사단법인 한국전기자동차협회
Korea Electric Vehicle Association

Status of Electric Vehicle in Korea

2016. 10. 19

JUNG DO YANG

Korea Electric Vehicle Association

Contents

Contents

◆ Needs of Electric Vehicle

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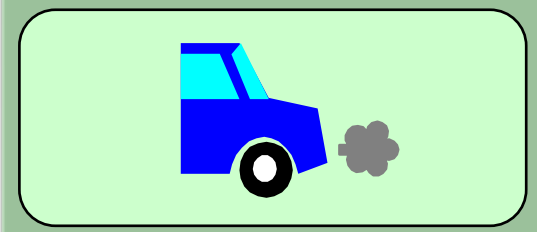
Air Pollution



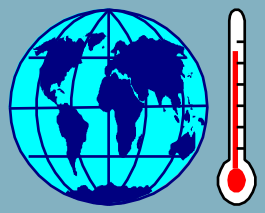
Regulation of noxious exhaust gases (HC/CO/NOx)

Reinforcement of Exhaust Control

- CARB
- EURO

obligation for the rate of zero emission vehicles introduction

Global Warming



Regulation of greenhouse gases (CO_2)

Realization of Fuel Efficiency Regulation

Driving efficiency improvement
- increased fuel-efficiency
- hybrid

High Efficiency power unit

Energy Security

Exhaustion of oil resources

Necessity of Alternative Energy

New power system
- DME, Bio-Fuel
- Electric drive
- FC

Development of alternative fuel cars

xEV (HEV / PHEV / BEV / FCEV)

◆ Background of Electric Vehicle Development

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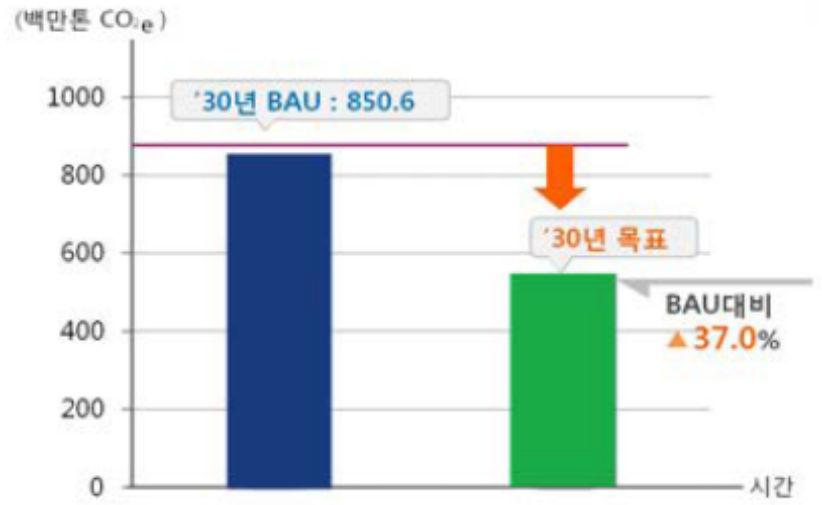
Submit "The more advanced" greenhouse gas reduction target ➡ Requires innovation of the domestic industry

37% Gas Emission Reduction Target By 2030

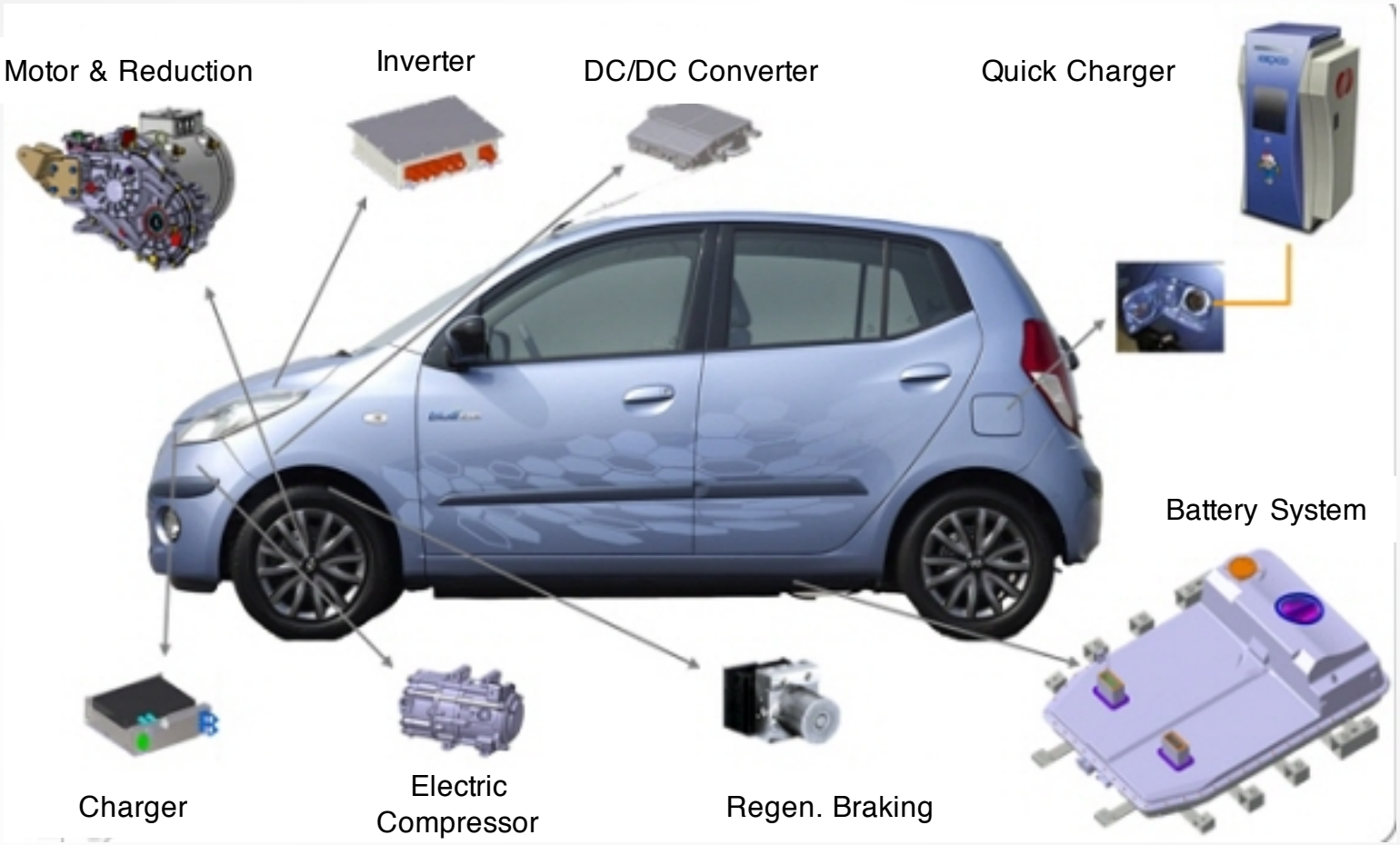
* International carbon markets 11.3%, 25.7% domestic reduction



