

Electric Vehicle and E-mobility Policy Trend in Korea and other Countries

May 03, 2023



KEVA
Korea Electric Vehicle Association

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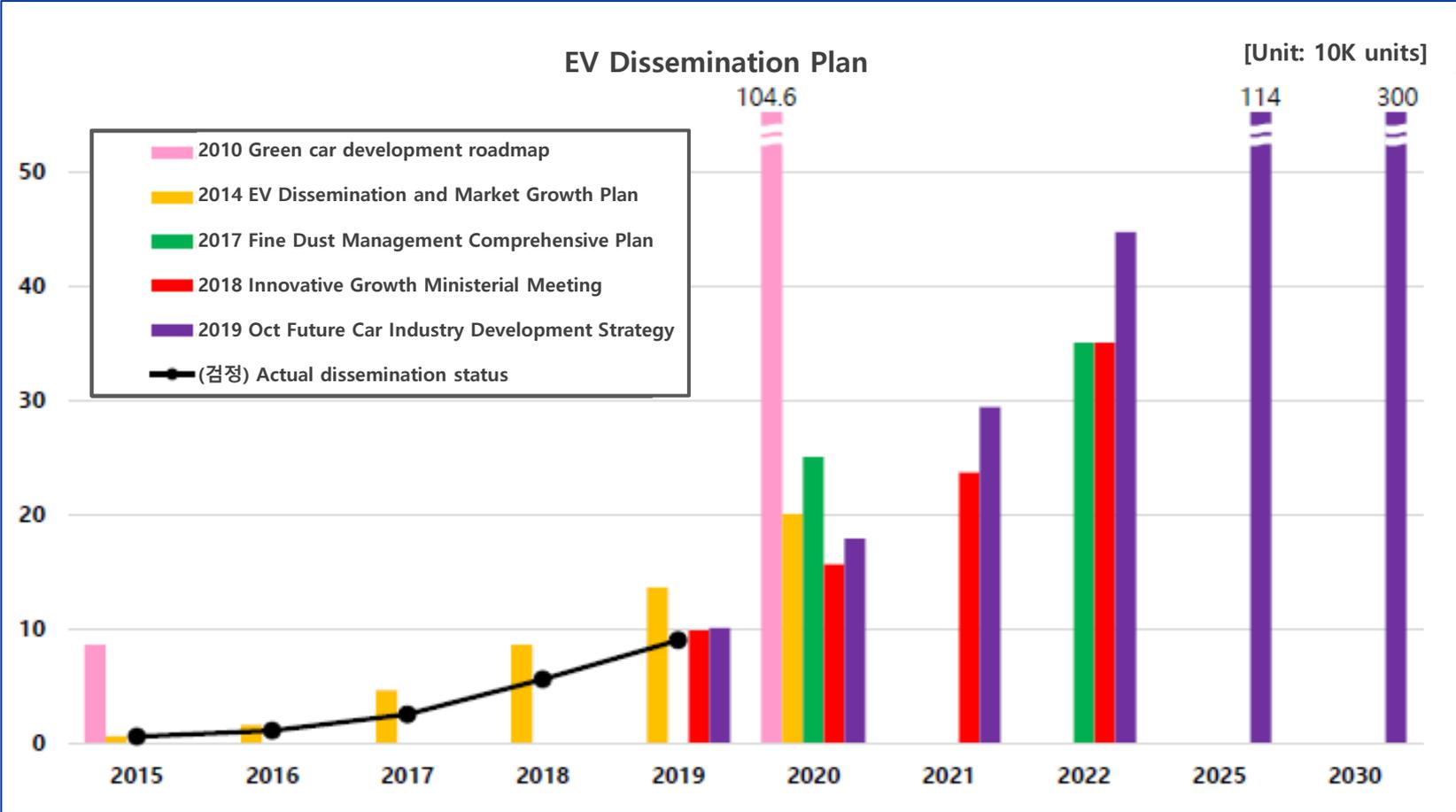
Micro EV
trend in
Korea and
Southeast
Asia

I

EV and Charging Station Infrastructure Dissemination Policy in Korea

EV Dissemination Plan

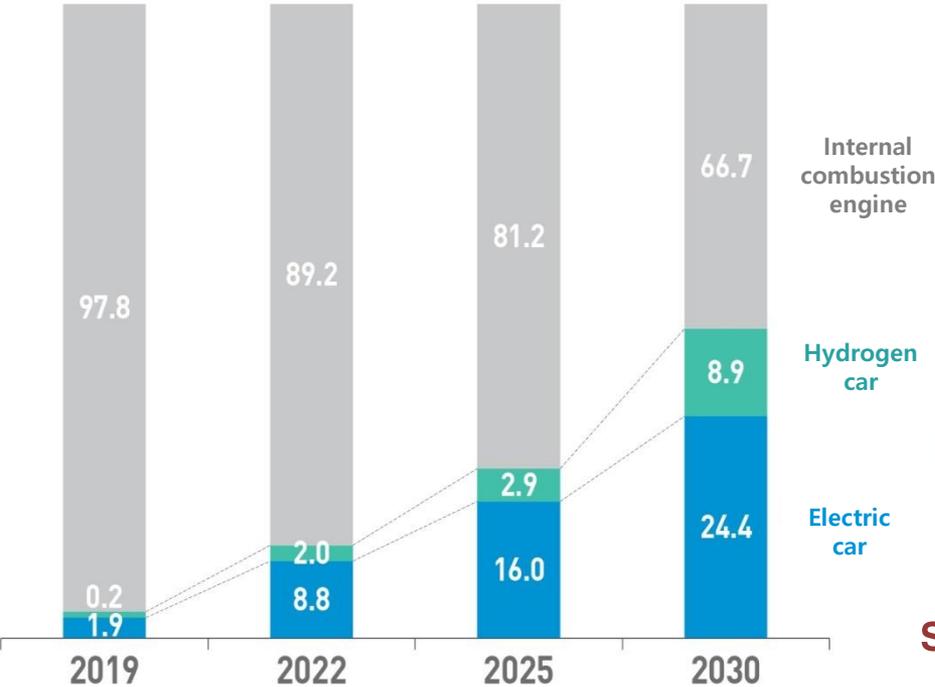
Korean New Deal Comprehensive Plan(July, 2020)
EV Dissemination Goal: 433K units (by 2022), 1.13 mil (by 2025)



EV Dissemination Plan

The era of EV will begin in earnest in 2022 (over 10% of new car sales)

(Unit : %)



Accumulated sales target of electric and hydrogen cars

	~2019	2022	2025	2030
 EV	91K	433K	1.13 mil	3 mil
 Hydrogen	5K	67K	200K	850K
 Sales Ratio	2.2%	10.8%	18.9%	33.3%

Effectiveness of EV Dissemination Policies

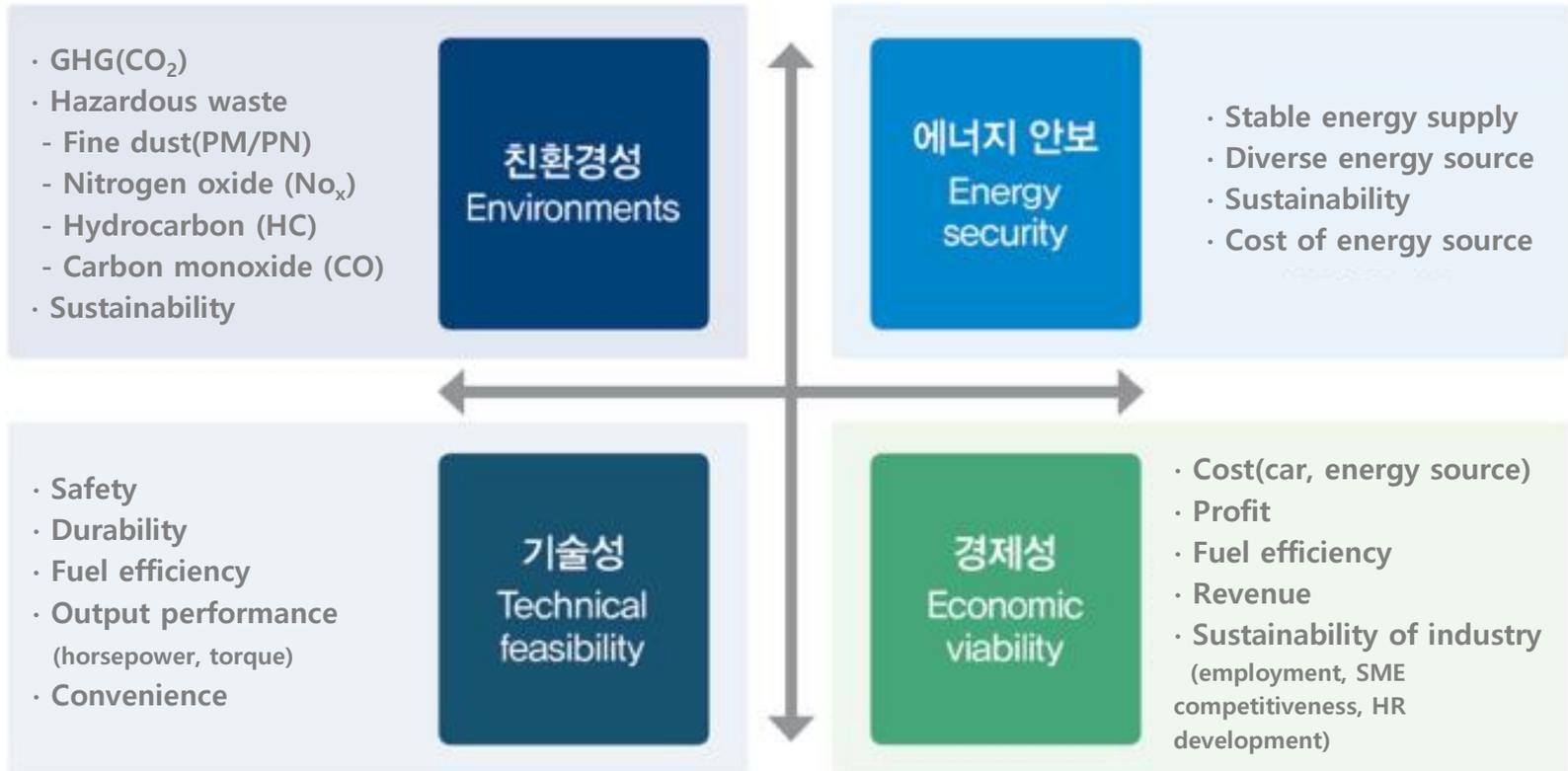
Category	EV purchase promotion	Ease of execution	Cost-effective administrative fee	Consistency with other policies
Mandatory sales of EV				
Ban of internal combustion engine sales				
Public and private institutions procurement system				
EV purchase subsidy				
Tax cut when purchasing EV				
Tax cuts for corporate EVs				
Tax cuts for EV ownership				
EV free parking benefits				
Benefits of using exclusive bus lanes				
Support for charging infrastructure installation				

Legend Low = 1 Middle = 2 High = 3

Source : Ecologic Institute(Berlin), Measures for the promotion of electric vehicles, 2019

Considerations for Implementing Govt Policies

When presenting a roadmap or developing a policy, different factors should be compared and their effect to each other should be analyzed comprehensively.



