance test of V2G system interface (KS R ISO 15118) ② EV charging infra management system (OCPP)
charging type	① Requirements of WPT(Wireless Power Transfer) and IC-CPD (KS R IEC 61980-1, 62752) ② EMC requirements for EV on/off board charger (KS R IEC 61851-21-1,2)

Thank you!

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