Major Reduction Measures for Transport Sector

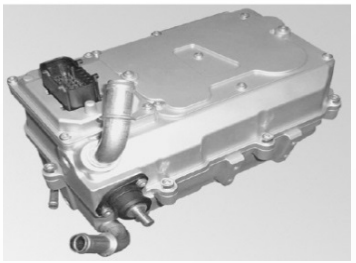
- The average greenhouse gas emission cars and fuel economy regulations
  (2015 140g/km ➡ 2020 97g/km)
- Expand Dissemination of Eco-Friendly Automotive
  (2.64% among the Automotive sales ratio of 2015 ➡ Expand to 30% on 2020)

◆ Main Parts of Electric Vehicle

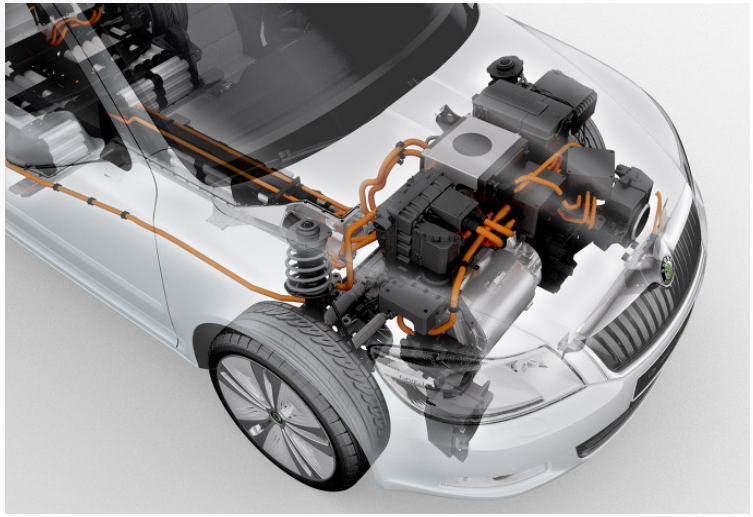


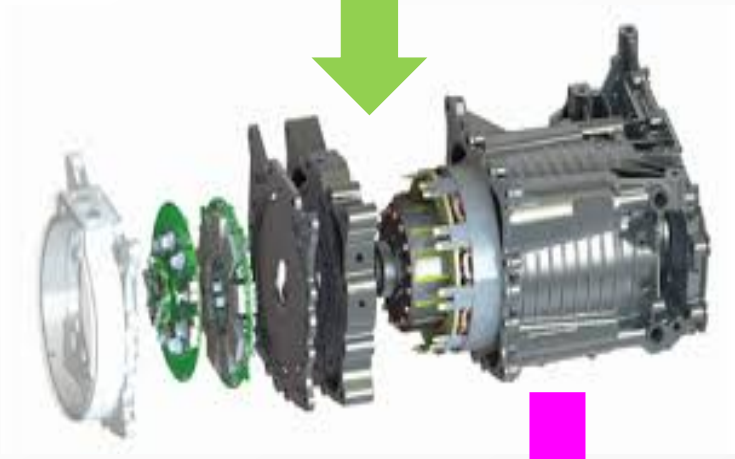
◆ Driving System of Electric Vehicle

Electric Energy



Inverter





Motor

Mechanical Energy

Gear

◆ Recharging of Electric Vehicle

Slow Charger

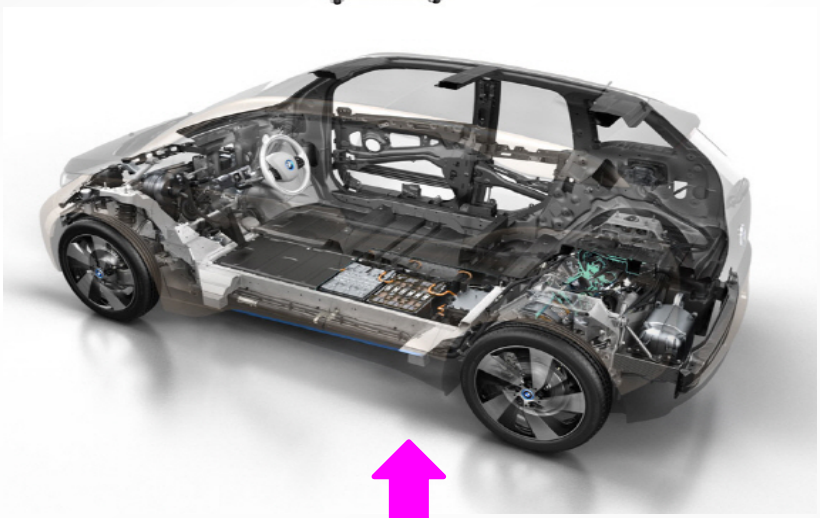
AC 220V

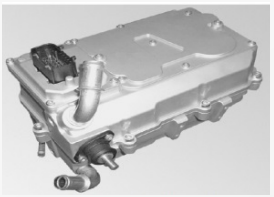
On Board Charger

Quick Charger

High Voltage DC

Battery System





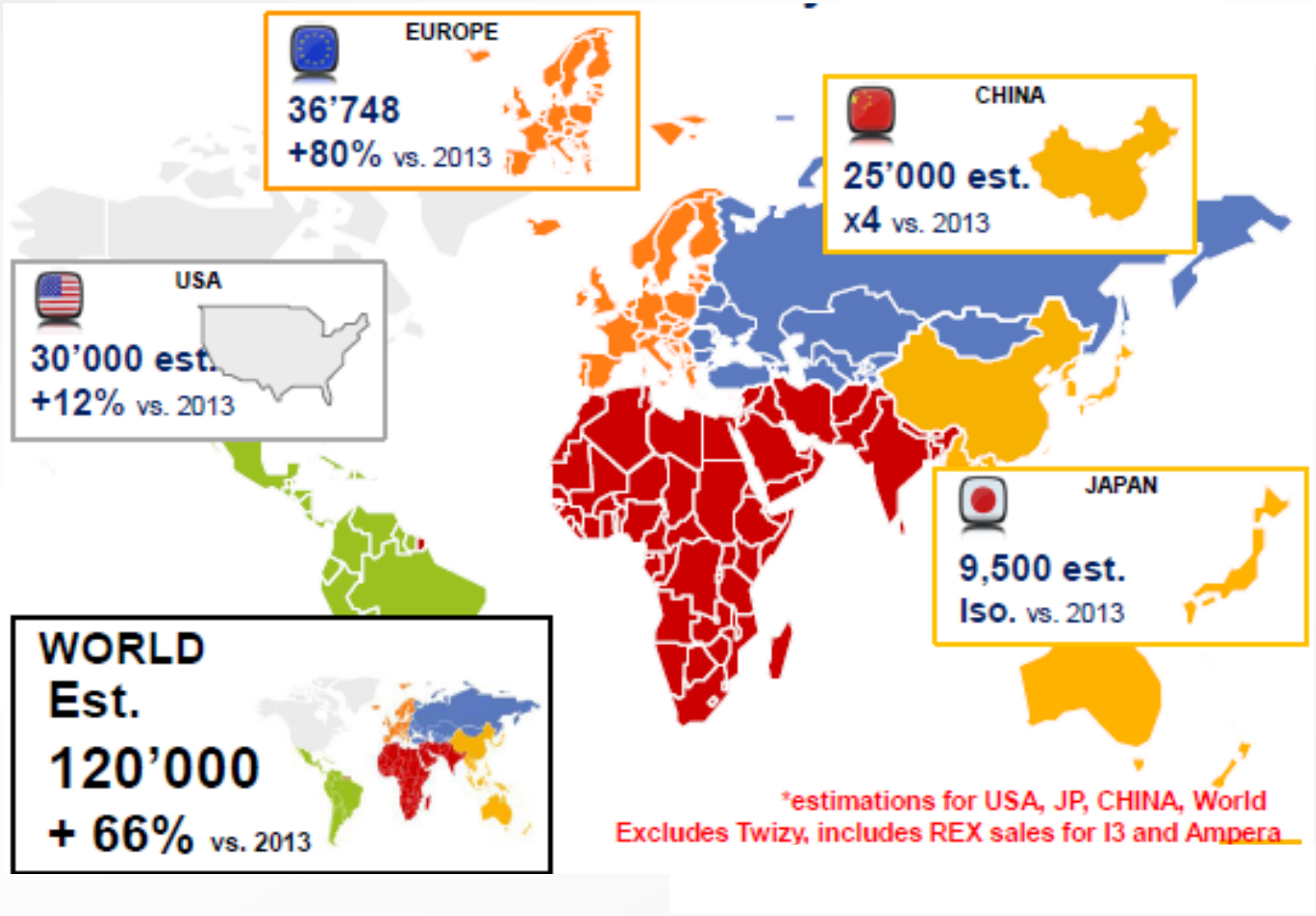
DC/DC Converter

Inverter

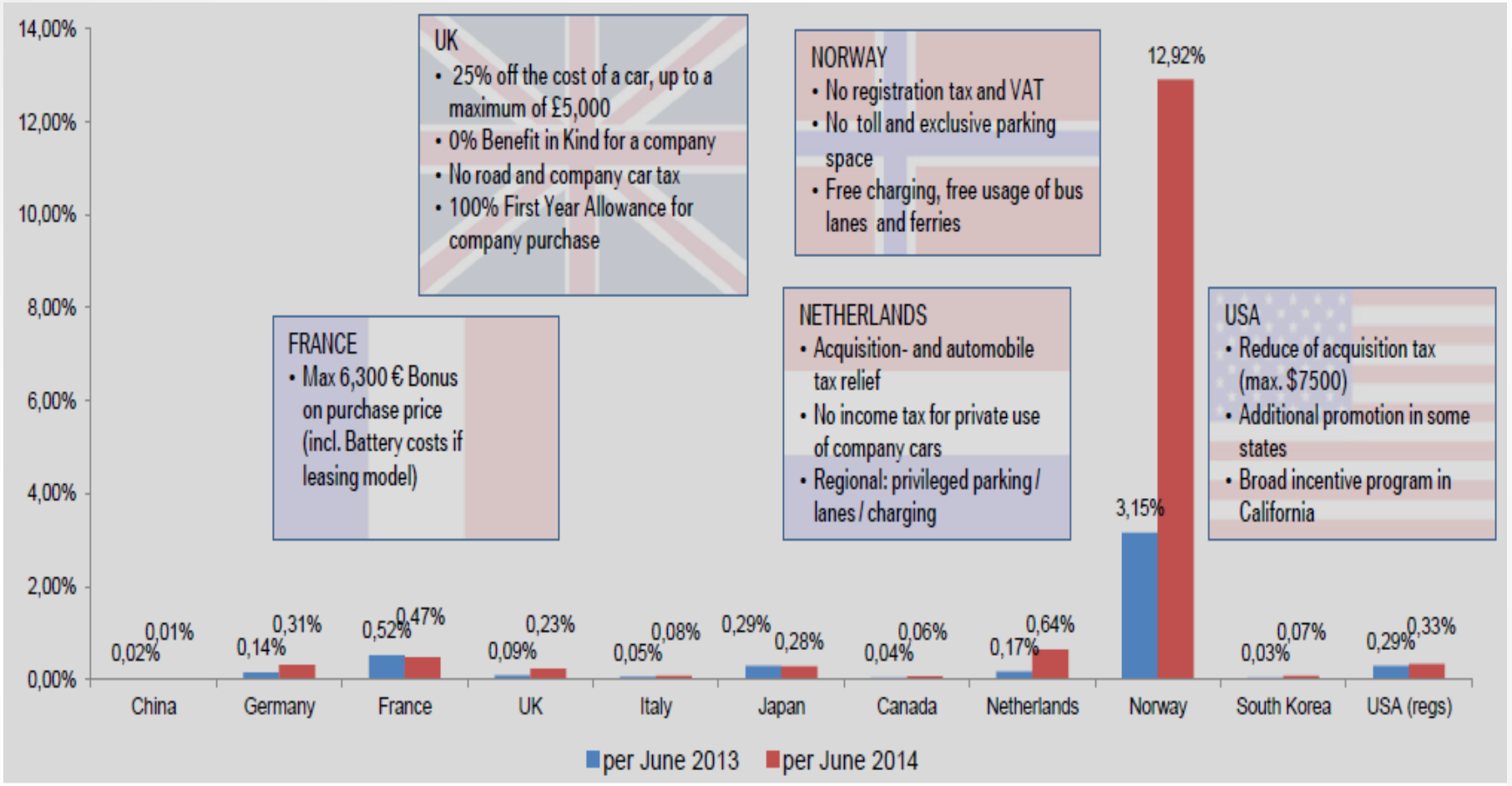
Low Voltage DC

Contents

◆ EV Market Status in the World(2014. 7.)



◆ EV Market Status & Promotion Policy



◆ Electric Vehicles in Korea

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Hyundai Ionic EV

Hyundai	EV	Ionic EV	
Top Speed	165km/h	Battery Type	NCM (Lithium-Polymer)
EV Drive Range	191km	Battery Capacity	28kWh
Motor Power	88kW	Battery Voltage	360V
Motor Torque	294Nm	Battery Charge	4.5h (220V)
Acceleration	10.2 second	MSRP	US$36,400

◆ Electric Vehicles in Korea