II

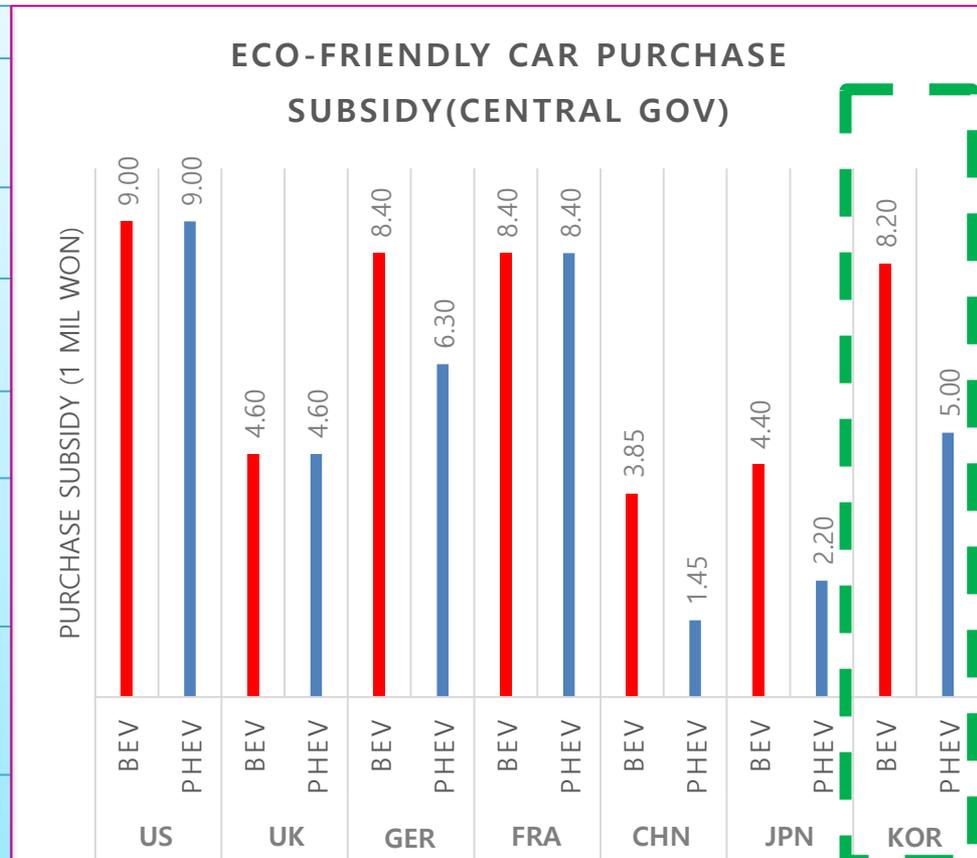
EV Dissemination Policy in Major Countries

Comparison of subsidies for eco-friendly cars in major countries (Central gov't)

Subsidy _ depends on classification of passenger cars and vans, fuel efficiency, and driving range(for passenger cars)

Govt subsidies up to 8.2 million won. Local govt subsidies 4-10 million won (as of 2020)

Categ	Purchase subsidy	Comment
U.S.	2,500~7,500 \$ (Up to 9 mil won) FOR PHEV, BEV	Reduction of subsidy for premium cars, high-income class. Tesla, GM excluded (over 200K units)
UK	3,000 GBP(4.6 mil won) PHEV, BEV	2015~2020 500 mil GBP (780 bil won) budget
GER	6,000 EUR(8.4 mil won) BEV 4,500 EUR(6.3 mil won) PHEV	Purchase of 40K EUR or below
FRA	6,000 EUR (8.4 mil won) FOR PHEV, BEV, FCEV	bonus-malus system (subsidy vs penalty)
CHN	2.25K RMB(3.85 mil won) BEV 8.5K RMB (1.45 mil won) PHEV	Extended end period of 2022
JPN	400K YEN(4.4 mil won) BEV 200K YEN(2.2 mil won) PHEV 2.25 mil YEN(25 mil won) FCEV	
KOR	Max 8.2 mil won BEV 5 mil won PHEV	Central govt budget(2019) Around 460 bil won



Eco-friendly Vehicle Dissemination Policy in Major Countries

Country	2022	2025	2030	2035	2040	2050
China		25% NEVs (PHEV, BEV, FCEV)				
Japan			30-40% HEV, 20-30% BEV, PHEV, 3% FCEV			100% HEV,PHEV, BEV,FCEV
Korea	430,000 BEVs 67,000 FCEVs	1,130,000 BEVs 200,000 FCEVs	33% BEV, FCEV			
U.S.		3.3 million ZEVs (PHEV, BEV,FCEV) in 11 states				All passenger vehicle sales to be ZEV in 10 States
UK			50-70% EV	No sales of new ICE		
Germany			7-10 million BEV, FCEV			All passenger vehicle sales to be ZEV

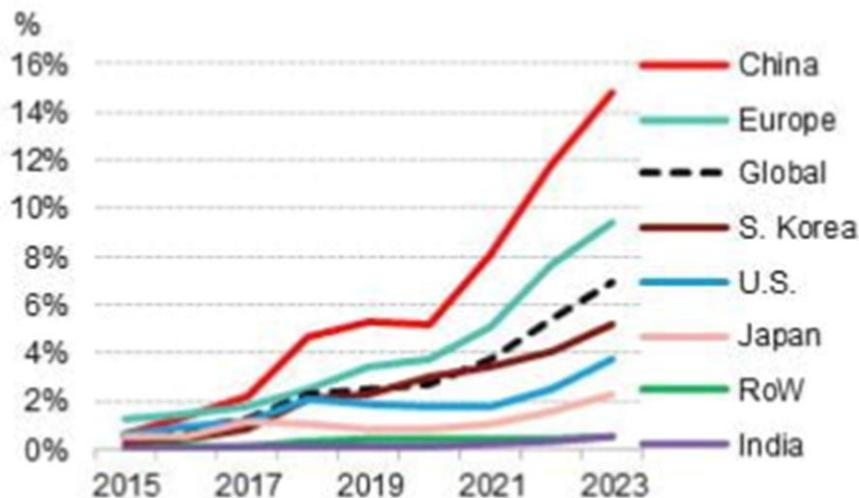
Eco-friendly Vehicle Dissemination Policy in Major Countries

EV m/s among new car sales

As of 2023: China(15%) > Europe(9%) > world avg. (7%) > Korea(5%)

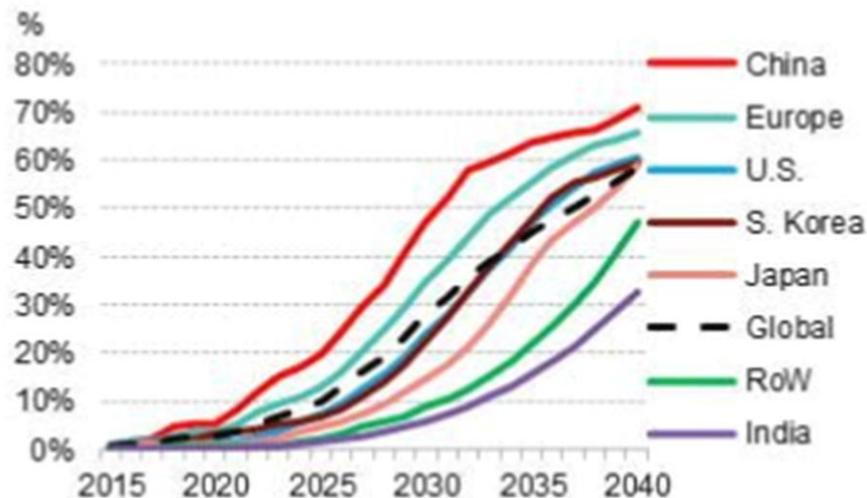
As of 2040: China(70%) > Europe(65%) > U.S., Korea, Japan(60%) forecast

Figure 1: Global short-term EV share of new passenger vehicle sales by region



Source: BNEF. Note: Europe includes EU, U.K. and EFTA.

Figure 2: Global long-term EV share of new passenger vehicle sales by region



Source : Bloomberg NEF, Electric Vehicle Outlook 2020

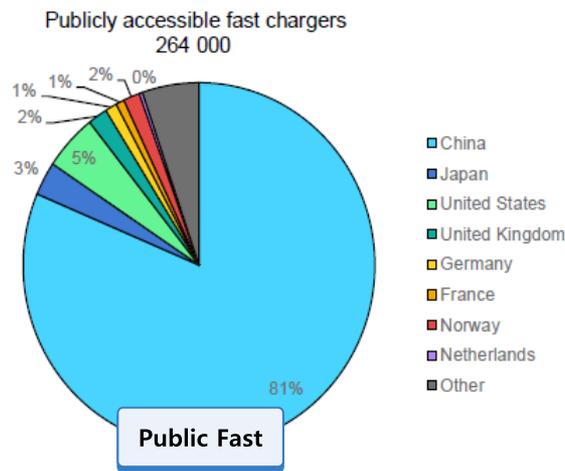
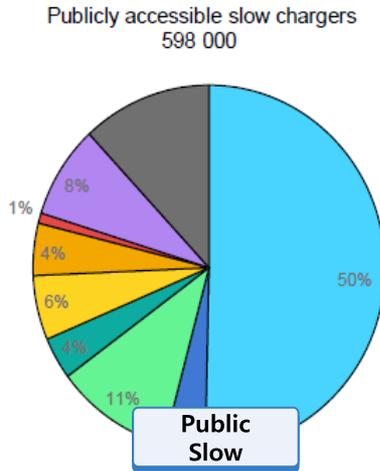
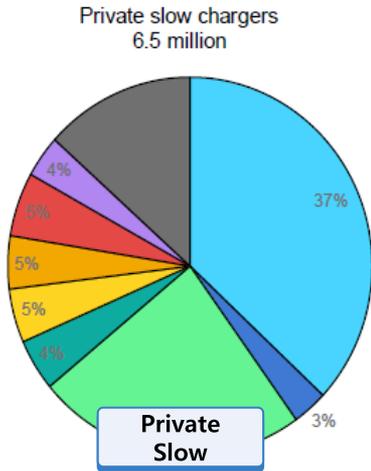
III

EV Charging Facility Infrastructure Status in Major Countries

EV Charging Facility Infrastructure Status in Major Countries

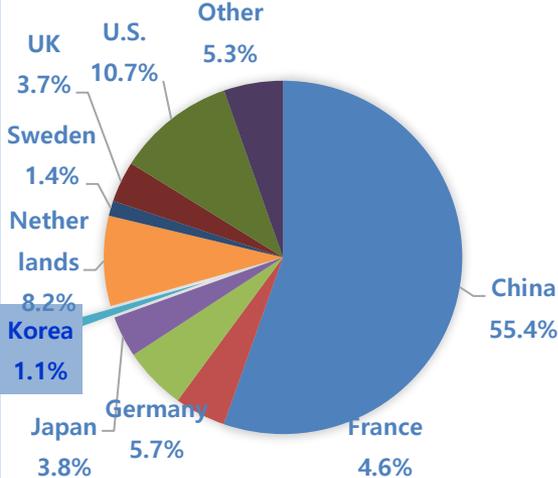
Private and publicly accessible chargers by country, 2019

2020 report, 2019 data



- China
- Japan
- United States
- United Kingdom
- Germany
- France
- Norway
- Netherlands
- Other

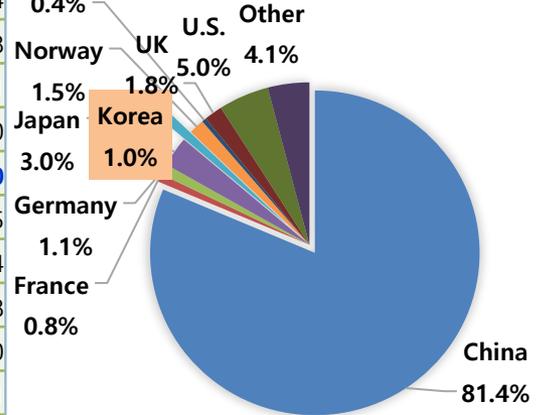
DISTRIBUTION RATIO OF GLOBAL EV SLOW AND FAST CHARGERS



Category	Slow Charger	Ratio(%)
China	331,238	55.4
France	27,661	4.6
Germany	34,203	5.7
Japan	22,536	3.8
Korea	6,514	1.1
Netherlands	49,324	8.2
Sweden	8,279	1.4
UK	22,359	3.7
U.S.	64,265	10.7
Other	31,938	5.3
Total	598,317	100.0

Category	Fast Charger	Ratio(%)
China	214,670	81.4
France	2,040	0.8
Germany	2,860	1.1
Japan	7,858	3.0
Korea	2,673	1.0
Norway	3,970	1.5
Sweden	1,161	0.4
UK	4,735	1.8
U.S.	13,093	5.0
Other	10,742	4.1
Total	263,802	100.0

