



Charging Standard

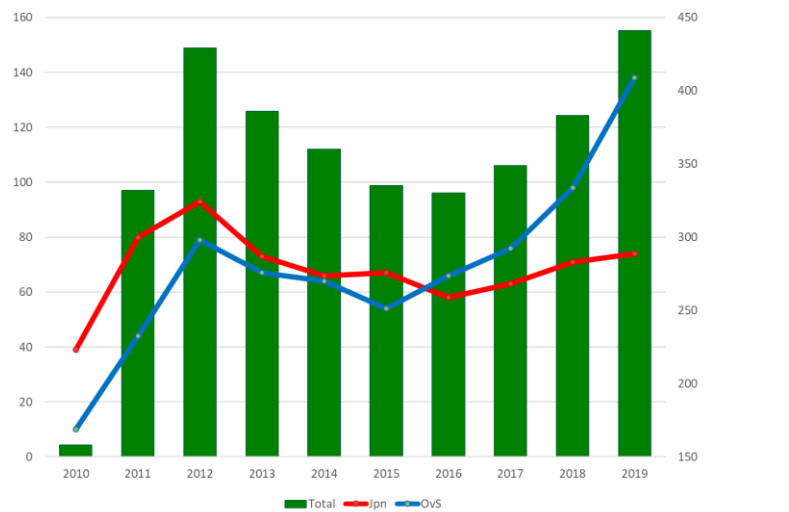
- Future Direction -

February 17th, 2020
CHAdemo Association
Secretary General
Makoto YOSHIDA

CHAdeMO members



448 comp
41 cont



Consortium

- Manufacture
- Charger/Connector
- EV/Parts
- Power Grid
- Communication/IT
- Construction
- Authority/Laboratory
- University
- Governments

Current Status



What is the Best?



Most Powerful?

Most in Number?

With History?


Good Shape?

	CHAdeMO	GB/T	US-COMBO CCS1	EUR-COMBO CCS2	Tesla 
Connector					
Inlet					
 	✓	✓	✓	✓	
					
 	✓			✓	
 	✓	✓	✓	✓	
 		✓			
Protocol	CAN		PLC		CAN
Max Power	400kW 1000x400	185kW 750x250	200kW 600x400	350kW 900x400	250kW?
Market Power	150kW	125kW	150kW	350kW	120kW
Connectors #	27,500	300,000	3,000	11,000	20,000
Start @	2009	2013	2014	2013	2012

Current Status



What is the Best?

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Connectors #	27,500	300,000	3,000	11,000	20,000
Start @	2009	2013	2014	2013	2012

Need Harmonization
Deferent Specifications
Double Investment
Less Efficient



l?
?
?
ry?
Good Shape?

Tasks for Harmonization



- Sustainability

Business Model

- Interoperability

Among Standards

Wide Coverage

Flexibility

Bi-Direction

- Localization

GLOCAL

Balance of Local and Global



Sustainability

Expandable & Consist

CHAdEMO Unique Lineup

- High/Big
 - 350kW, 500kW+
 - Battery 100kWh+
 - Charge @Dedicated Place
 - Auto Charge
 - New Plug, New Device
- Moderate
 - 100-150kW
 - Battery 50kWh+
 - Charge along Road
 - Maintenance/Update
- Low/Small
 - 3-20kW
 - Battery 2-10kWh
 - Charge @Home, Base
 - Low Cost (efficiency)
 - Wireless Charging



Available -Here and There



as of August 2019



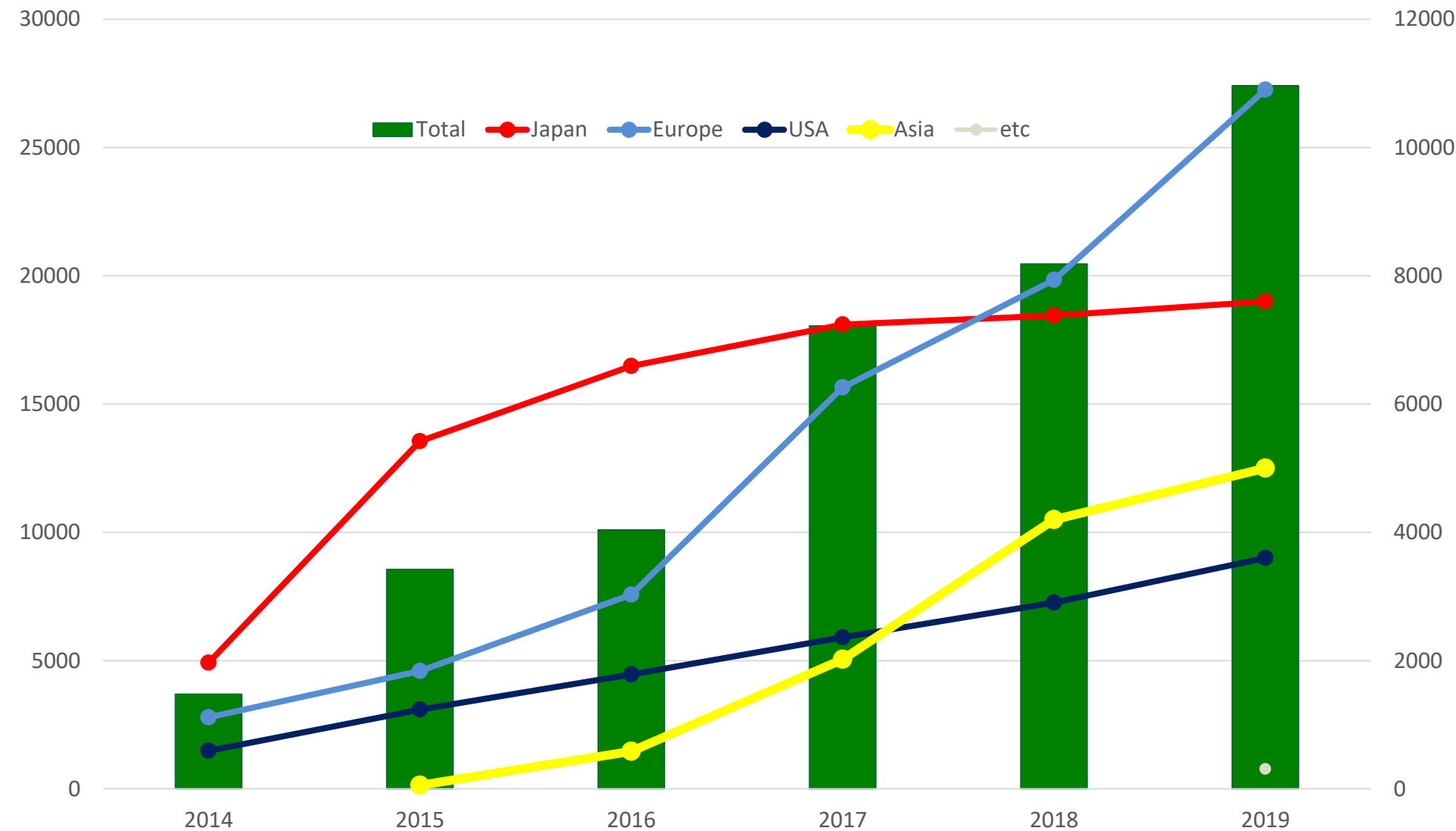
71 economies

27500 cgrs

Available -Here and There



as of August 2019





Where are they?