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Korea Electric Vehicle Association

KIA Soul EV

KIA LAY EV

KIA	EV	Soul EV	
Top Speed	120 km/h	Battery Capacity	27 kWh
Motor Power	80 kW	Battery Charge	4h (220V) Quick 33min (80%)
Motor Torque	284 Nm	EV Drive Range	148 km
Battery Type	LMO (Lithium-Polymer)	Acceleration	11.4 seconds (0-100km/h)
Battery Voltage	360V	MSRP	US$35,000

Kia	EV	RAY EV	
Top Speed	130 km/h	Battery Capacity	16.4 KWh
Motor Power	50 KW	Battery Charge	6h (220V) Quick 25min (80%)
Motor Torque	167 Nm	EV Drive Range	139 km
Battery Type	LMO (Lithium-Polymer)	Acceleration	15.9 seconds (0-100km/h)
Battery Voltage	330V	MSRP	US$39,105

◆ Electric Vehicles in Korea

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RSM SM3 EV

Renault Samsung	EV	SM3 Z.E	
Top Speed	135 Km/h	Battery Capacity	22 KWh
Motor Power	70 KW	Battery Charge	4-8h(220V) 30 min (Quick 80%)
Motor Torque	250 Nm	EV Drive Range	182 Km
Battery Type	Lithium Manganese Battery (LMO)	MSRP	US$42,255

GM Spark EV

GM	EV	Chevrolet Spark EV	
Motor Power	95.6KW	Charge Time	7h (240V) Quick 20 min(80%)
Motor Type	AC Permanent-Magnet	Drive Range	132Km
Motor Torque	542 Nm	MPGe	128/109/119
Battery Type	LMO(Laminate Cell)	Electricity Consumption	175 Wh/km
Battery Capacity	19 KWh	Vehicle Weight	1356 kg
Acceleration	7.6 seconds (0-100 km/h)	MSRP	US$34,185