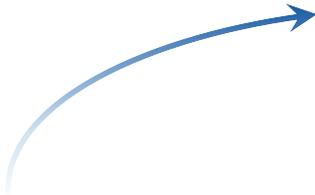
WORLDWIDE EV PUBLIC FAST CHARGER DISTRIBUTION RATIO



EV Charging Facility Infrastructure Status in Major Countries

EV: Charger Ratio
2019 IEA data: 33.6, 9.8 / 2020 1Half K-eco data: 15.4, 5.0

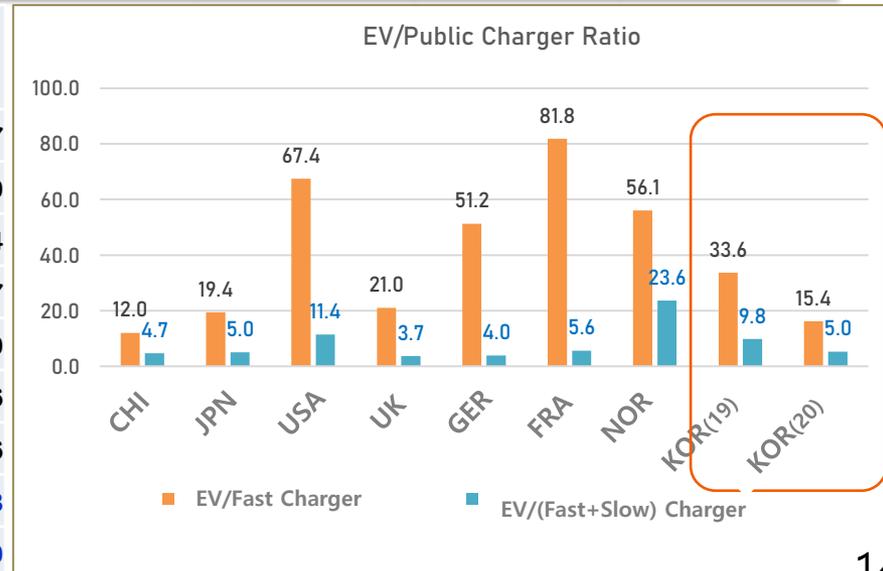
Source: K-eco statistics(2020.06)



Total		Disclosed			Undisclosed
		Total	Information transmitted	Information NOT transmitted (only location)	
Total	55,625	22,049	21,939	110	33,576
Fast	8,790	7,243	7,151	92	1,547
Slow	46,835	14,806	14,788	18	32,029

2020 IEA report. 2019 data

Category	EV Units	Fast Charger Units	EV /Fast Charger	Slow Charger Units	EV /((Fast+Slow) Charger)
China	2,581,190	214,670	12.0	331,238	4.7
Japan	152,320	7,858	19.4	22,536	5.0
U.S.	882,280	13,093	67.4	64,265	11.4
UK	99,260	4,735	21.0	22,359	3.7
Germany	146,460	2,860	51.2	34,203	4.0
France	166,810	2,040	81.8	27,661	5.6
Norway	222,620	3,970	56.1	5,466	23.6
Korea(19)	89,918	2,673	33.6	6,514	9.8
Korea(20)	111,307	7,243	15.4	14,806	5.0

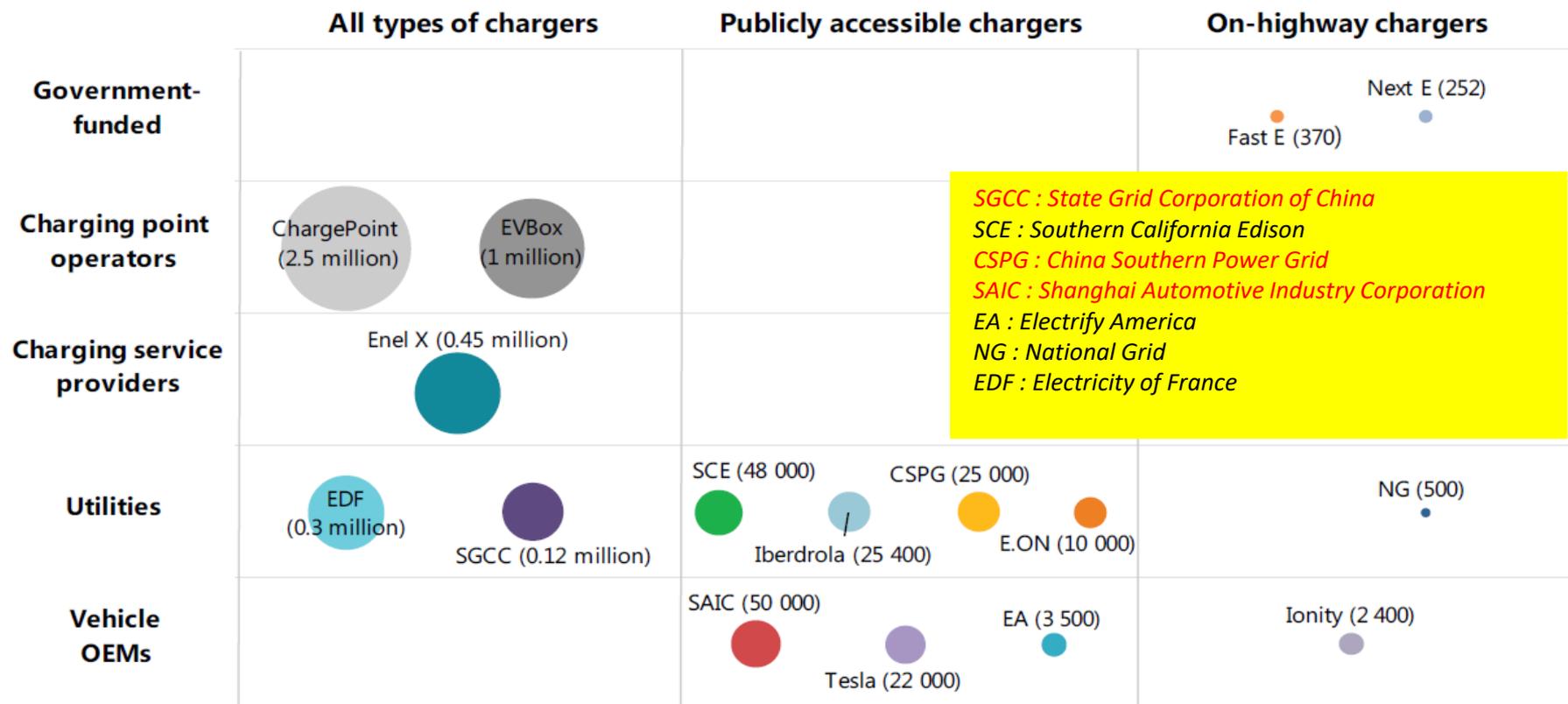


EV Charging Facility Infrastructure Status in Major Countries



Plans by various org. such as govt, charger operators, service providers, power companies, and automobile manufacturers

Figure 2.3. Selected providers of charging infrastructure and recently announced plans/targets



U.S. Policy and Status

Various fee systems to membership and charging region.

About 40% difference by membership level. There is a 10% difference by region (East vs. West coast).

CA region members: 30 minutes. 8,000 won for fast (DCFC) charging.

Example of Fee System by Charging Operator

electrify america LOCATE A CHARGER HOW IT WORKS PRICING MOBILE APP HOME PRODUCTS

Search address or location

STATUS: Site is live, Coming soon

CONNECTOR: CCS-DC, CCS-CHADEMO-DC, L2

STATION COUNT		CHARGER COUNT	
TYPE	NUMBER	TYPE	NUMBER
Live stations	453	CCS	1552
Coming soon	103	CCS-CHADEMO	453
		Level 2	102

Pass		Pass+	
\$1.00 session fee		\$4.00 monthly fee	
POWER LEVEL	COST	POWER LEVEL	COST
1 - 350 kW	\$0.99 / min.	1 - 350 kW	\$0.70 / min.
1 - 125 kW	\$0.69 / min.	1 - 125 kW	\$0.50 / min.
1 - 75 kW	\$0.25 / min.	1 - 75 kW	\$0.18 / min.

EVgo Special Offers Charge with EVgo Sign Up Partner with EVgo FIND A FAST CHARGER

SEE FAST CHARGING RATES FOR YOUR REGION

California: Los Angeles / OC / Inland Empire

PAY AS YOU GO	MEMBERSHIP
No Monthly Fee	Unlock Our Lowest Rates
REGISTER NOW >	BECOME A MEMBER >
DC Fast Charging \$0.27/minute	DC Fast Charging \$0.23/minute
45-Minute Session Length	60-Minute Session Length 8pm-8am 45-Minute Session Length 6am-8pm
No Commitment	\$7.99/month Cancel Anytime 34 minutes of fast charging included
Level 2 Charging \$1.50/hour	Level 2 Charging \$1.50/hour

SEE FAST CHARGING RATES FOR YOUR REGION

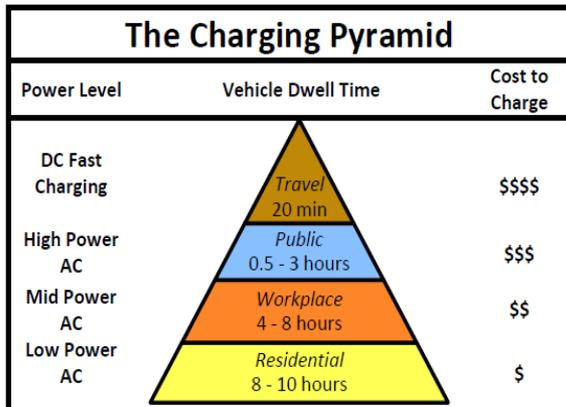
New York

PAY AS YOU GO	MEMBERSHIP
No Monthly Fee	Unlock Our Lowest Rates
REGISTER NOW >	BECOME A MEMBER >
DC Fast Charging \$0.30/minute	DC Fast Charging \$0.27/minute
45-Minute Session Length	60-Minute Session Length 8pm-6am 45-Minute Session Length 6am-8pm
No Commitment	\$7.99/month Cancel Anytime 29 minutes of fast charging included
Level 2 Charging \$1.50/hour	Level 2 Charging \$1.50/hour

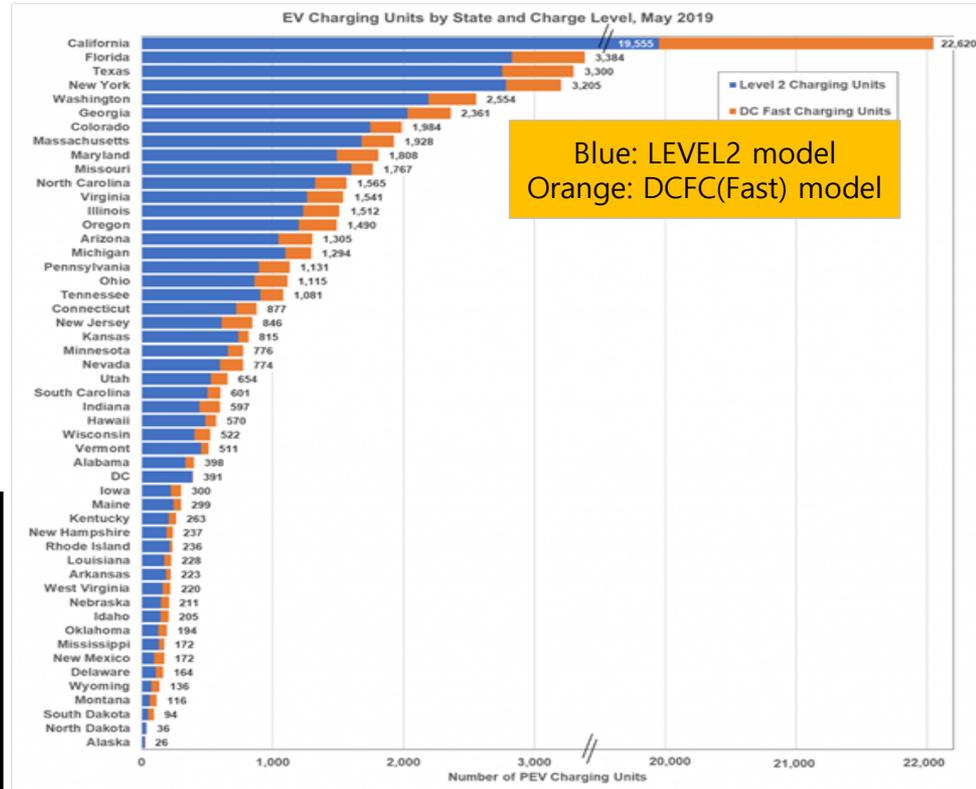
U.S. Policy and Status

In the US, LEVEL2 class (3kw~22kw) models take up the majority (80% level) of public chargers. LEVEL2 models are mainly used at workplaces(mid Power) or public places(high Power). Fast chargers(DCFC) are used for travel. Charging ratio is very small.