Charging Spot



Japan



USA



Europe (NL)



China

←NL

Shopping Mall

Japan→




Dealer



Home



Gas Station




Office

←Malaysia

Parking

Japan→




Convi. Store

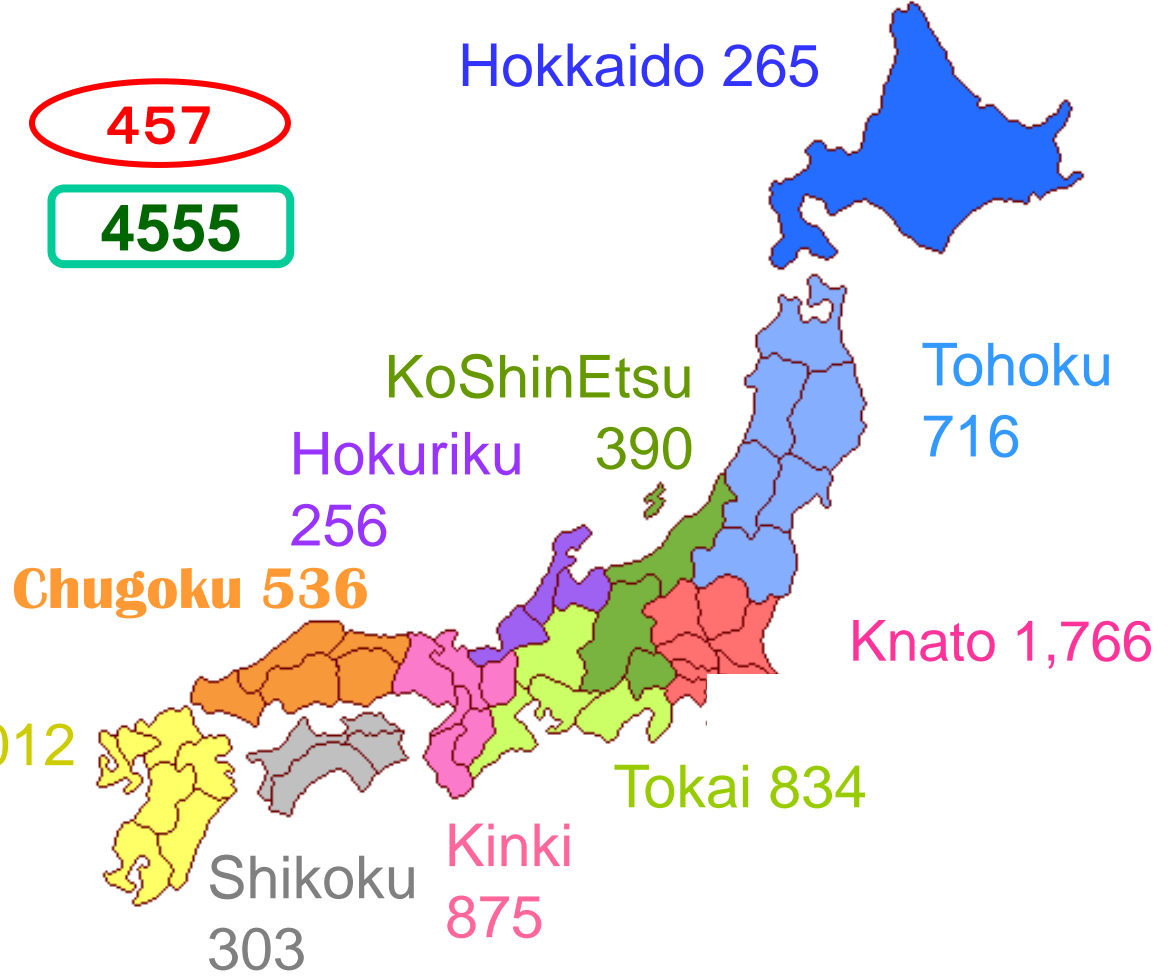


In the Japanese Case



① Dealers;	2,283
② City Office :	301
③ Roadside Mall	687
④ SA · PA (Hwy) :	391
⑤ Shopping Mall :	391
⑥ Hotels:	162
⑦ Gas Stations :	66
⑧ Cnv Store :	1,032

457
4555



6,953 Spot
7,241 Cgr

(as of 2017 Nov)

Sustainable Business Model

- Electric Fee; **Good** (cents/kW)
- Charger Cost; **Good** (vs Petro, Hydrogen)
- Duration; **Long** (vs Petro, Hydrogen)



Keep the Cost as Minimum and

- Shorten the Charging Duration
- Reduce the Operating Cost
- New Value (User Provide Energy back and Paid)
- Incidental Service (Information, Entertainment etc)

Sustainable Business Model



Keep the Cost as Minimum and

- Shorten the Charging Duration
- Reduce the Operating Cost
- New Value (User Provide Energy back and Paid)
- Incidental Service (Information, Entertainment etc)