◆ EV Status in Korea

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Model	Price($)	Maker	Range	Weight	Charging Time	Top Speed	Battery Capacity	Warranty
Ionic	36,400	Hyundai	191km	1,445kg	4.5hrs	165km/h	28kWh	10year, 200,000km
Soul	38,600	Kia	148km	1,508kg	4.5hrs	145km/h	27kWh	10year, 160,000km
Spark	36,200	GM	128km	1,240kg	6~8hrs	145km/h	21kWh	8year, 160,000km
i3	58,200 ~62,700	BMW	132km	1,300kg	6~8hrs	150km/h	22kWh	8year, 160,000km
SM3 Z.E.	40,900	RSM	135km	1,580kg	6~8hrs	135km/h	22kWh	8year, 160,000km
Ray	31,900	Kia	91km	1,185kg	6hrs	130km/h	16.4 kWh	8year, 160,000km

◆ Dissemination Status of Electric Vehicle

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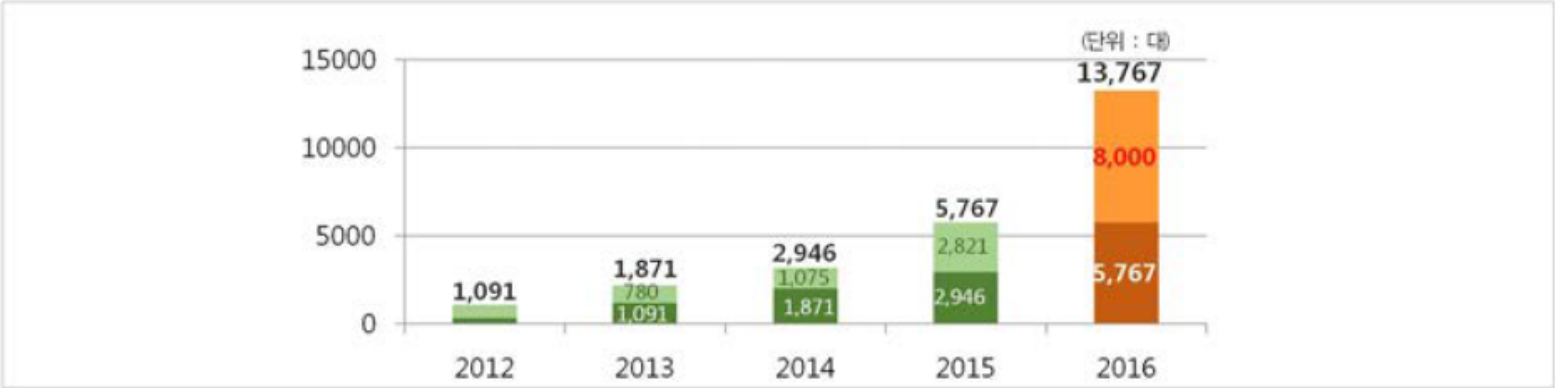
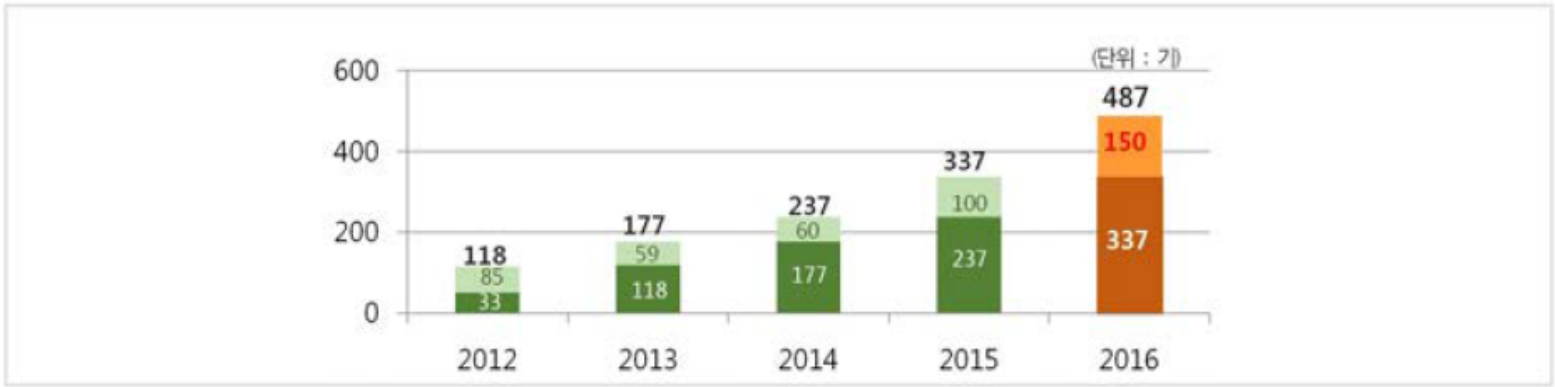
5,767 vehicles, Public Rapid Charger Facilities 337 units(end of 2015)

Electric Vehicle Registration Trend



Rapid Charger Installation Status



◆ Roadmap of Electric Vehicle

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Strategy

Build "EV Commercialization Era" foundation through EV Charging facility expansion, technology development and facilitating the participation of private sectors

Policy Target

Items	2014	2015	2016	2017	2018	2019	2020
EV	3K	6K	16K	46K	86K	136K	200K
Rapid Charger	232	432	532	632	830	1,000	1,400
Range	160	200	230	230	270	270	300

Projects

- Core Technology Development
- Expand Vehicle Dissemination
- Increase Charging Facilities
- Promote Private Sector Participation

◆ Policy for Expanding Electric Vehicle Supply

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- **(Subsidy)** Increase the subsidy amount to lessen the burden when purchasing EV ($10,800 → $12,600) – Expansion of tax reduction through the agreement with local government (Acquisition Tax, Urban Railroad Purchase Bond)