Construction status of each charger model



Low Power AC (Level 1)	Mid-High Power AC (Level 2)	DC Fast Charging (DCFC)
<ul style="list-style-type: none"> • 120 Volts AC, 12-16 A • 2-5 miles of range per hour of charge • Typical EVC cost: a few hundred dollars • Typical installation cost: \$0 	<ul style="list-style-type: none"> • 208/240 Volts AC, up to 80 Amps • 10-20 miles of range per hour of charge • Typical EVC cost: \$500 - \$8,000 • Typical installation cost: \$600 - \$13,000 per charger 	<ul style="list-style-type: none"> • 200 - 500 VDC, up to 350 A • 60-80 miles of range per hour of charge • Typical EVC cost: \$15,000 - \$40,000 • Typical installation cost: \$8,000 - \$50,000 per charger



China's Policy and Status

Build infra for 5 million EVs by 2020. 120K central chargers and 4.8 million distributed chargers.

Country is divided into three levels of promotion areas.

Cities of rapid EV dissemination will have ratio of 1:7 to 1:8.

Charging Station Infrastructure Plan

2015~2020 Charging Station Infrastructure Guideline

Category	Region	Target	City	Description
Accelerated development Region	Beijing, Tianjin, Hebei, Liaoning, Shanghai, Shandong, Zhejiang, Fujian, Guangdong, Hainan, etc.	Central. 7400 Distrib. 2.5 mil units	Promotion Cities	Charging station:EV= 1:7 Within 0.9km
			Other	Charging station:EV= 1:12 Within 2km
Pilot Region Expansion Region	Shaanxi, Neimenggu Autonomous Region, Jilin, Heilongjiang, Jiangxi, Henan, Hubei, Hunan, Chongqing, Sichuan, etc.	Central. 4,300 Distrib.2.2 mil units	Promotion Cities	Charging station:EV= 1:8 Within 1km
			Other	Charging station:EV= 1:15 Within 2.5km
Aggressive promotion region	Guangxi, Tibet Autonomous Region, Qinghai, Ningxia, Xinjiang Uighur Autonomous Region, etc.	Central. 400 Distrib.100K units	All cities	Charging station:EV= 1:12 Within 2km

China's Policy and Status

Charging fee = electricity fee + charging service fee

Electricity fee: diff. by time, peak hours (about 1.1 yuan/kwh) non-peak hours (about 0.4 yuan.kwh)

Charging service charge = 0.8 yuan/kwh (main revenue source of charging operator)

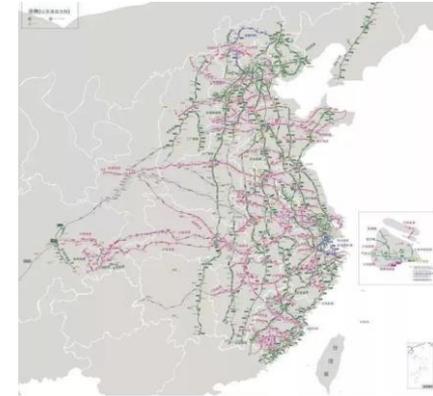
Total charging fee = about 1.2 ~ 1.9 yuan (kwh): about 206 ~ 326 won / kwh

Increased on 2020 Jul 06.
Ministry of Env, KEPCO
173.8 won /kwh → 255.7 won /kwh
Source : Korea EV charging svc

Major EV Charging Operator Status

Company	Description
 State Grid Corporation of China (国家电网)	State Grid Corporation of China. State-owned (est. in 2002). China's largest power supply company. Charging stands and stations. Largest in China. Goal to build 10,000 Public Fast Charging stations by 2020
 TELD (特来电)	Construction and operation of EV charging stations, sales of new energy, etc. 2nd biggest in China. Specialized company in the field of Internet linkage system.
 Star Charge (星星充电)	Construction and operation of charging stations. Installation and repair of charging facilities. Charger consulting. Mobile payment thru cooperation with China mobile operators

Three companies
operate more than 75%
of all public chargers



National Electric Grid Beijing Charging Corporation's Charging Fee by Time

Category	Time	Charging fee (RMB/kWh)
Max peak range (July-Aug/year)	11:00-13:00	1.0941
	16:00-17:00	
Peak Time	10:00~15:00	1.0044
	18:00~21:00	
Normal	07:00~10:00	0.6950
	15:00~18:00	
	21:00~23:00	
Non-peak time	23:00~07:00(next day)	0.3946

Japan's Policy and Status

Most of Japan's charging fee is a membership system and hourly charging system. In the case of NCS, the monthly membership fee is 42,000 won for fast charging. 5,000 won for 30 minutes.

EV charging service fee system

Issued by	Card Type		Monthly membership fee (yen/month) Excluding Tax	Fee/charge (yen/min)	
				Fast	Slow
Japan Charging Service (NCS)	NCS Card	Fast Charger only	3,800	15.0	-
		Slow Charger only	1,400	-	2.5
		Fast Slow both	4,200	15.0	2.5
Nissan	ZESP2	Unlimited Use Plan	2,000	무료	1.5
		Charge per use plan	1,000	15.0	1.5
Mitsubishi	EV Support	Basic	500	12.0	1.4
		Premium	1,500	8.0	무료
Toyota	PHV Drive Support	Flat-rate plan	1,000	15.0	무료
		Pay as you go plan	무료	15.0	2.5
BMW	Charge Now	Fast Slow Charger	5,000	15.0	무료
		Slow Charger only	2,500	-	무료
Volkswagen	Volkswagen Recharge Card	Basic Plan(Slow)	1,400	-	2.5
		Basic Plan(both)	3,200	15.0	2.5
		Premium Plan(both)	5,200	무료	무료
Tesla	Tesla Recharge Card	Fast Charger only	2,778	15.0	-
		Fast Slow both	3,010	15.0	2.5
Honda	Honda Charging Service	Pay as you go plan	Free ⁴⁾	16.5	1.5
Guest fee				50.0	8.0

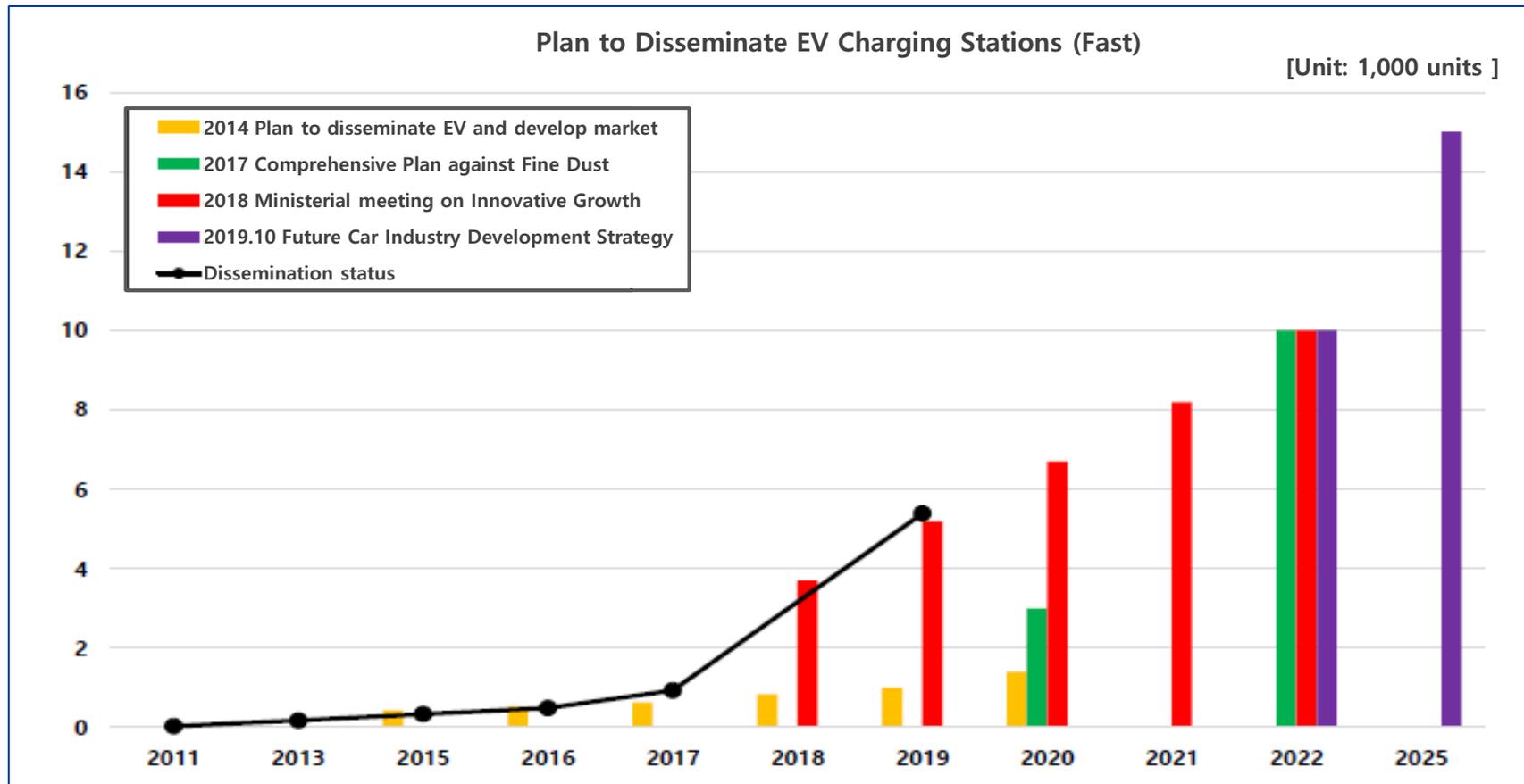
IV

EV Charging Station Infrastructure Status in Korea

Korea's EV Charging Station Infra Plan

Korean New Deal Comprehensive Plan(2020.07)

**Charging Station Infrastructure Dissemination Goal 2025 Fast(15K units)
Slow(30K units)**

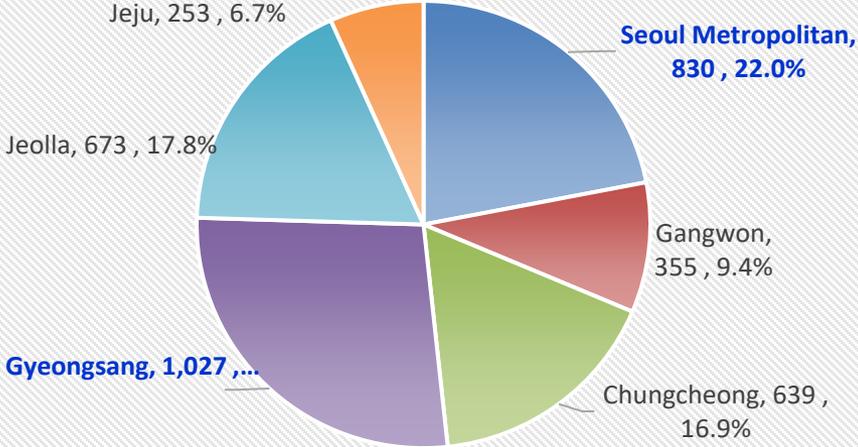


Korea's EV Charging Station Infra Status

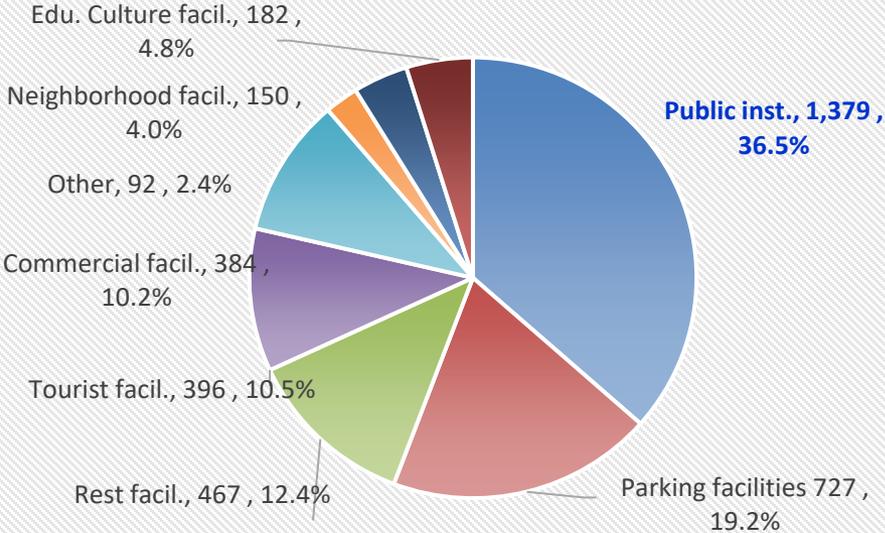
MOE Distribution by region for Fast Chargers: (Seoul Metropolitan + Gyeongsang Region) Installation QTY_ Half of the total