■ Suitable Specific Charger to be Installed

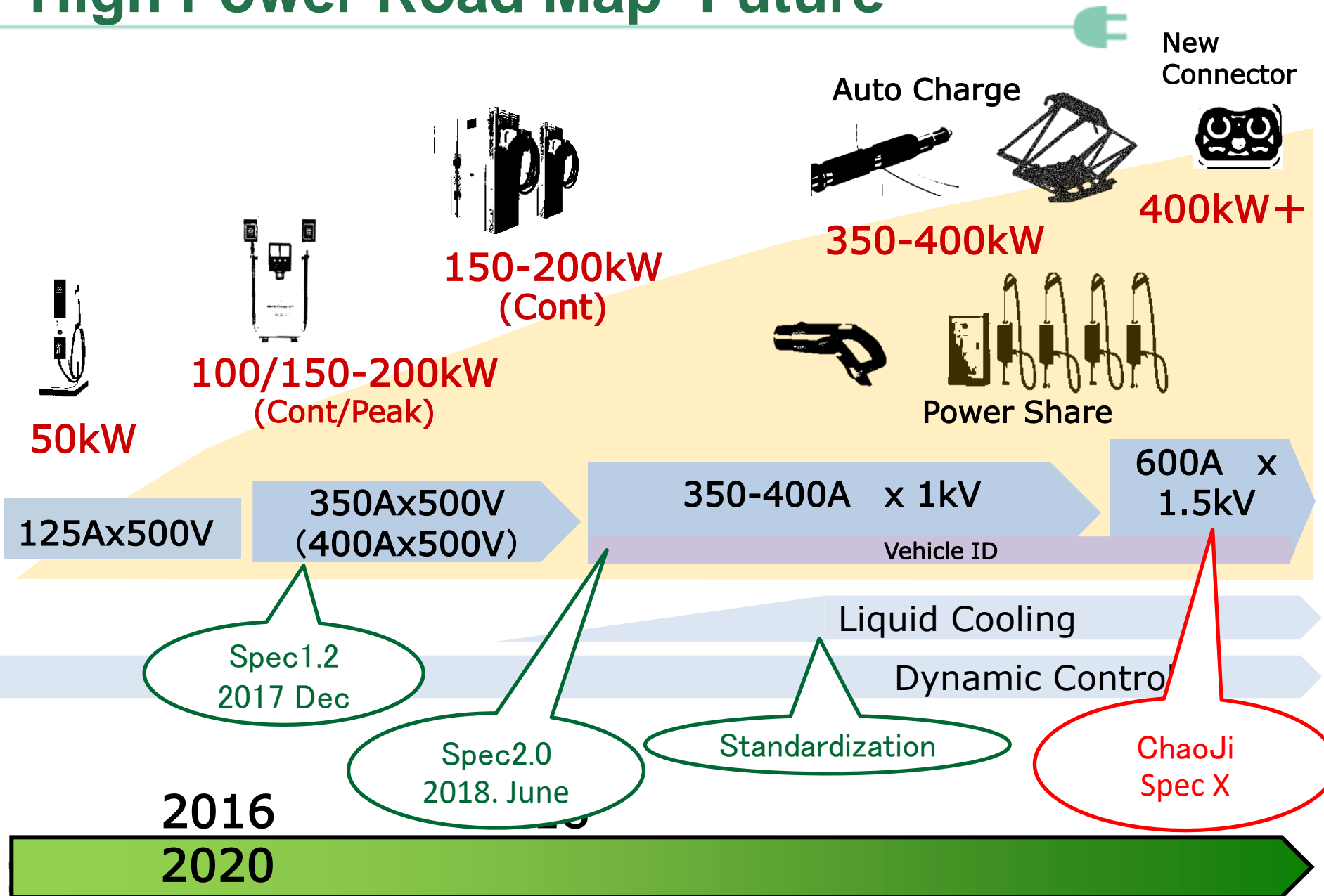
■ New Scheme of Charging Service

- Identification, Billing, Measurement

■ Utilization of IT

- Dynamic Station Info. and Guide
- Forecastable Behavior for Energy Availability
- Info. Share for Car Sharing and Battery Sharing
- Coupon, Discount (Demand Control)

High Power Road Map -Future-



High Power; Tasks



I. Electrical Safety

II. Battery Acceptance

III. Impact to the Power Grid

IV. High Cost

I. Electrical Safety

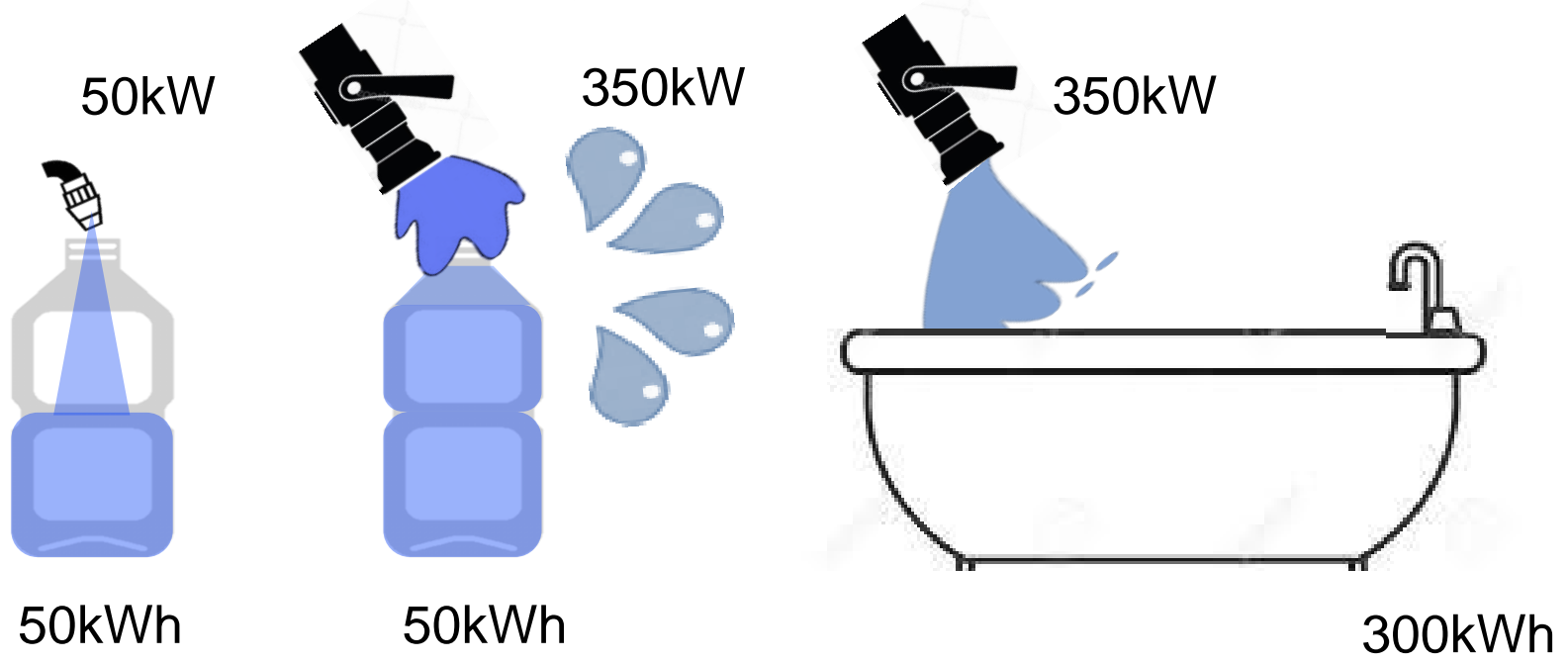


- Heat Resistance for High Current
 - Human Damage
 - Battery Safety
 - Connector Damage
- Electrical Shock for High Voltage
 - Human Damage
 - Spark
- Heavier Cable and Connector
 - Risk for Drop
 - Hard to Handle
- Heavy Connectivity
 - Connector Damage
 - Non-Sufficient Contact