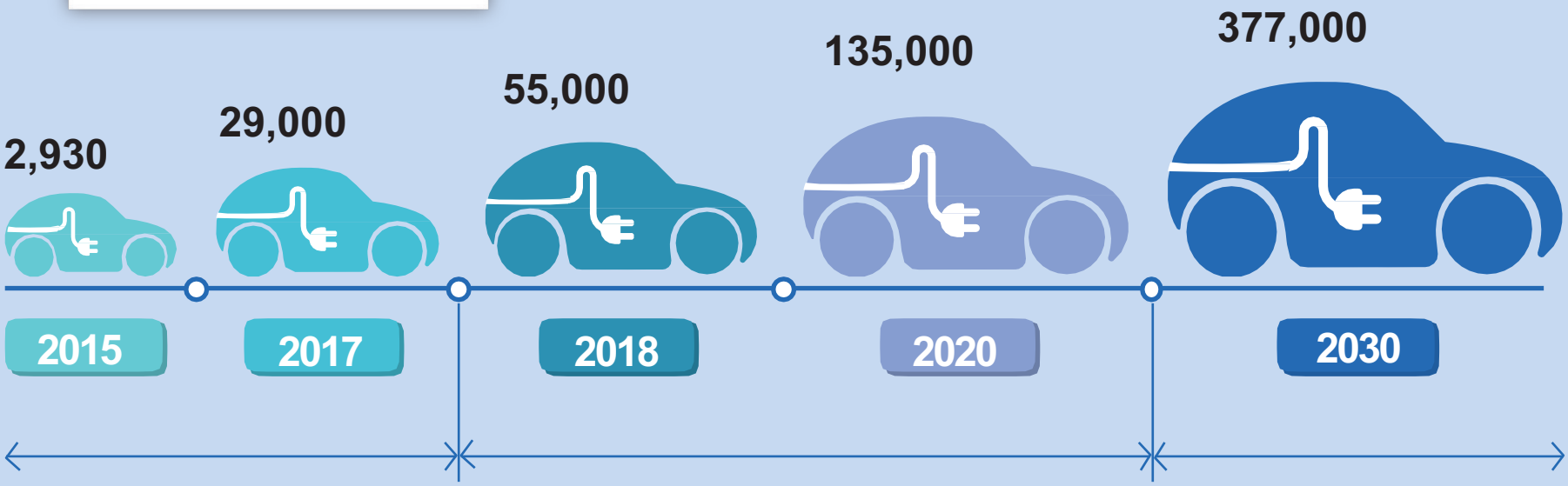
- **(Toll Fee)** Discount of toll fee and parking fee
  - (Nationwide) Mandatory for more than 50%, 1hr free charging in Seoul (Oct~), 100% free of charge in JEJU

- **(Exclusive Plate No. for EV)** Create exclusive insurance to lessen the burden of the EV insurance fee (twice of ordinary ICE vehicle) and apply exclusive plate number to distinguish electric vehicle (end of 2016)

- **(Freeway Drive)** Review to allow the temporary using Bus Exclusive Lane in Freeway.

- **(Public Offices)** Expand the portion of EV purchase rate to 40% from 20% (June 2016~)

◆ Roadmap of EV in JEJU



◆ Development Status of Electric Vehicle

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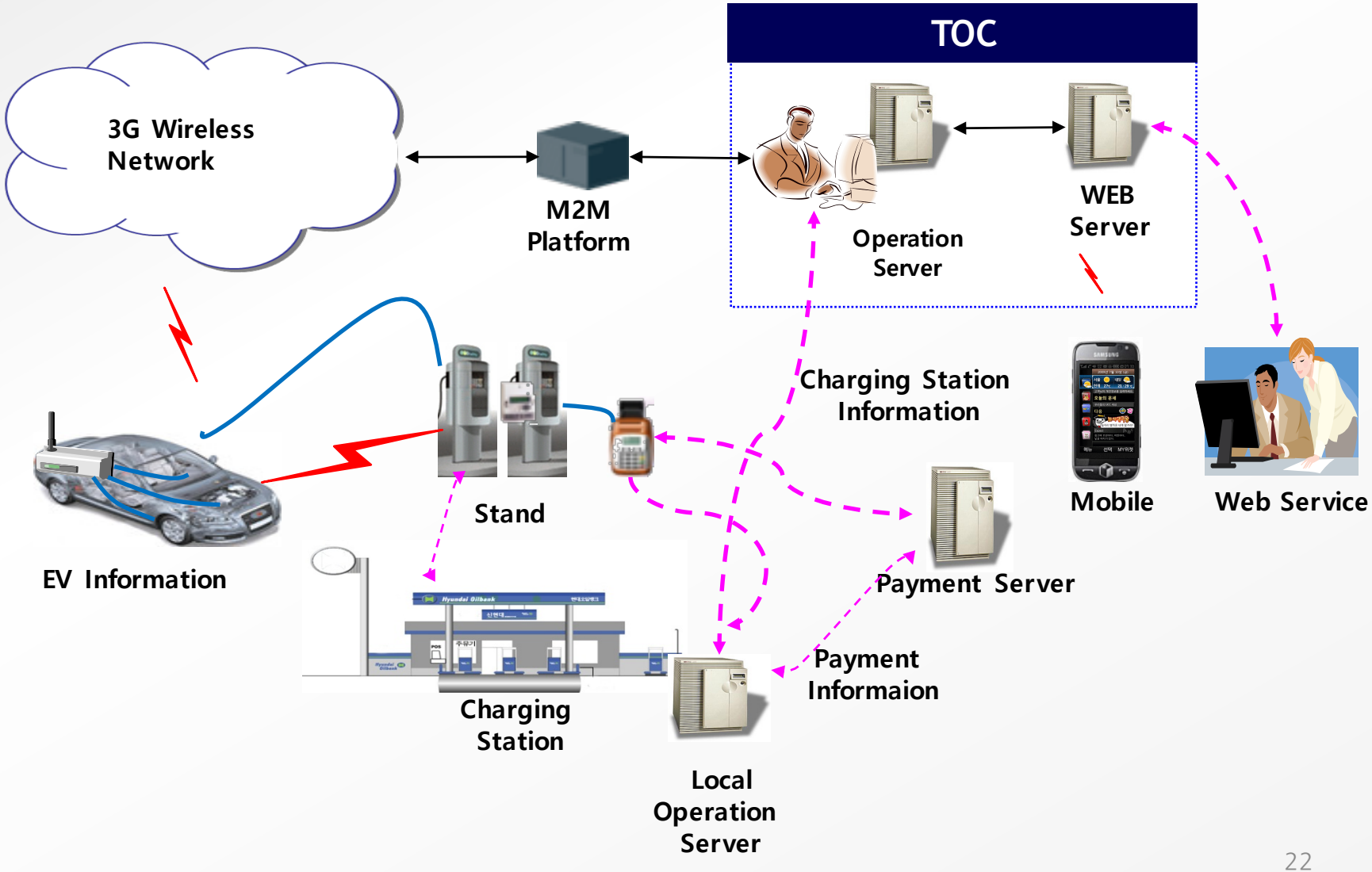
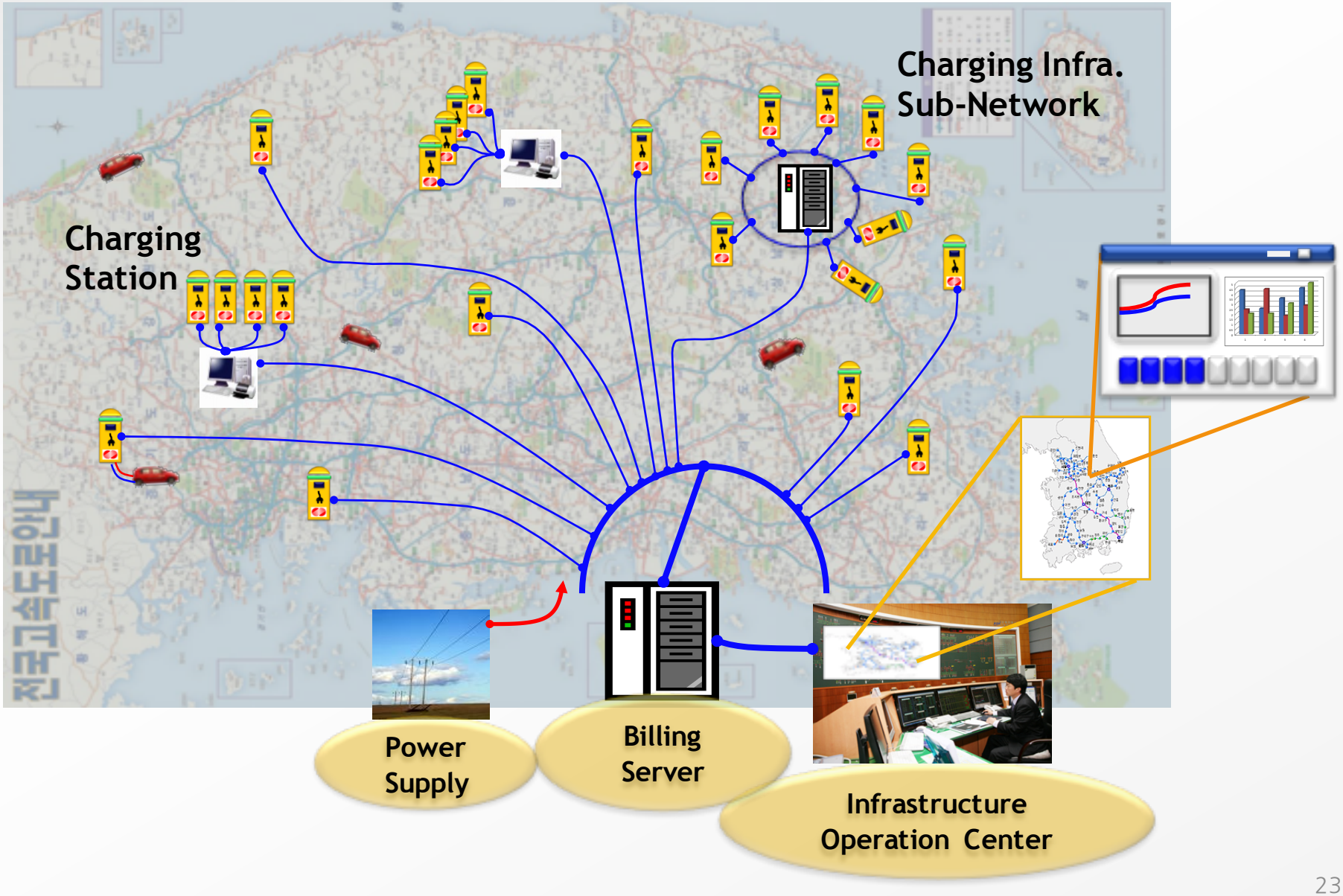
Manufacturer	Nissan	Ford	Tesla	Chevrolet	Tesla	BMW
Vehicle	 LEAF	 Focus EV	 Model X	 Bolt	 Model 3	 i5
Mileage(a single full charge)	172km	122km	370km	322km	322km	124km
Battery capacity	30kWh	23kWh	85kWh	60kWh	50kWh	20kWh
coming	2016	2016	2016	2017	2017	2017
Manufacturer	**Audi**	**Jaguar**	**Porsche**	**Peugeot**	**Apple**	**VW**
Vehicle	 Q6 E-tron quattro	 EV-Type	 Mission E	 Fractal	 Apple Car	 BUDD-e
Mileage(a single full charge)	500km	483km	500km	450km	500km	600km
Battery capacity	95kWh	Not yet confirmed	Not yet confirmed	30kWh	Not yet confirmed	101kWh
coming	2018	2018	2019	2019	2020	2019