Distribution by location: Public (36.5%) > Parking facil. (19.2%) > Rest facil. (12.4%)

MOE Fast Charger Regional Distrib.(N=3,777)



MOE Fast Charger Location Distrib.(N=3,777)

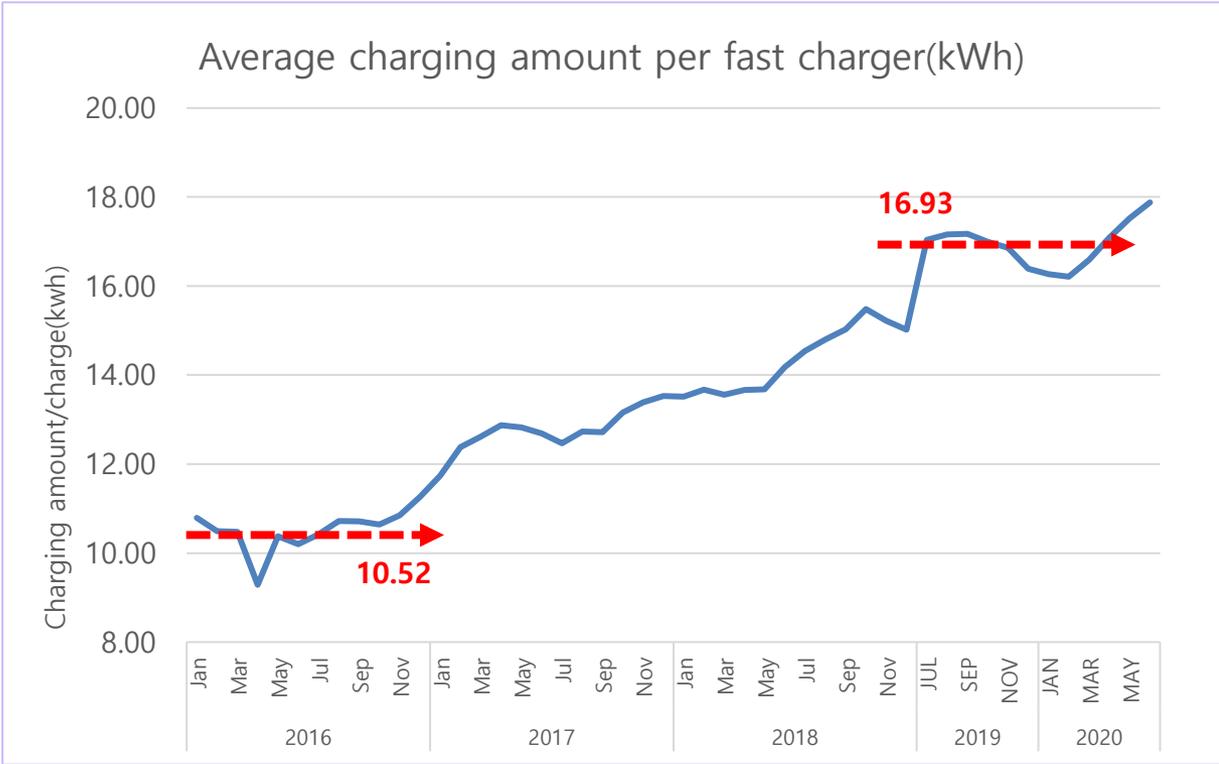


Source : K-eco Operation Data

Korea's EV Charging Station Infra Status

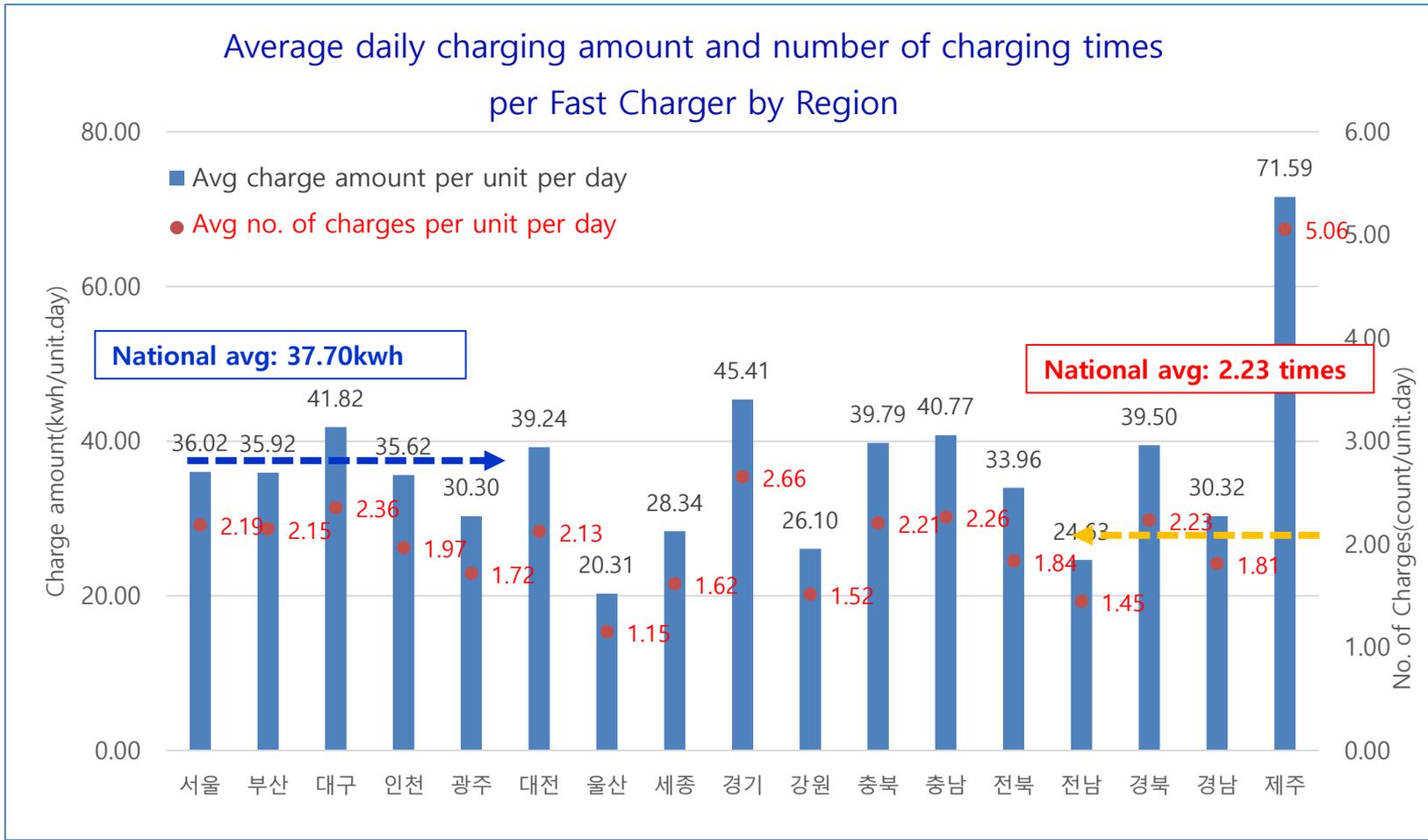
MOE Fast Charger installations, analysis of over 4.7 million charging data over the last 5 years. Avg value of one charge 10.52kwh(2016) → 16.93kwh (2019). About 61% increase

Source : K-eco



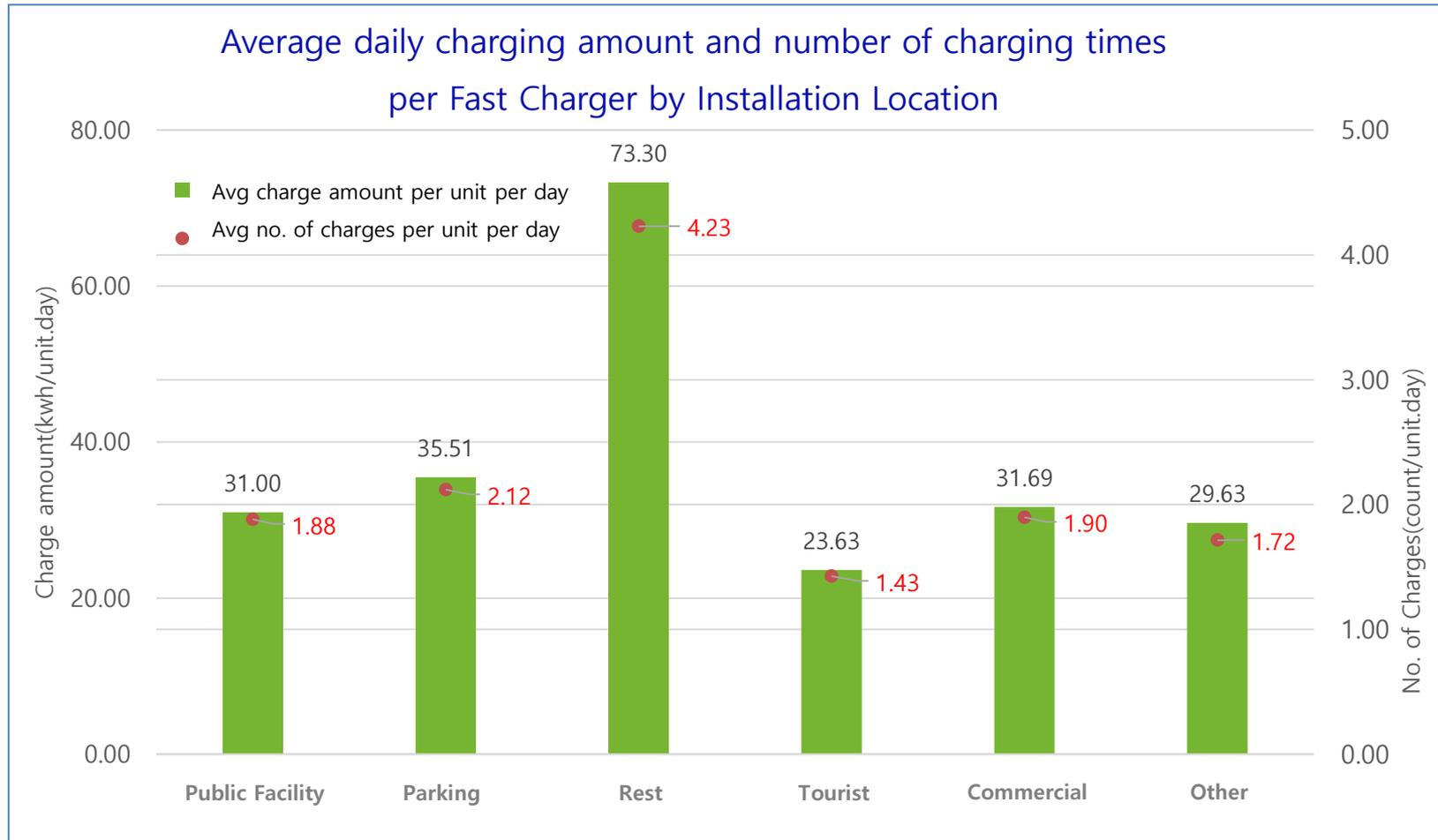
Year	Number of Charges	Comment
2016	174,617	1 yr
2017	417,722	1 yr
2018	1,723,760	1 yr
2019	1,244,923	2 Half (Jul~Dec)
2020	1,128,702	1 Half (Jan~Jun)
Total	4,689,724	-