II. Battery Acceptance



■ Need Good Chargeability Battery

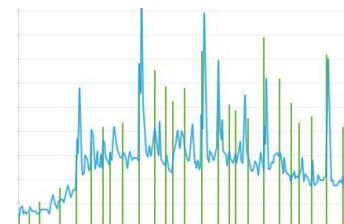
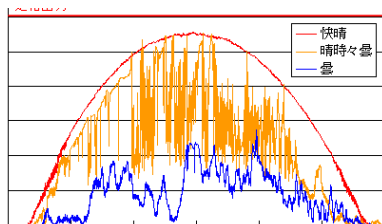
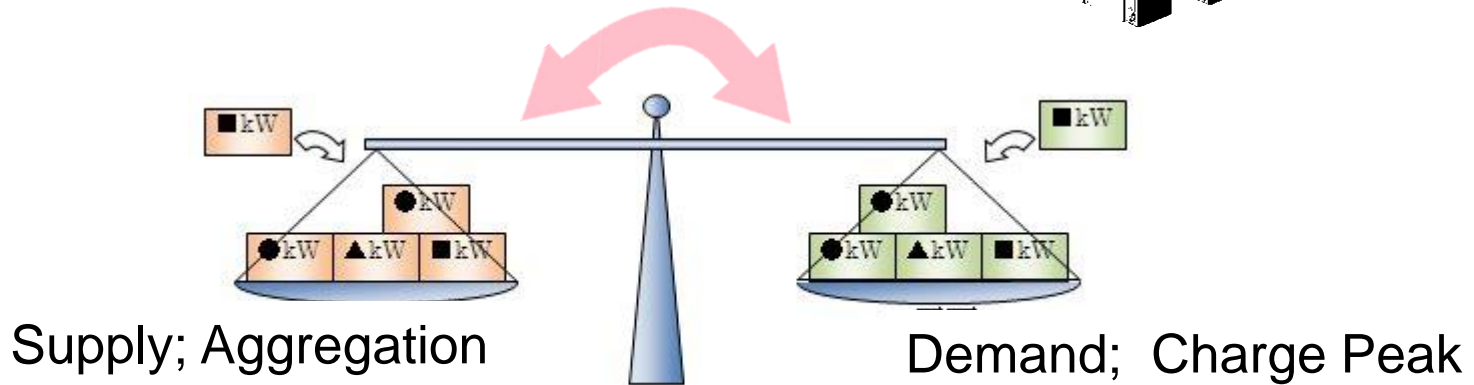
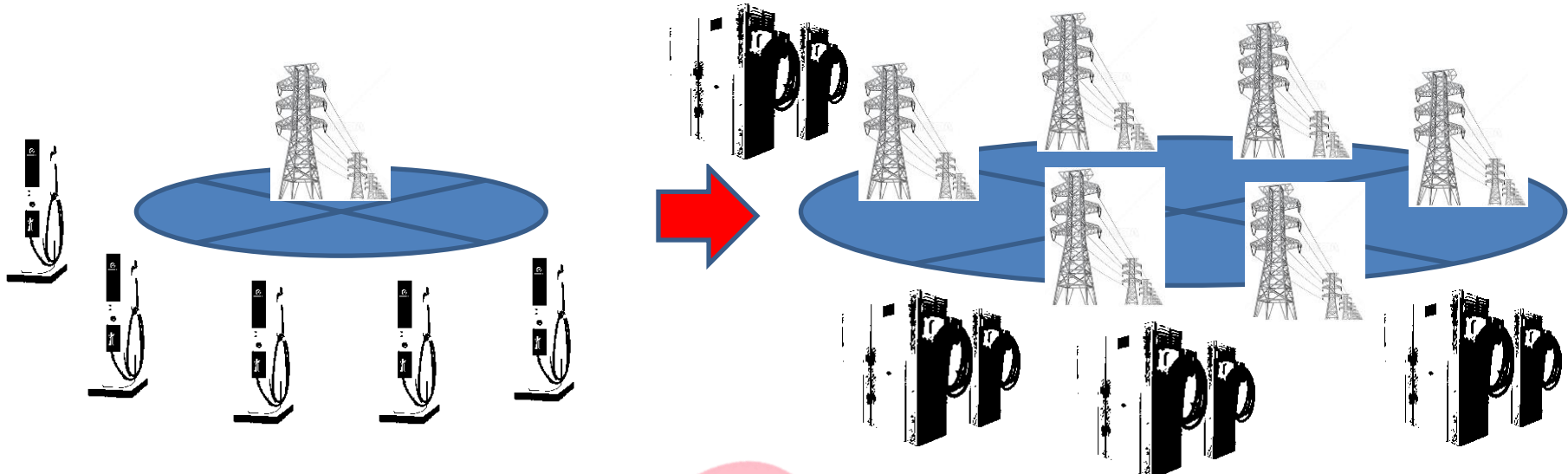


Battery	Charger		
	50kW	150kW	350kW
25kWh	30 min	×	×
50kWh	1 hour	20 min	×
150kWh	3 hours	1 hour	30 min

III. Impact to the Power Grid



@Macro Grid



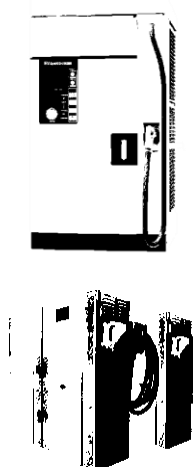
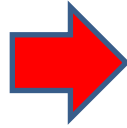
IV. High Cost



\$20K



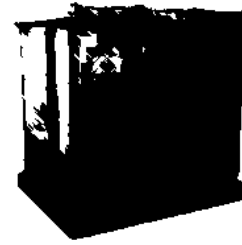
x 10



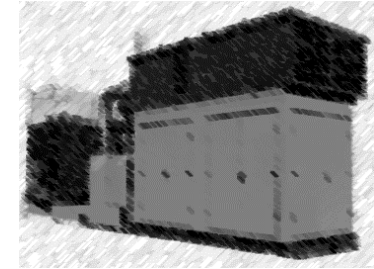
Bigger

\$200K

@Micro Grid



Power Receiving Facility

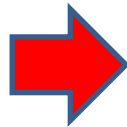


Radiator Facility

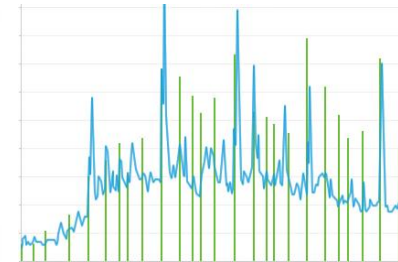
\$600/month



x 5



\$3000/month



Electric Fee; Base Price (defined by Peak)

High Power; Solutions



- Multi-Arm; Power Share
Dynamic Current Control
- Multi-Inlet
- Dedicated Charge Place
- Use Automated Charge
- Charger with Battery
Avoid the Peak
- New Standard Assuming High Power