Contents

◆ Concept of EV Charging Infrastructure

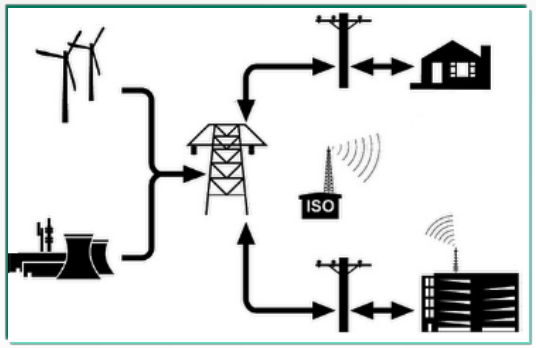


◆ EV Charging Infrastructure



◆ Fast Charger for EV

Power Grid



Electric Vehicle

☞ 80%SOC Charging: 0.5hr

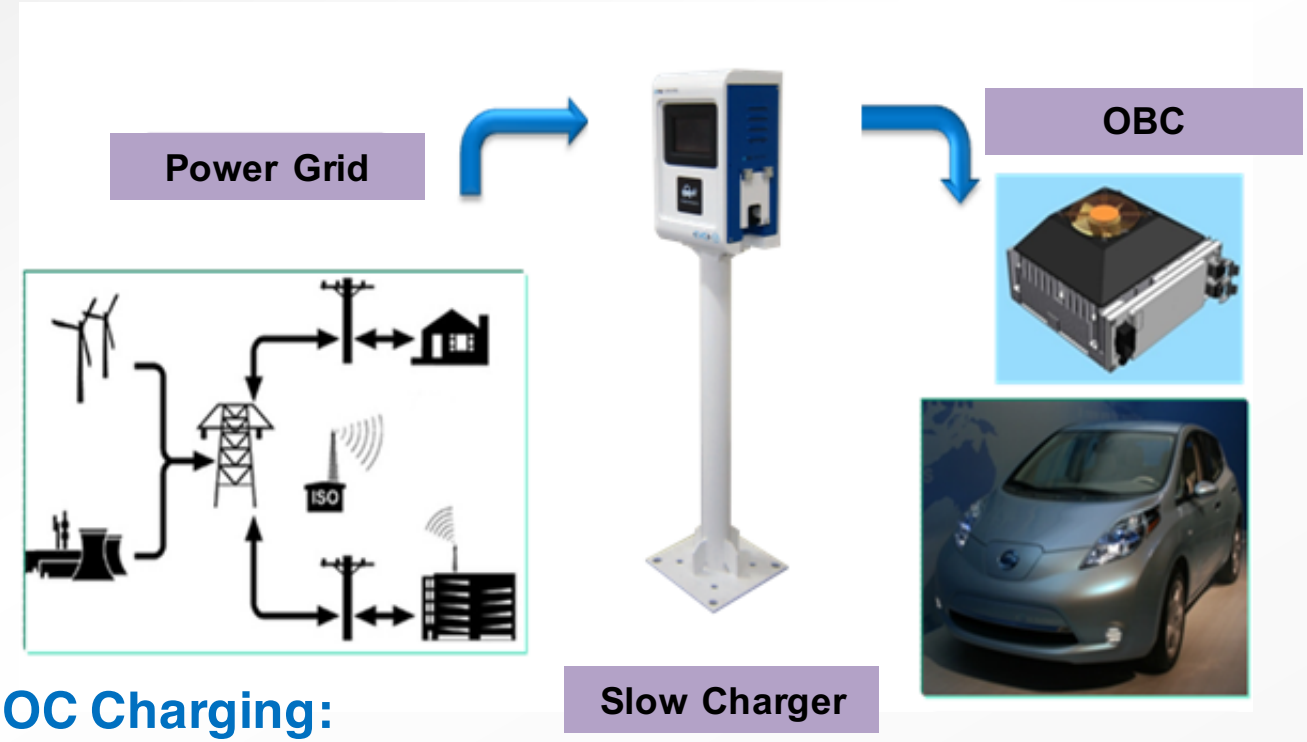
- ▹ Power : 50~500VDC, Max. 50kW/100kW
- ▹ User Identification
- ▹ Power Metering & Billing
- ▹ Communication with Vehicle: CAN
- ▹ Communication with Operation Center: Wireless Com.(CDMA)