Korea EV Charging Station Infrastructure Operation Status by Region



Source : K-eco Operation Data

Korea EV Charging Station Infrastructure Operation Status by Installation Location



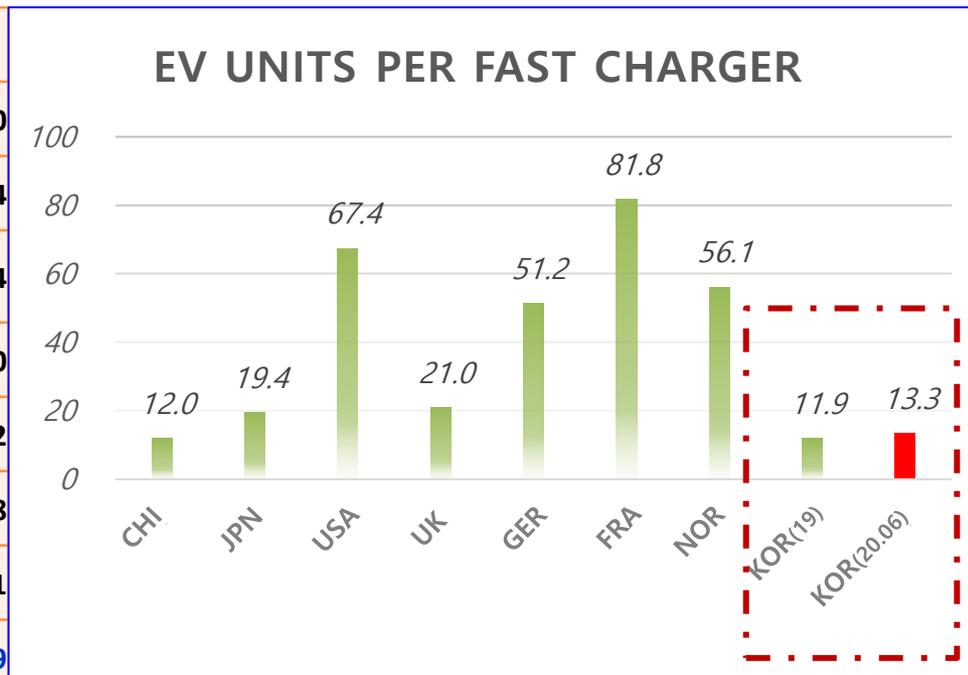
Source : K-eco Operation Data

Consideration Points for the scale of charging station infrastructure

**Ratio of EV per fast charger is relatively low.
Excellent building charging station infrastructure.**

Comparison of EV (BEV) and Fast Charger supply status _ as of the end of 2019

Category	EV Units	Fast Charger Units	EV/Fast Charger
China	2,581,190	214,670	12.0
Japan	152,320	7,858	19.4
U.S.	882,280	13,093	67.4
UK	99,260	4,735	21.0
Germany	146,460	2,860	51.2
France	166,810	2,040	81.8
Norway	222,620	3,970	56.1
Korea (2019.12) *	89,918	7,574	11.9
Korea (2020.06) *	117,307	8,790	13.3



Source : IEA, Global EV Outlook 2020 (2020.05)

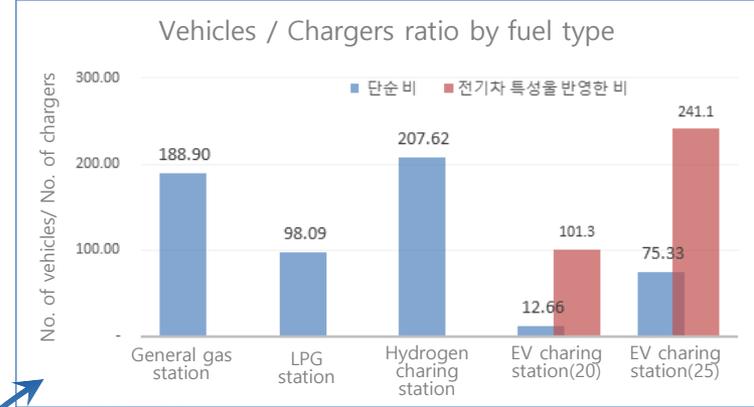
* Ministry of Land, Infrastructure and Transport, K-eco statistics(2020.06)

Consideration Points for the scale of charging station infrastructure

Comparison of the charger operations by fuel

Instead of absolute sizing, how does it compare to other fuels?

× 10



Fuel Category	Vehicle count	Vehicles by gas station (A)	No. of stations (Charging station)	No. of gas (charger) stands (B) ¹⁾	No. of vehicles/ No. of chargers (A/B)	No. of vehicles / No. of chargers (A/B) ²⁾
Gasoline	11,220,194	21,723,686	11,500	115,000	188.90	188.90
Diesel	9,952,673					
Hybrid car (Gasoline+electricity)	550,771					
LPG	2,002,988	2,002,988	2,042	20,420	98.09	98.09
Hydrogen	7,682	7,682	37	37	207.62	207.62
EV(2020)	111,307	111,307	-	8,800	12.66	101.3
Other	177,468	177,468	-	-	-	-
Subtotal of registered vehicles	24,023,083	-	-	-	-	-
EV(2025) ³⁾	-	1,130,000	-	15,000	75.33	241.1

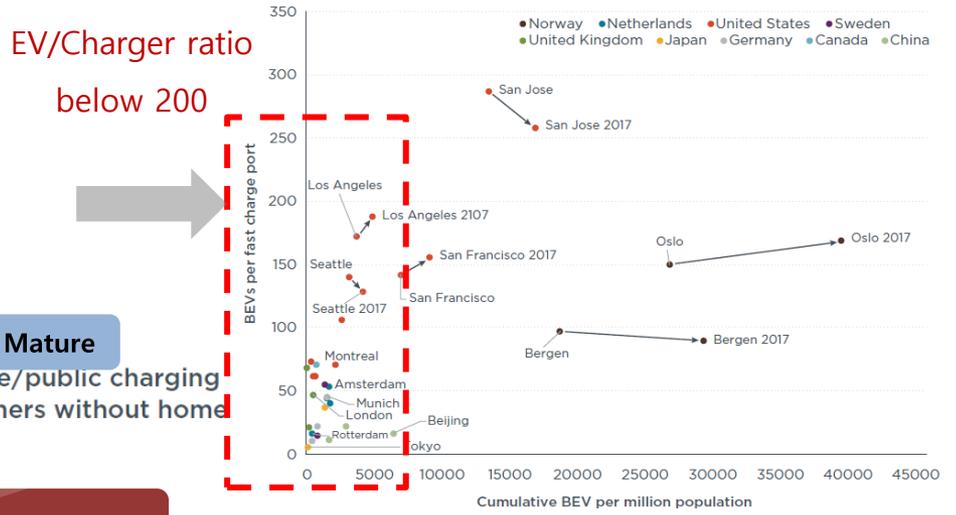
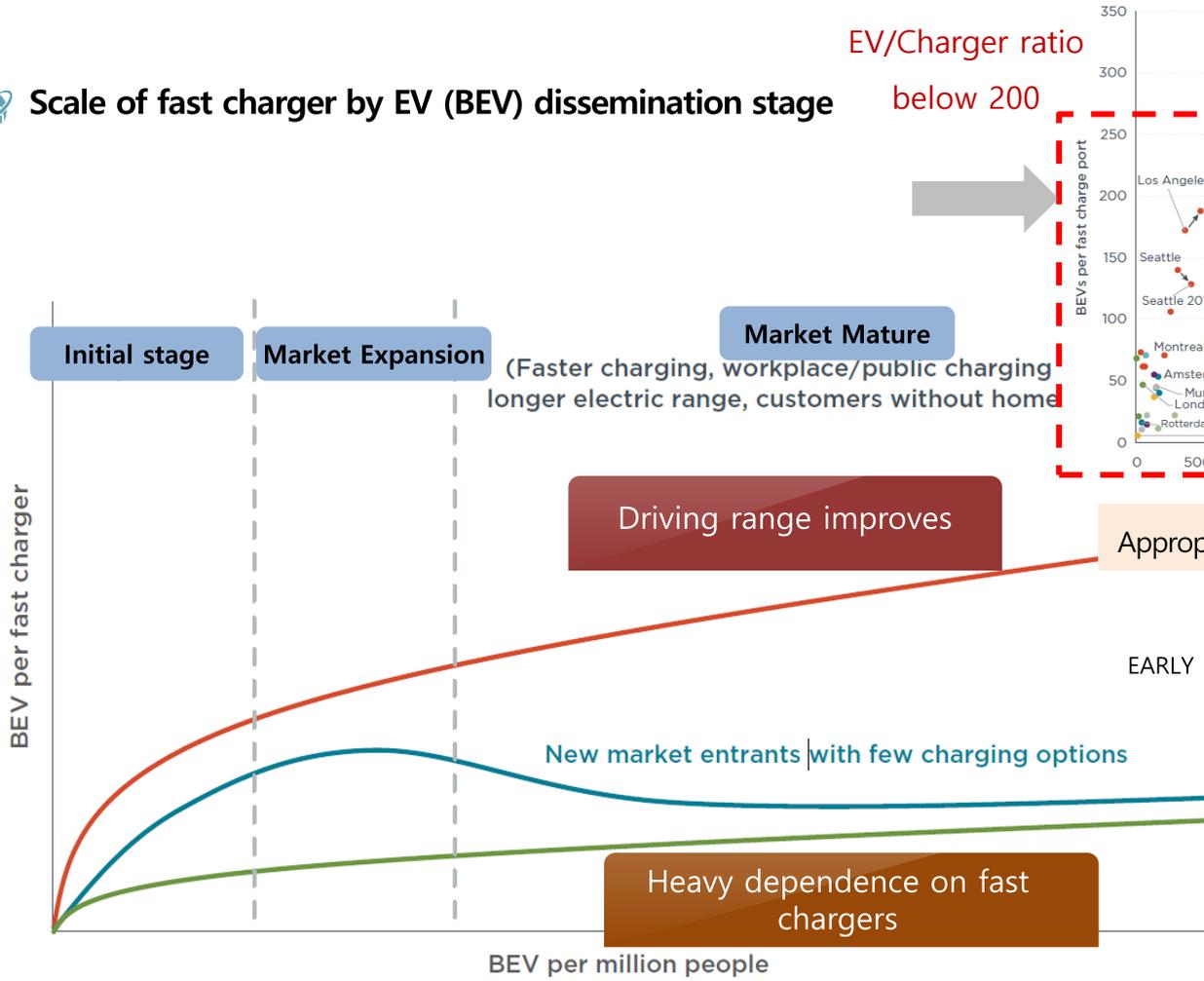
Constant considering EV characteristics				
Category	Charging Time	Driving range	Slow included	
Internal combustion engine	3 min	600km	1.0	
EV(20)	30 min	300km	40%	
Comparison value	10	2	0.4	8.0
EV(25)	20 min	500km		
Comparison value	6.7	1.2	0.4	3.2

Consideration Points for the scale of charging station infrastructure

As the driving range improves, the slope flattens out (need for chargers decreases).

If there is heavy dependence on fast chargers, more chargers will need to be built.