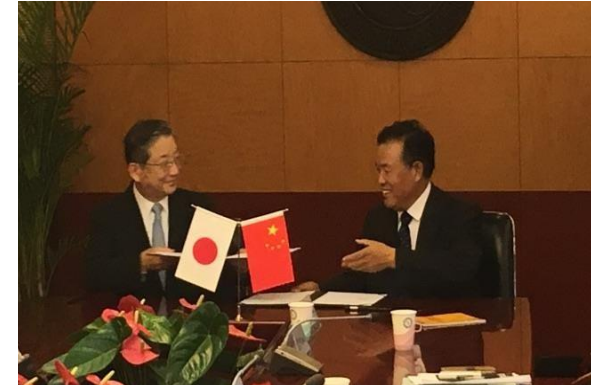


China and Japan Agreement



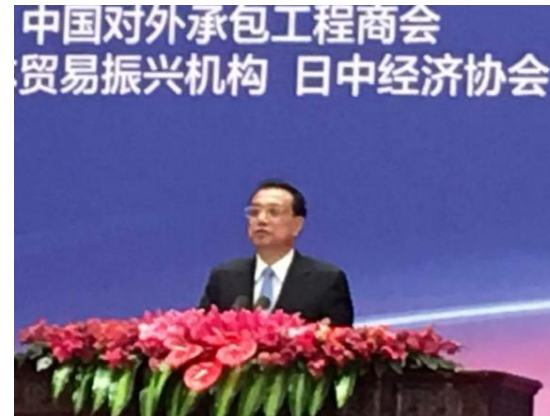
Develop New Standard

- Agreement to develop common new standard on 28th of August 2018
- China Electricity Council and CHAdeMO Association Agreed to Establish the new future Standard by 2020



Expansion to Global Level

- Agreement to expand common standard to the 3rd Countries on 26th October 2018 under the supervision of each Government





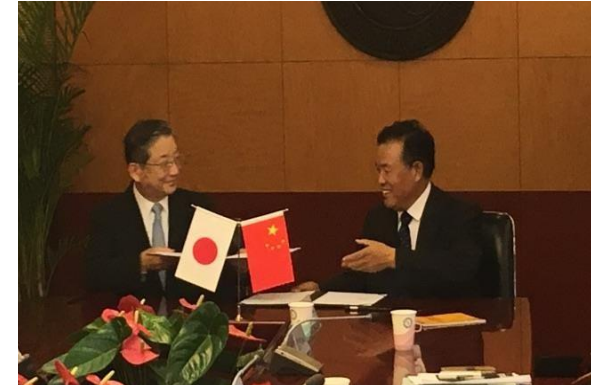
Interoperability

China and Japan Agreement



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ChaoJi Standard

Compatible

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Connector					
Inlet					
 	✓	✓	✓	✓	
					
 	✓			✓	
 	✓	✓	✓	✓	
 		✓			
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ChaoJi



Future

?

?

✓

✓

CAN

900kW 1500x600

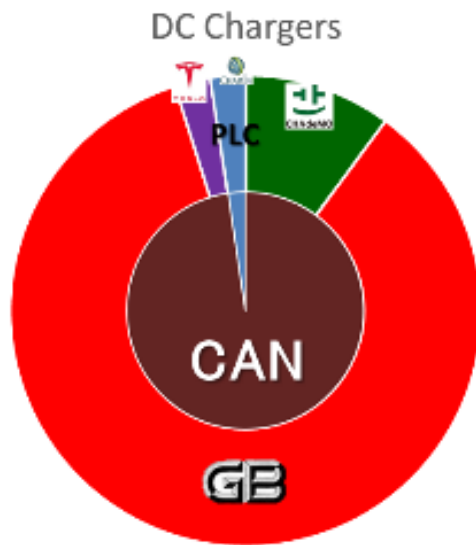
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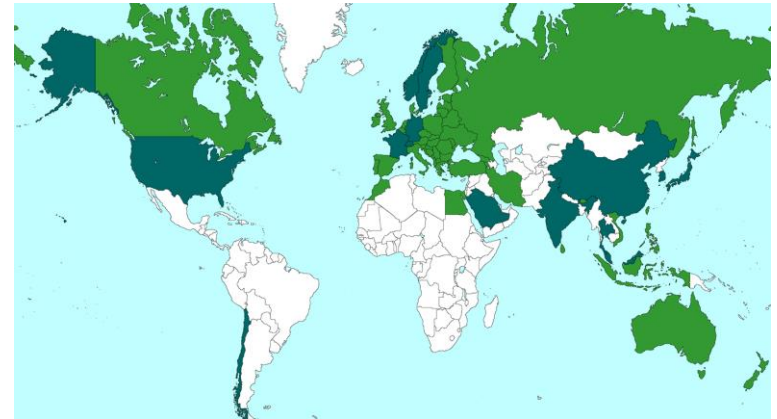
2020 Target

Merit of Common Project

- Better Quality, Safety, Compatible Standard
- Market Expansion with A Unique Standard
- Mass Manufacturing leads **Cost Down**
- **Current Asset Utilization** by **Backward Compatibility**
- No Business Obligation (Independency)