◆ EV Fast Charger(50kW)

[Specifications]

Item	Spec.
Input	56kVA. 3Ø, AC380V±10%[60Hz]
Output	50kW. DC 50~500V, Max 125Adc
Power Factor	>0.95
Voltage Accuracy	±1%[Full Scale]
Current Accuracy	±1%[Full Scale]
Max. Efficiency	>92%
I THD	<5%
User Interface	7” Touch Screen, Button, RFID
Operating Temp.	-10 ~ 50℃
Safety Control	OV, OC, OT, Short-Circuit Protection, etc
Connector Type	CHAdeMO, Combo Type 1, Combo Type 2

◆ Slow Charger for EV



☞ 100% SOC Charging: 4~5hr

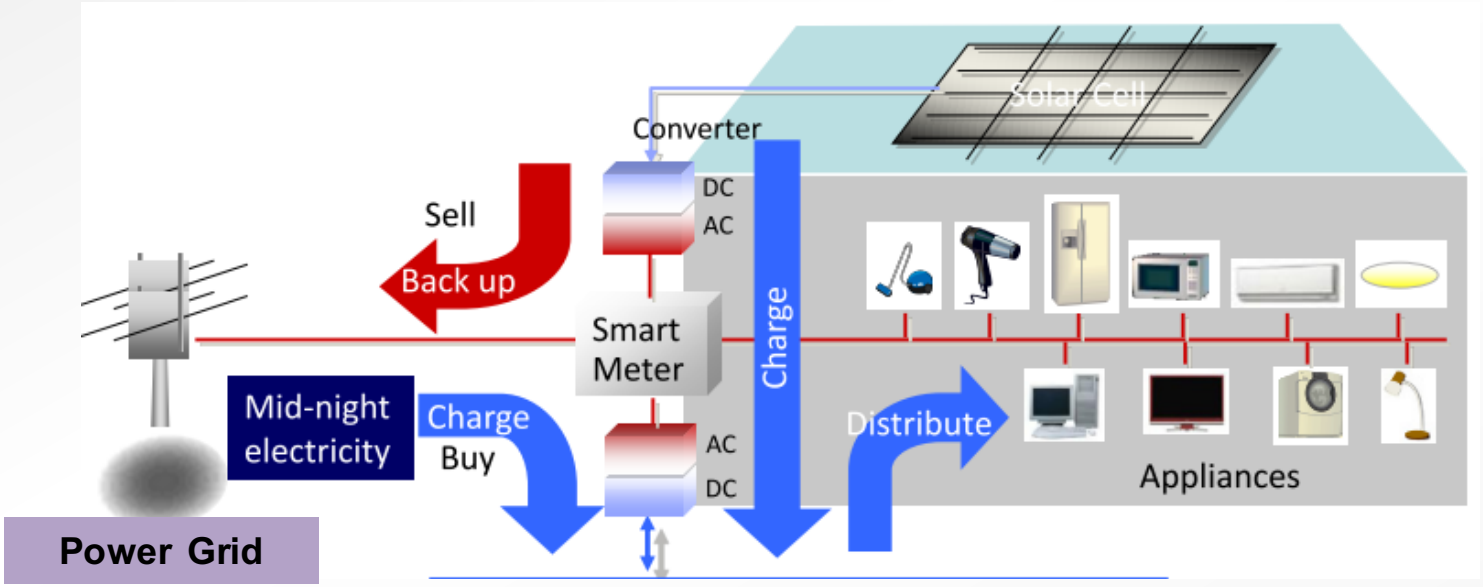
- ▹ Power: 1Ø AC220V (50/60Hz), 35A (7.7kVA)
- ▹ User Identification
- ▹ Communication with Operation Center: Wireless Com.(CDMA)

◆ EV Slow Charger(7.7kW)

[Specifications]

Item		Specifications
General	Size	W350 * D165 * H1460
	Display	7" Touch Screen
Electrical Characteristic	Input	1Ø, AC220V [60Hz] Max. 35A. 7.7kVA
	Output	1Ø, AC220V [60Hz]. 7kW
	Power-meter Accuracy	±1.0%
	Insulation Resistance	5MΩ@500V
Environment	Operating Temp.	-10°C ~ 50°C
	Operating Humidity	<RH95%
Safety Control	Over Voltage	Automatically Stop
	Over Current	Automatically Stop
	Short-Circuit	Automatically Stop
Connection		SAE J1772

◆ Home Charger for EV



☞ 100% SOC Charging: 4~5hr

▷ Power: 1Ø AC220V (50/60Hz), 15A (3.3/7,7kVA)

▷ Communication with Home Energy Management System

◆ EV Home Charger(7.7kW)

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Korea Electric Vehicle Association

[Specifications]

Item		Specifications
General	Size	L332 * W332 * D155
	Display	LED
Electrical Characteristic	Input	1Ø, AC220V [60Hz] Max. 35A. 7.7kVA
	Output	1Ø, AC220V [60Hz]. 7kW
	Insulation Resistance	5MΩ@500V
Environment	Operating Temp.	-10°C ~ 50°C
	Operating Humidity	<RH95%
Safety Control	Over Voltage	Automatically Stop
	Over Current	Automatically Stop
	Short-Circuit	Automatically Stop
Connection		SAE J1772

◆ Electricity Fee for Electric Vehicle

▶ 저압전력 기본요금 : ₩2,390/kW

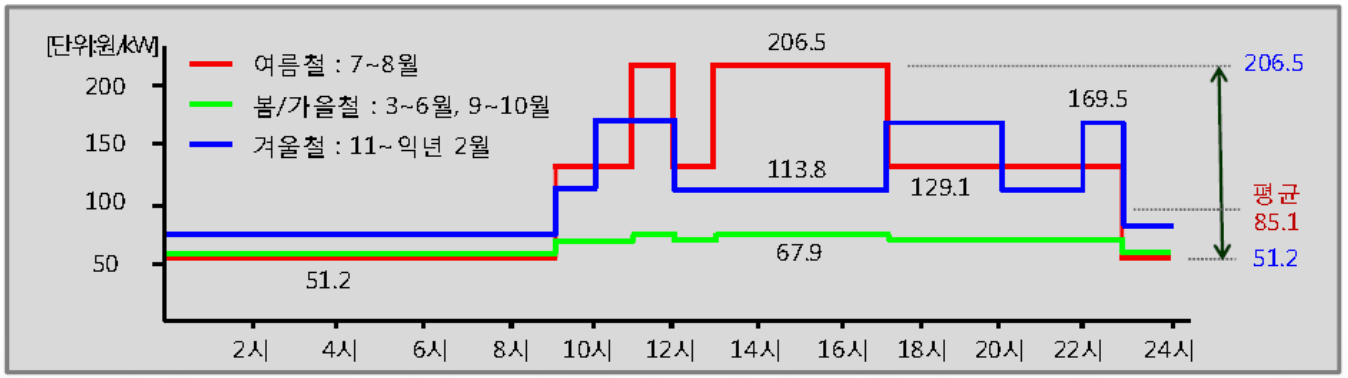
▶ 고압전력 기본요금 : ₩2,580/kW

- 30kW 공급 계약 시 기본요금 : ₩71,700@저압 / ₩77,400@고압(월)
- 50kW 공급 계약 시 기본요금 : ₩119,500@저압 / ₩129,000@고압(월)