Scale of fast charger by EV (BEV) dissemination stage



Appropriate EV/Fast Charger ratio according to city size

Source : ICCT, LESSONS LEARNED ON EARLY ELECTRIC VEHICLE FAST-CHARGING DEPLOYMENTS

Charging Station Infrastructure Business Evolution

Operator	Project	Facility	(Completion) Time
GS Caltex LG Electronics	Energy-Mobility Convergence Station	Gas, maintenance car wash service Charging and maintenance service	January 2019 announcement
GS Caltex (Seoul Gangdong Gas Station)	Convergence Energy station	Gasoline diesel LPG EV hydrogen vehicle charging station	Completion in May 2020 Plan 8 more locations
Ministry of Trade, Industry and Energy Jeju Island, Jeju Energy Corporation (Morowat Parking Lot 2)	Renewable energy convergence EV charging station	85kW solar power generation facility Energy storage device 156kW 4 Fast Charger 3 Slow Chargers	Completion in June 2020
Korea Gas Corporation, Hyundai Motor	J/V to build and operate a convergence charging station	Hydrogen car, LNG car, EV charging facilities	July 2020 announcement
Samchully Yongin City, Samsung C&T (Yongin Everland)	Convergence Charging station	CNG vehicle, hydrogen vehicle 5 Fast Charger 2 Slow Chargers	Completed in September 2020
MOE, local government	Mega station	Gasoline diesel LPG EV hydrogen car, etc. 150 EV chargers 2 hydrogen car chargers ('21~'22 1 location) Convenience facilities Shopping mall, exhibition hall, experience hall	July 2020 announcement ('23~'25 3 locations)



Landmark Mega Station, Charging Station

Landmark charging station including convenience facilities such as future vehicle charging, exhibition&experience, maintenance&training, and restaurants (Pilot construction in '21, 4 locations by region by 2023)



- 1 Increase charging convenience
- 2 Enhance the economy of the Charging Station Infrastructure
- 3 Provide opportunities to experience future cars
- 4 Change awareness

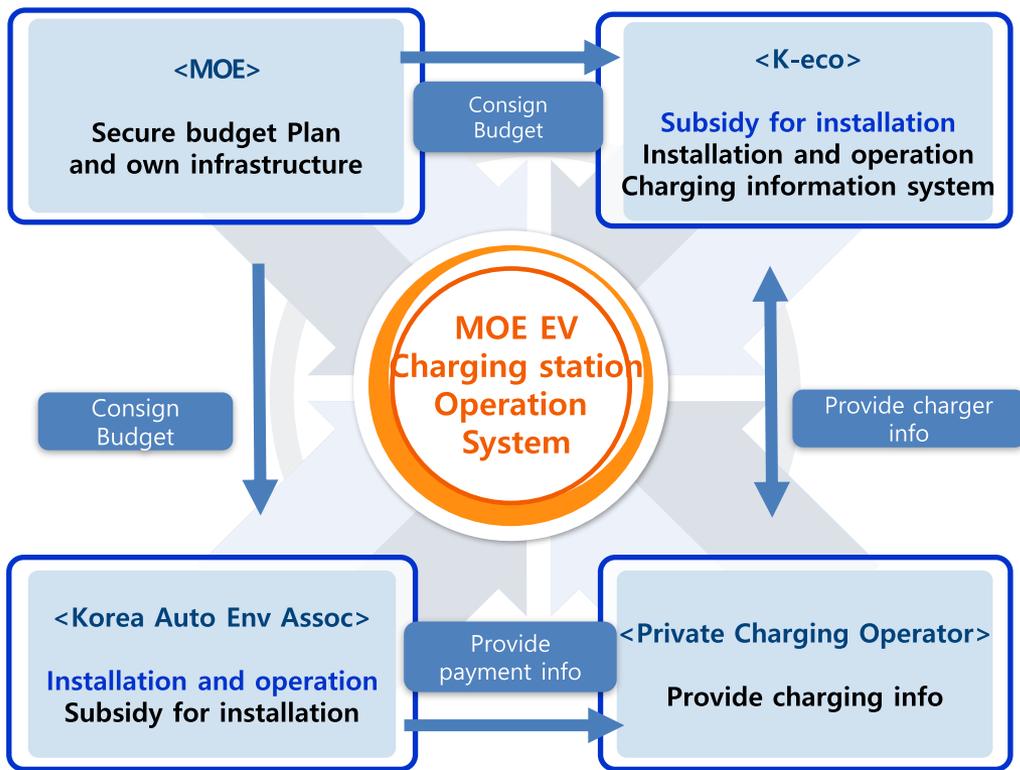
EV and E-mobility Policy Trend in Korea and other Countries

V

EV Charging Operators in Korea

EV Charging Station Infrastructure Operation in Korea

EV Public Fast Charger and operation (as of 2020)



Source: Clean Air Conservation Act Article 66 (Consignment)

EV Charger operators_ Fast, Slow Category

Detail Category	Fast Charger	Category	Slow Charger
MOE Korea Auto Env Association	3,777	Local govt	298
Local govt	334	KEPCO	3,712
KEPCO	2,583	Powercube	10,201
happecharge	506	Everon	7,207
STraffic	487	GNTEL	6,992
Daeyong CHAEVI	320	KT	6,221
Jeju EV Service	130	happecharge	2,873
GNTEL	115	ChargeEV	2,659
Other operators	386	KLINLEX	1,219
Total	8,790	Jeju EV Service	1,107
		Other operators	4,346
		Total	46,835

Source: K-eco Operation Data, from June, 2020

Note) Listed operators with over 100 Fast chargers, and 1,000 Slow chargers.

EV Charging Station Infrastructure Operation in Korea

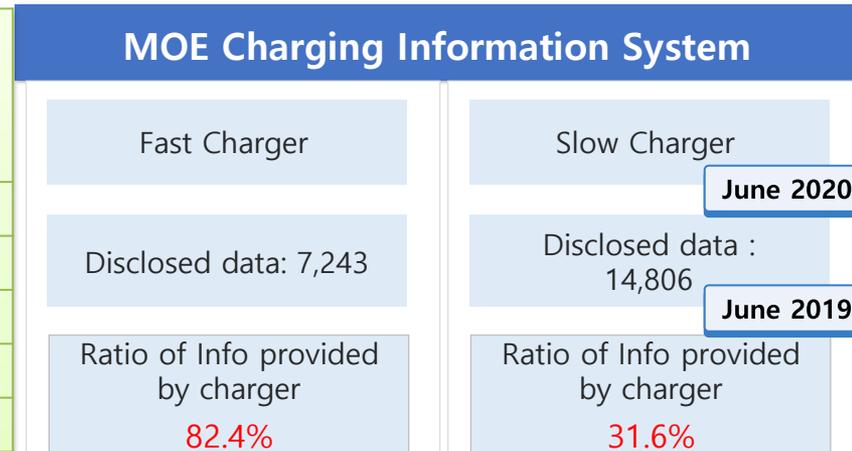
MOE charging information system currently in operation

Disclosed information Fast 82.4%, Slow 31.6%

Need additional interface to increase data from 2019, create big data, improve ease-of-use, and convenience.

MOE EV Charging Information System Information Disclosure Status

Category	General		Disclosed			Undisclosed
			Total	Receives data	Does not receive data (only location)	
General	Total	55,625	22,049	21,939	110	33,576
	Fast	8,790	7,243	7,151	92	1,547
	Slow	46,835	14,806	14,788	18	32,029
MOE	Total	3,777	3,762	3,749	13	15
	Fast	3,777	3,762	3,749	13	15
	Slow	0	0	0	0	0
Local gov	Total	720	688	661	27	32
	Fast	419	403	376	27	16
	Slow	301	285	285	0	16
Other Institutions	Total	51,128	17,599	17,529	70	33,529
	Fast	4,594	3,078	3,026	52	1,516
	Slow	46,534	14,521	14,503	18	32,013



Source : K-eco Operation Data, as of June 2020



VI

Micro EV Trends in Korea and Southeast Asia

Korea Micro EV Market Trend

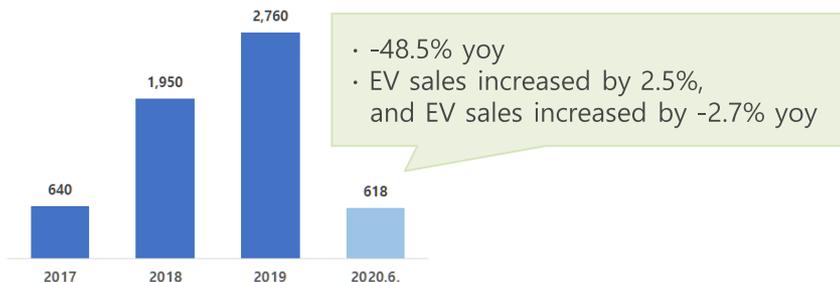
Domestic Micro EV Sales Status

- In 1H of 2020, micro EV (passenger) sales was 618 units, down 48.5% yoy.
- ※ Comparison: In 2020, the number of EV sales increased 23.0% yoy (22,267 units)
- Market shrunk due to disruption in Korea Post's Micro EV purchase plan and the COVID19

Micro EV Production Status in Korea

- The Micro EV market is oversupplied because in addition to the existing Micro EVs, Kangwon (Potro) and Ulsan-type Micro EVs were added.
- The installed battery capacity varies from 6.8 kWh (Twizy) to 17.4 kWh (D2C)

< Korea Micro EV Sales Trend >



< Dpeco >



< Specifications of major domestic micro EV sales models >

Company	Renault Samsung	Daechang Motors	Semisysco	Semisysco	Camsys	Masta EV	KST	Dpeco	Ulsan TP	
Model	Twizy	Danigo3	D2C	EV Z (light)	CEVO-C!	Masta Van	Maiv M1	Potro	Ulsan EV	
Overall length, width, and height (mm)	2,370×1,237×1,454	2,300×1,190×1,485	3,095×1,495×1,705	2,820×1,530×1,520	2,430×1,425×1,550	3,150×1,297×1,685	2,860×1,500×1,565	3,395×1,440×1,860	2,710×1,485×1,560	
Maximum speed (km/h)	80	80	80	106.6	80	78	80	80	80	
Battery capacity (kWh)	6.8	13.0	17.4	26.0	8.0	10.0	10.0	13.4	9.7	
Driving distance per charge (km)	Room temperature	84.1	83.0	101.1	150.0	66.7	64.6	56.9	65.3	120(not certified)
	Low temperature	83.8	72.8	96.2	133.7	70.4	76.0	52.9	46.4	-
Vehicle price (10,000 won)	1,330~1,430	1,880	1,980	2,750	1,450	1,790	1,650	1,800~2,100	-	

Micro EV market trends in major countries

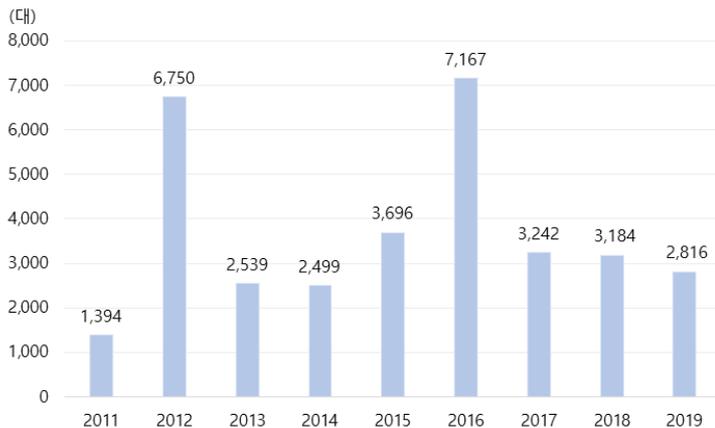
Europe's Micro EV market is stagnant after sales peaking in 2016

- 7,168 units in 2016 → 2,816 units in 2019
- Pilot project integrating Micro EV into the urban transport system at EU level (ELVITEN project, STEVE project, etc.)
- Private enterprises use Micro EV for car sharing (Car2Go, DriveNow, Totem Mobi, Share' N Go, Hamo project, etc.)

Japan to expand the market by improving Micro EV system

- About 300 micro EVs sold in 2019
- Previously, micro EVs for demonstration projects were allowed on the road as a special exception, but as the vehicle category of Micro EVs was stipulated and safety standards were set in September 2020, micro EVs are expected to be disseminated in earnest.