Mass Marketing

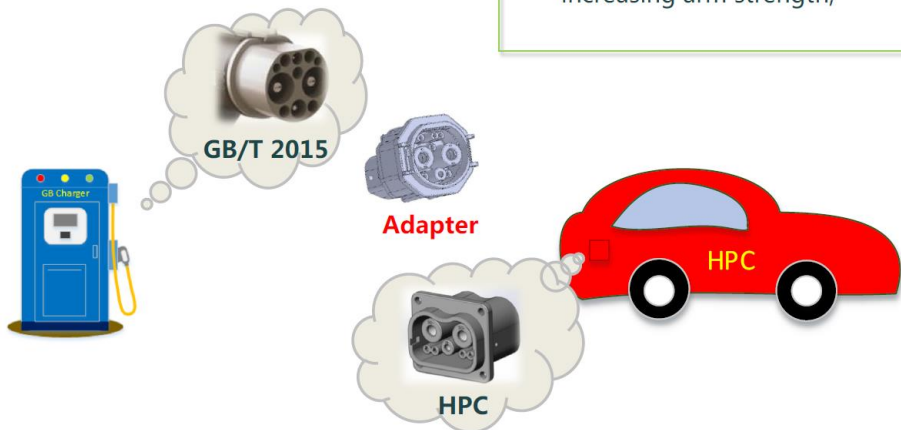


Geographical Coverage

Backward Compatibility

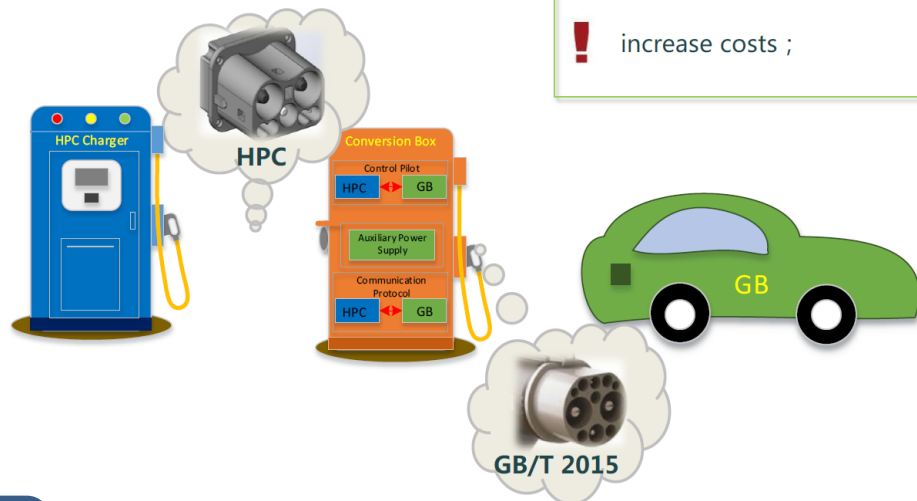
Current Charger ChaoJi Car

- ✓ low cost ; easy to carry ;
- ! limit charging output power increasing arm strength;



ChaoJi Charger Current Car

- ✓ conform with IEC standards ;
- ! increase costs ;



Dual Charger (ChaoJi and Current)

- ✓ easy to use, strong security ;
- ! need to install two sets of different charging coupler;



Experiments

Feb 6@UL Kashima Labo



- Confirm the Backward Compatibility between ChaoJi and CHAdeMO
- Confirm the Basic Function of Liquid Cooling ChaoJi Connector and its Adaptor



Connector
Mechanical Integrity
Insertion Easiness

Adaptor
Mechanical Integrity
Heat Resistance



Anti-Shock
Insertion Easiness
Ease of Use

Protocol
Backward Compatibility

Safety
Functionality

Etc



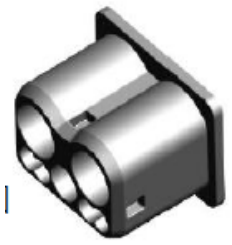
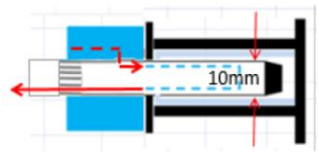
- Trial has Started with 475kW/500A ChaoJi in Real Market Operation (@China)
- Consider the Trial in Real Market Operation in Japan for FY 2020

Expansion of ChaoJi Project

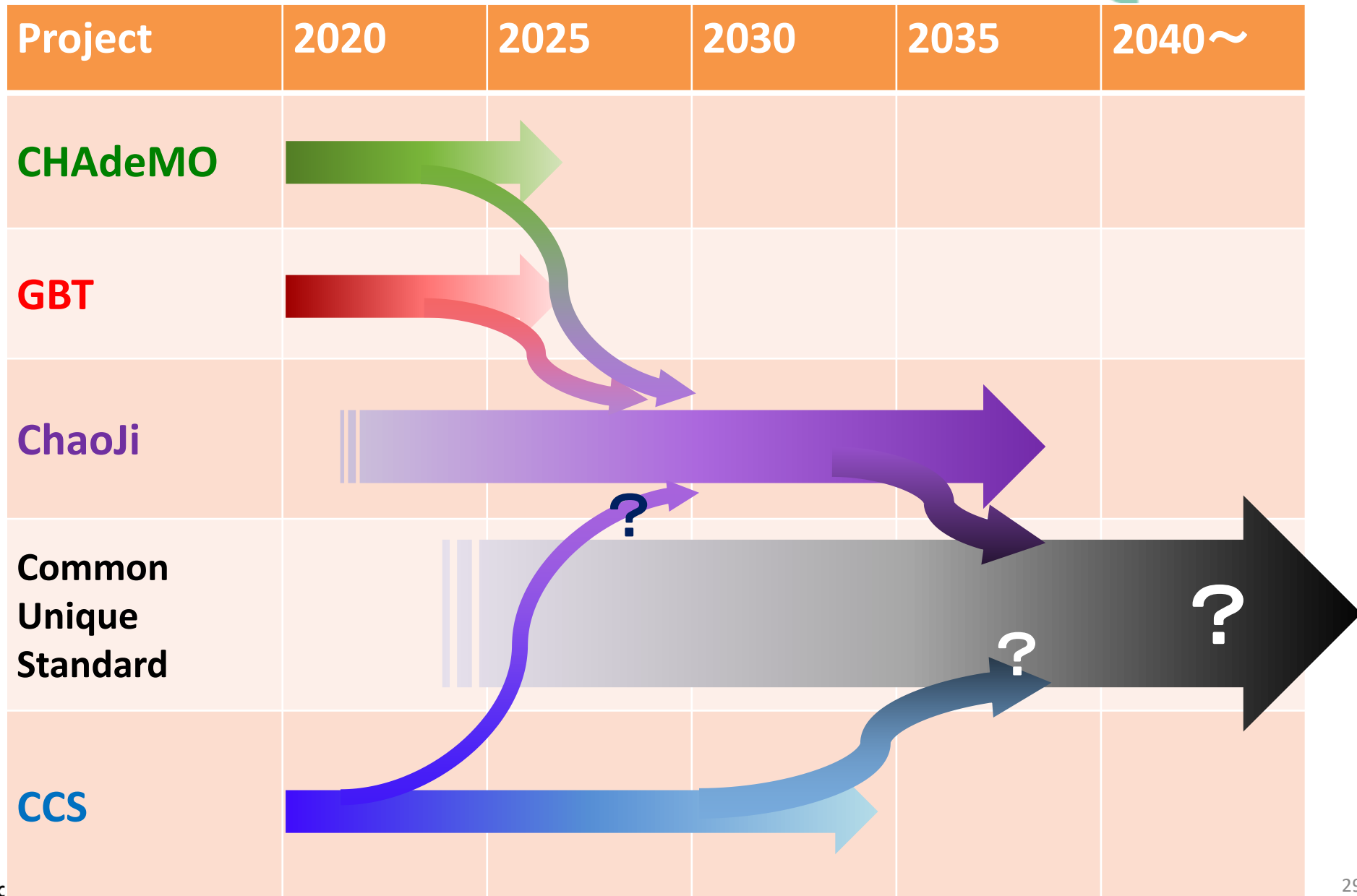


- Open to Everybody
- Not only from Japan and China

Logos displayed include: TOYOTA, HASETEC, YAZAKI, TÜV Rheinland (Japan), STATE GRID CORPORATION OF CHINA, 北汽集团, ATC, PHOENIX CONTACT, NISSAN, ShinDengen, SUMITOMO ELECTRIC, UL (Japan), 星星充电, WOER, HONDA, nichicon, Fujikura, 蔚来汽车, HUBER+SUHNER, MITSUBISHI MOTORS, NS-TEXENG, JAE, TEPCO, BYD, XUJI, AVIC, SUBARU, Tyco Electronics (Japan), TERTEC, DAIMLER, 奥特迅, K, ISUZU, 株式会社 東光高岳 TAKAOKA TOKO CO., LTD., Shell, Audi, 充电 echarge.net.com, TESLA, ABB, DELTA, TOSHIBA, NARI 国电南瑞, JAGUAR, LAND-ROVER, HYUNDAI, TRITIUM, FUSO, SIEMENS, EKO SMART ENERGY SYSTEMS, PSA GROUPE, intech, CREATIVE POWER TECHNOLOGIES, GM.