전기차 충전전용요금제도 제정

- **한전이 충전사업자에 공급하는 전력원가** 수준의 전기요금임(누진제 없음)
  ※ 충전사업자는 충전기 구축원가, 운영비용을 합산한 서비스요금을 고객에게 부과
- 주간시간대 충전부하를 야간으로 옮기기 위하여 **시간대별/계절별 차등요금제 적용**

['10.7.30 전기차 충전전력 요금 신설]



※ 충전요금제 신청없이 가정내 충전할 경우, 누진제로 요금과다 청구 예상

Contents

◆ EV Charger Installation & Operation Status

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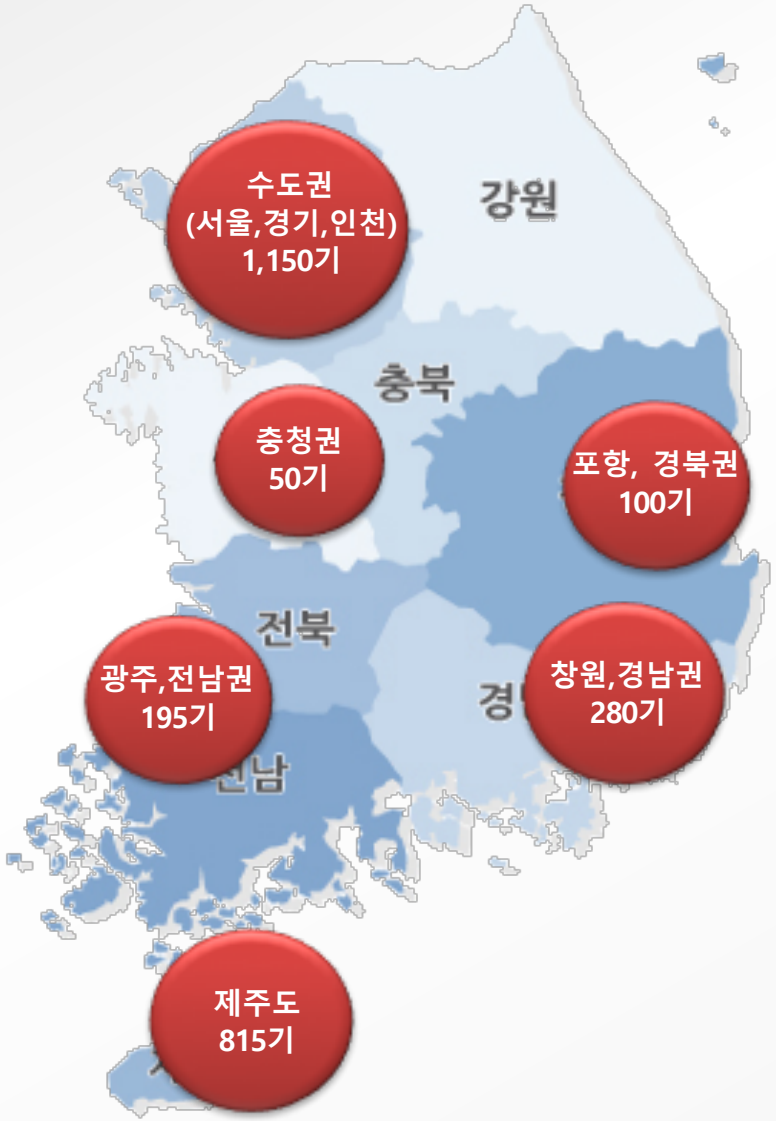
Korea Electric Vehicle Association

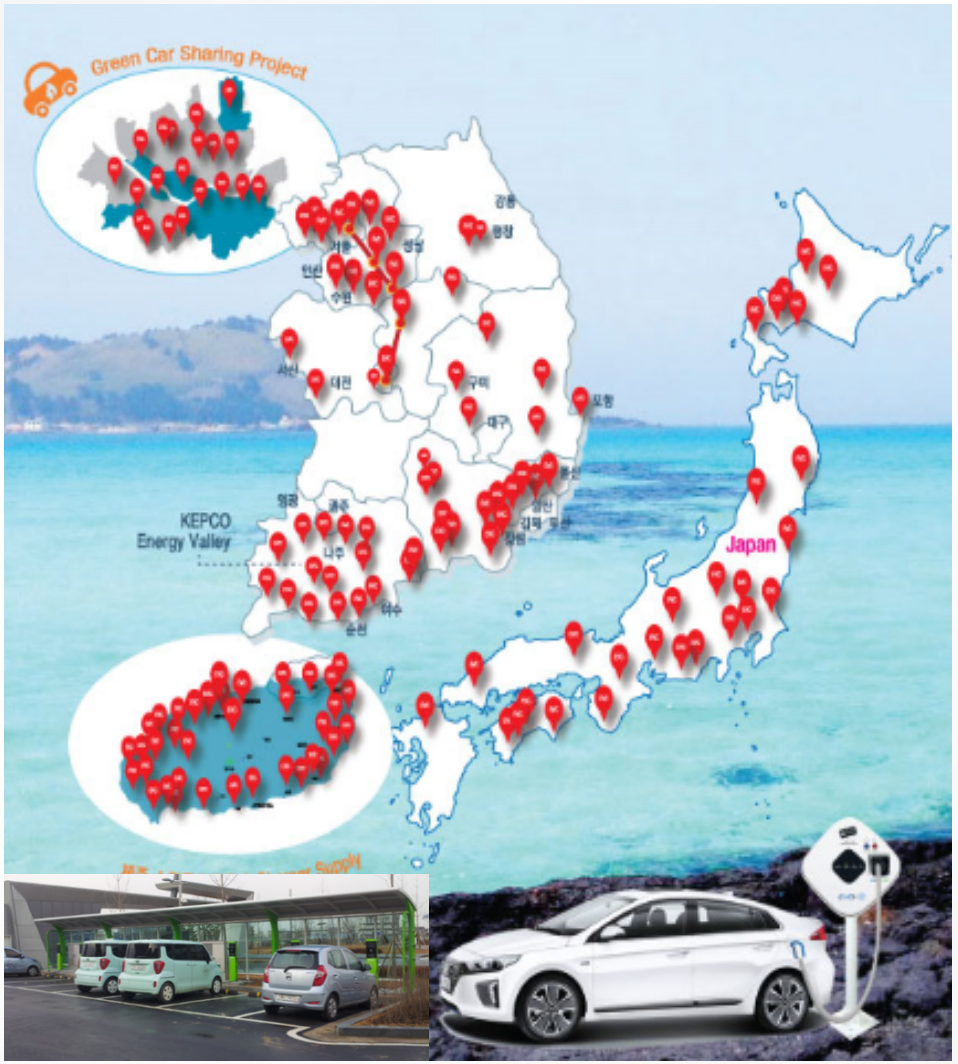


(2015. 12.)

Slow: 3,200sets

Fast: 337sets

◆ EV Charger Installation & Operation Status



◆ Roadmap of EV & Charger in Korea

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Korea Electric Vehicle Association

(Unit: set)

Item		2014	2015	2016	2017	2018	2019	2020
EV	per year	1,000	3,000	10,000	30,000	40,000	50,000	64,000
	Accu.	3,000	6,000	16,000	46,000	86,000	136,000	200,000
Fast	per year	60	100	150	150	193	170	400
Accu.		237	337	487	637	830	1,000	1,400
Slow Charger		1,170	2,940	9,800				

Muchas gracis!

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