< New registrations of Micro EVs in Europe >



Source: Citroën

< Japan Micro Mobility Vehicle Category (Revised) >

	제1종 원동기 부착 자전거 (미니카)	경자동차			보통자동차 (소형자동차)
		초소형 모빌리티 (인정차)	초소형 모빌리티 (형식지정차)	경자동차	
최고속도	60km/h (도로교통법)	개별 제한 부여	구조상 60km/h	구조상의 제한 없음	구조상의 제한 없음
정격출력	0.6kW 이하	0.6~8.0kW 이하	0.6kW 이하	0.6kW 이상	0.6kW 이상
전장	2.5m 이하	3.4m 이하	2.5m 이하	3.4m 이하	12m 이하 (4.7m 이하)
전폭	1.3m 이하	1.48m 이하	1.3m 이하	1.48m 이하	2.5m 이하 (1.7m 이하)
전고	2.0m 이하	2.0m 이하	2.0m 이하	2.0m 이하	3.8m 이하 (2.0m 이하)

Competition model trends in major countries

Full-scale sales of mass-produced micro EVs by big automakers

- (Citroen) AMI released on July 2020, vehicle price of 6,000 euros (about 8 million won), long-term rental and sharing, etc.
- (VW SEAT) Electric Minimo to be released in 2021
- (Toyota) Mass production Micro EV to be released in 2021
- (Kia) Promote development of Micro EV for European market (targeted for release in 2022, rival model to Citroen AMI)

Dev't and marketing of Micro EV with various technologies applied

- UK Gordon Murray Design developing MOTIV that can link autonomous driving technology with UK gov support.
- Italy XEV launching YOYO produced by 3D printing at a price of 5,999 euros (about 8 million won) at end of 2020.
- The amphibious model Fomm ONE developed by Japan Fomm (Fomm) mass-produced in Thailand from 2019.
- A number of battery replacement models developed and released (SEAT Minimo, FOMM Fomm One, KST Electric Maiv M2)

< Overseas Micro EV model specifications >

Company	Citroen	Gordon Murray Design	Eli Motors	Micro Mobility Systems	XEV	SEAT	Toyota	Fomm
Model	AMI	MOTIV	Eli Zero	Microlino 2.0	YOYO	Minimo	Commercial model (to be released)	Fomm ONE
Overall length, width, and height (mm)	2.41×1.39×1.52	2.537×1.310×1.628	-	2.4(length)	2.5(length)×1.5(width) h)	2.50(length)×1.24(width)	2.49×1.29×1.55	2.585×1.295×1.560
Maximum speed (km/h)	45	65	60	90	70	-	60	80
Battery capacity (kWh)	5.5	17.3	4.0	15.0	7.5	-	-	2.96×4
Driving distance per charge (km)	75.0	100.0	120.0	120.0	150.0	100.0	Around 100	160.0
Vehicle price	6,000 EUR	-	10,000 dollars	12,000EUR	5,999EUR	-	-	2.3 million yen +α

Competition model trends in major countries

<Autonomous Urban Micro EV 'MOTIV'>



<XEV's 3D printing micro EV 'YOYO'>



<SEAT's battery exchange type 'Minimo'>



<Citroen AMI>



<Toyota General Micro EV Model>



<Amphibious model Fomm ONE>



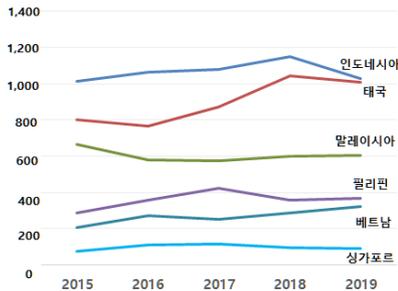
Automotive Market in Southeast

📍 **Six Southeast Asian countries (Indonesia, Thailand, Malaysia, Philippines, Vietnam, Singapore). 3.42 million cars sold in 2019**

- The ratio of the commercial vehicle market is large, and the number of automobiles produced in five major countries (6 countries excluding Singapore) is 4.15 million units.

< Southeast Asia car sales (2015-19) >

(Unit: 1,000 units)

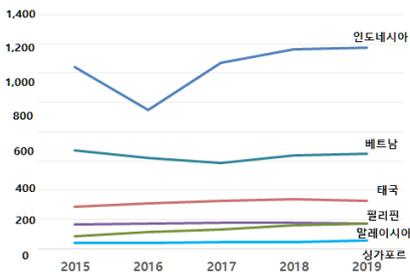


(Unit: 1,000 units)

Country	2015	2016	2017	2018	2019	Passenger	Commercial
Indonesia	1,013	1,062	1,079	1,151	1,030	786	244
Thailand	800	769	872	1,041	1,008	469	539
Malaysia	667	580	577	598	604	550	54
Philippines	289	359	425	357	370	109	261
Vietnam	209	271	251	288	322	237	85
Singapore	78	110	116	95	90	77	23
Total	3,056	3,151	3,320	3,533	3,424	2,227	1,196

< Sales of two-wheel vehicles and scooters in Southeast Asia (2015-19) >

Unit: 1,000 units)



(Unit: 1,000 units)

Country	2015	2016	2017	2018	2019
Indonesia	6,708	6,215	5,886	6,383	6,487
Vietnam	2,849	3,121	3,272	3,386	3,255
Thailand	1,639	1,738	1,811	1,788	1,719
Philippines	851	1,140	1,319	1,590	1,705
Malaysia	381	396	434	472	547
Singapore	7	8	9	12	19
Total	12,435	12,618	12,732	13,631	13,732

Micro EV Market Potential in Southeast Asia

Southeast Asian govt have set roadmaps, policies, and regulations to vitalize the EV market.

< Strategies by major Southeast Asian countries to promote electrification >

Perspective	Item	 Thailand	 Malaysia	 Indonesia
Necessity	Environment	GHG reduction target of by <u>at least 20%</u> compared to BAU by 2030	GHG reduction target of by <u>35-45%</u> compared to BAU by 2030	GHG reduction target of by <u>29%</u> compared to BAU by 2030
	Energy security	Oil, which accounts for <u>40% of energy sources</u> , depends <u>60% on imports</u>	<u>Coal (for power generation), which accounts for 20% of energy sources, depends 90% on imports.</u>	Coal and natural gas are produced in the country, so <u>energy self-sufficiency is very high.</u>
Promotion/ Inhibition Factor	EV roadmap	<u>'Target of total sales of 1.2 million units¹⁾ by 2036</u>	<u>'Target sales of 100,000 EVs by 2030²⁾</u>	<u>'Target sales of 1.2 million LCEVs by 2035³⁾</u>
	Policy and regulation	<u>Investment incentives regulated according to the degree of localization of production</u>	<u>In NAP2014⁵⁾ corporate tax, parts import duty and goods tax exempted for local production as well as R&D subsidy</u>	<u>Exemption of luxury tax for EVs, plans to provide investment incentives for OEMs</u>
Creation of new business		<u>Declared the development of next-gen automobile industry such as EVs⁴⁾ as an important medium-term policy for 'Thailand 4.0,' policy</u>	<u>Promoting local development and production investment thru 'National Electric Mobility,' with the aim of establishing an <u>EV supply chain and becoming an export base</u></u>	<u>Declaration of promotion of major export bases for ICE cars and EVs in 'Making Indonesia 4.0,'</u>

- Note :
- 1) PHEV/BEV
 - 2) PHEV/BEV
 - 3) HEV/PHEV/BEV/FCV/Bio Fuel
 - 4) EVs including two-wheeled, three-wheeled, and commercial vehicles
 - 5) Malaysia's "National Automobile Plan for 2014"

Micro EV Market Potential in Southeast Asia

< EV dissemination goals in major SE Asia countries >

Country	Announcement	Description
Indonesia	2019. 1.	• Disseminate 2.1 million motorcycles and 2,200 EVs by 2025
Malaysia	2016. 3.	• Disseminate 1.2 million EVs by 2036
Singapore	2016. 6.	• Disseminate 1,000 BEVs by 2020
	2018. 10.	• Disseminate 800 BEV taxis by 2022
Thailand	2017. 8.	• Disseminate 100,000 EVs and electric two-wheelers, and 2,000 electric buses by 2030
Vietnam	2013. 8	• Disseminate 100,000 EVs by 2020

Gov promoting modernization of aging public transportation

- Replace jeepneys with new models (including EV)
- Electric two- and three-wheels for taxis (electric motorcycles and Micro EVs)

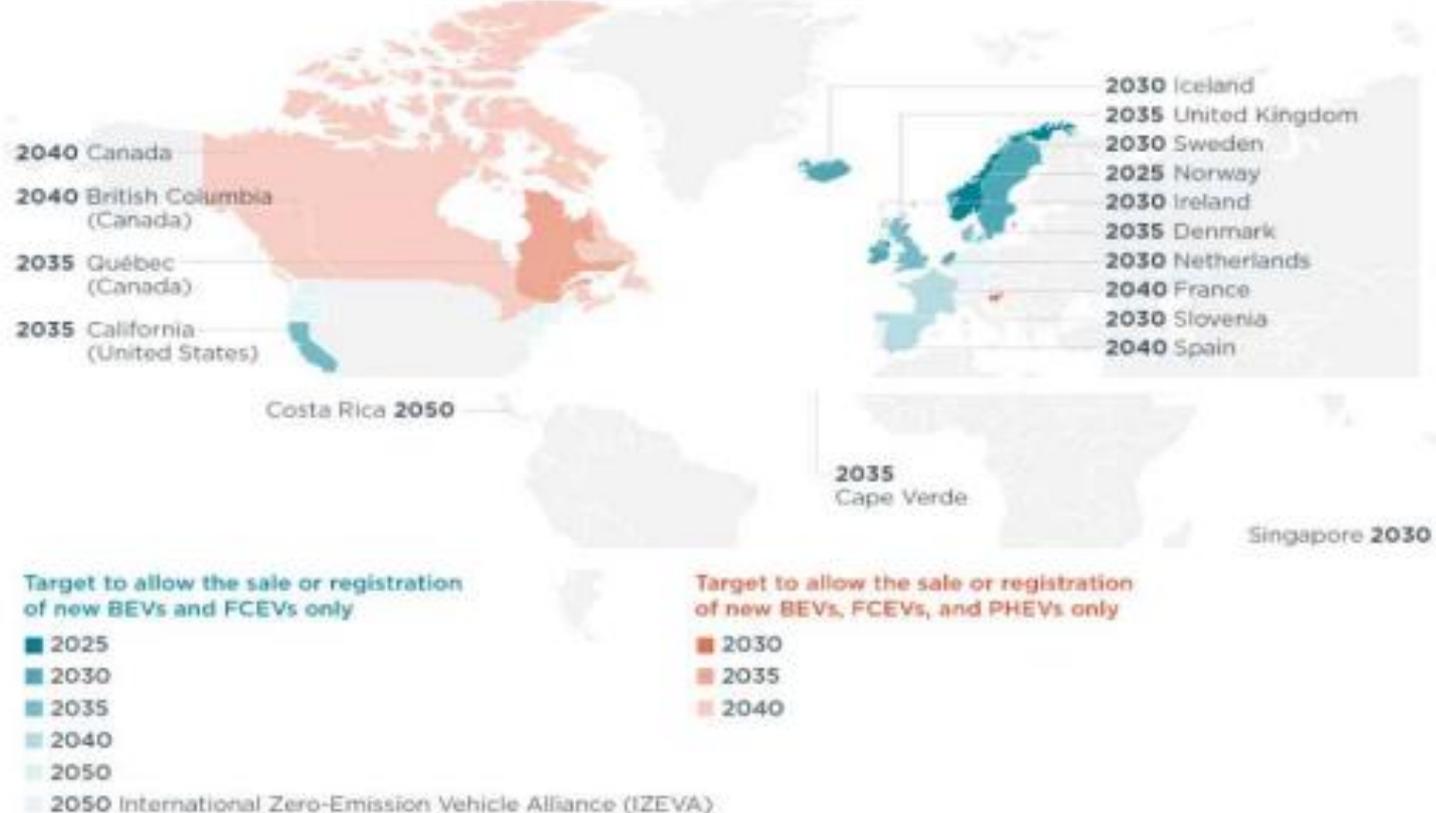


Changing Public Transportation in Asia

- Philippines** → Gov plans to replace with new models by 2022
Small passenger bus "Jeepney"
- Indonesia** → Will replace with gasoline with natural gas. Will disseminate 4-wheel vehicles gradually
Three-wheel taxi "Bajay"
- India** → Big automaker Mahindra has introduced electrical models
Three-wheel taxi "Auto-rickshaw"
- Thailand** → Will replace 22K Took tooks with electrical models by 2025
Three-wheel taxi "Took took"

Major Countries Plan to Stop Internal Combustion Locomotives

The suspension of internal combustion locomotives will begin in the EU region after next year, and regulations will be expanded to the global automobile market such as Korea, India, China, the United States, and Japan



Implications

- ✦ **Global electric vehicle and battery markets grow rapidly in line with rising international oil prices and environmental policies of each country**
- ✦ **Unlike general automobile exports, electric vehicle exports are growing remarkably even during the pandemic**
- ✦ **Electric vehicle markets in major countries have different strengths, focusing on sales, exports, and production**
- ✦ **Close negotiations are needed as electric vehicle and battery supply chains such as IRA are being reorganized in the U.S. are being reorganized**

“

THANK YOU

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Korea Electric Vehicle Association

Secretary-General
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