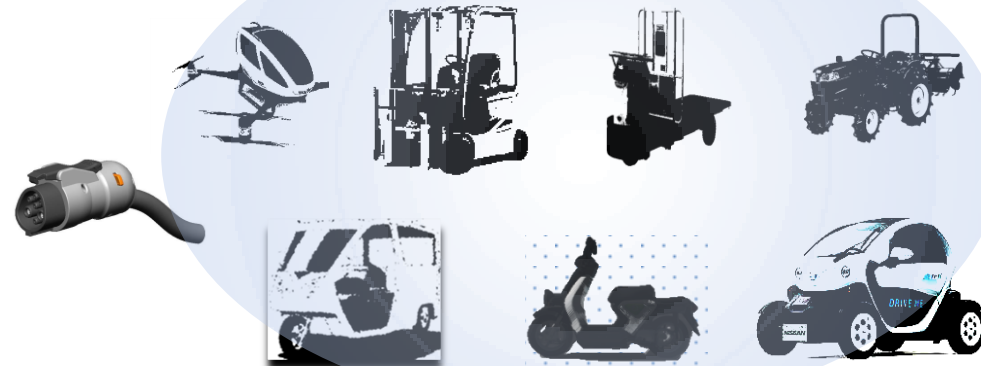
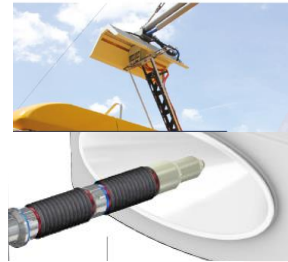
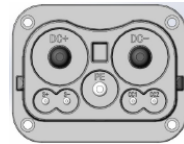
Harmonization



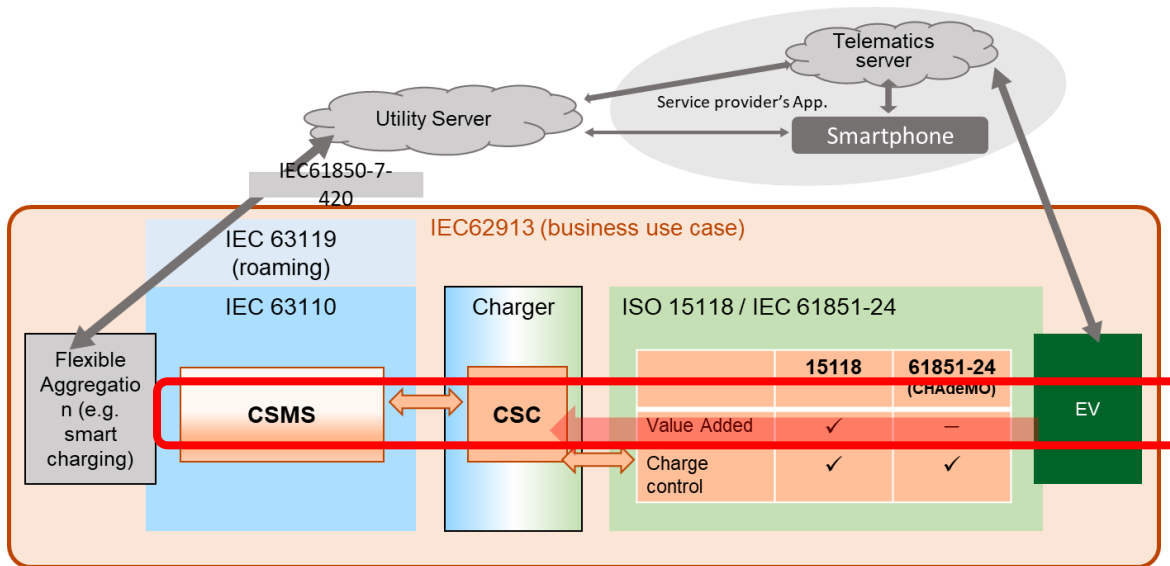
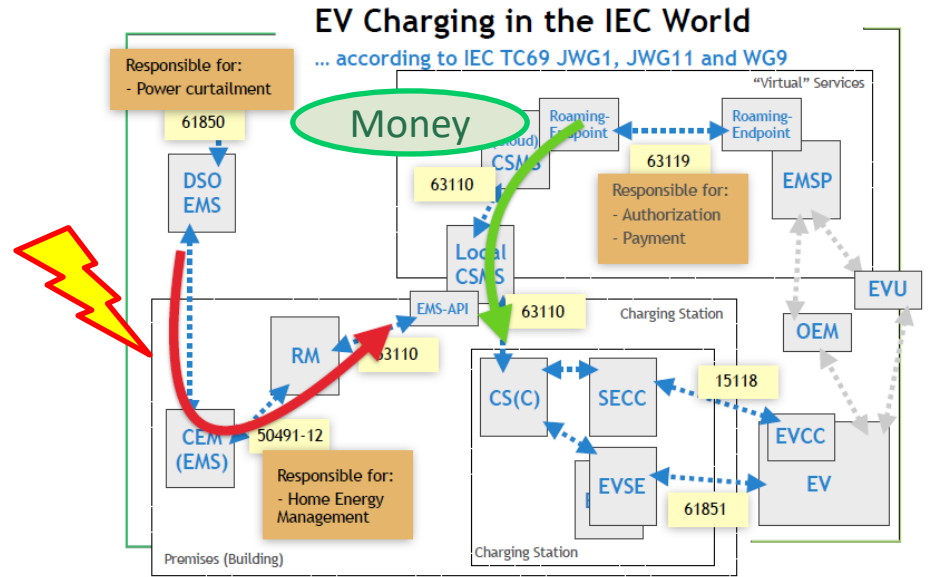
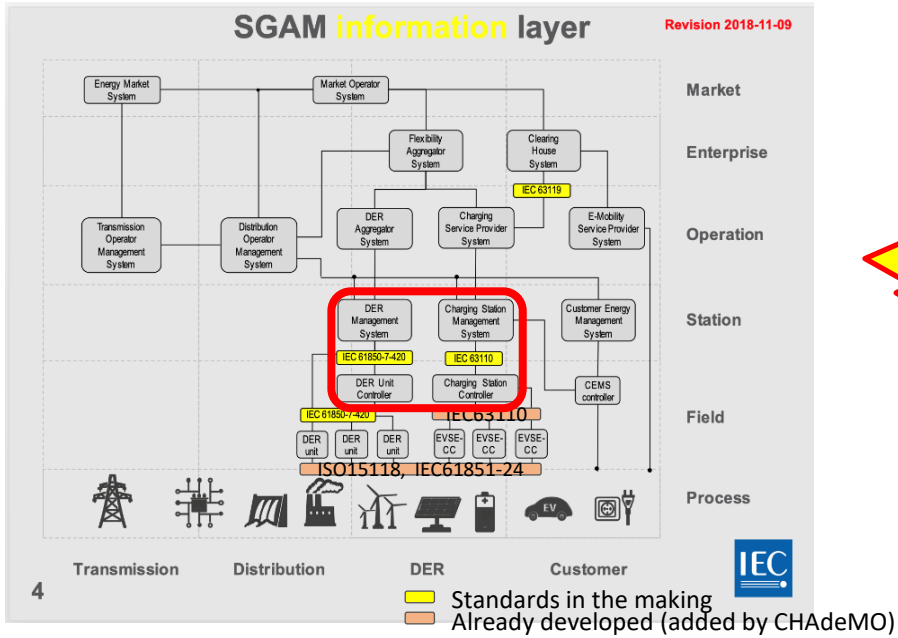
Wide Coverage

CHAdeMO Unique Line-Up

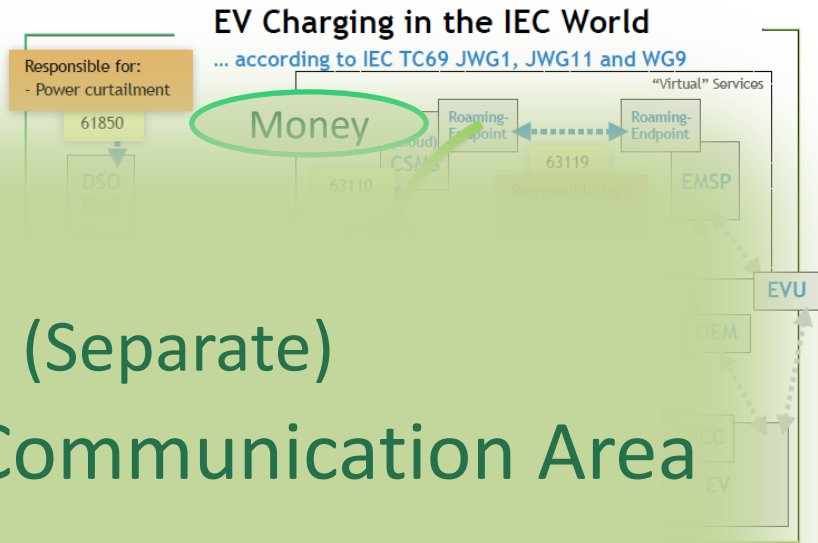
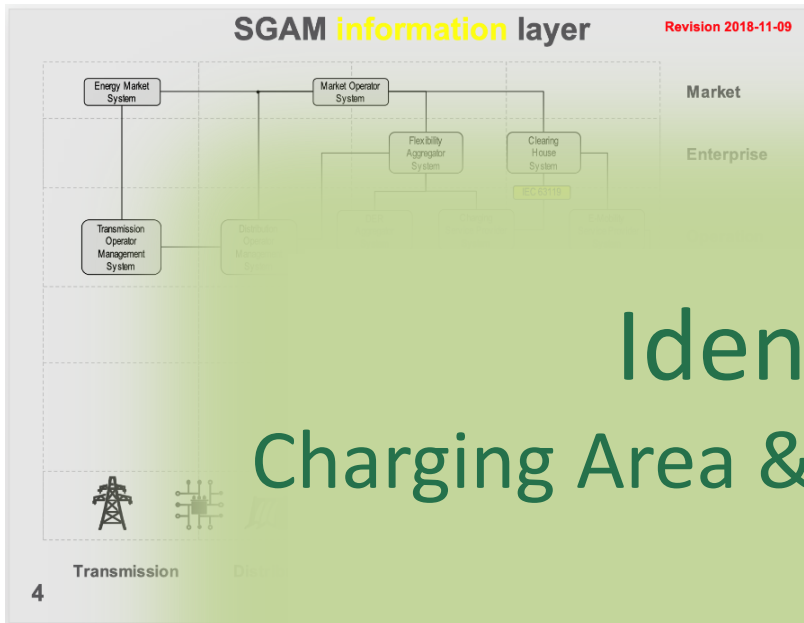
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 - 350kW, 500kW+
 - Battery 100kWh+
 - Charge @Dedicated Place
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- **Low/Small**
 - 3-20kW
 - Battery 2-10kWh
 - Charge @Home, Base
 - Low Cost (efficiency)
 - Wireless Charging



Flexibility



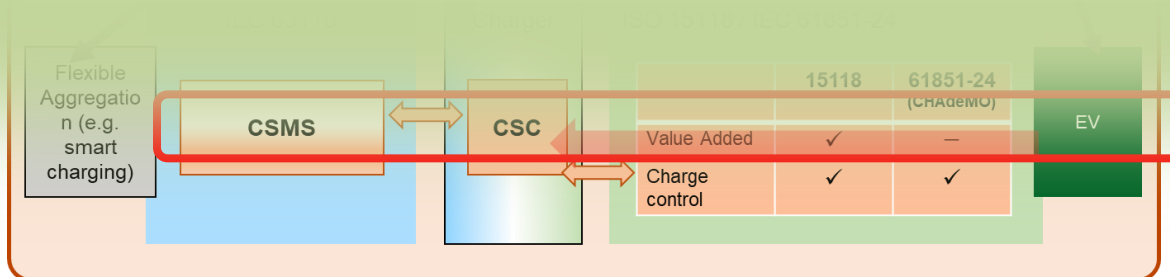
Flexibility



Identify (Separate)
Charging Area & IT Communication Area

To Keep

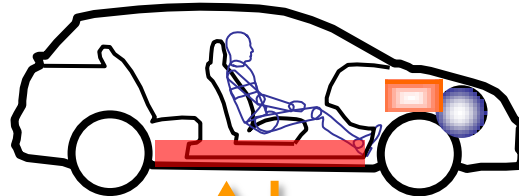
Flexibility for Charging Business
Security for Communication



Bi-Directional

CHAdEMO Unique
System A Annex
Only

Electric Vehicle



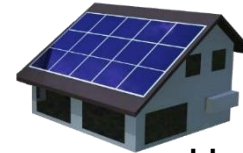
Battery

Power
Generation

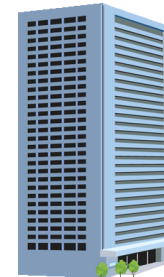
Power
Feeding



Charge at low demand
Feed at high demand



Home(10kW)



Building(10MW)



Mega
City(600MW/day)

Oil

Bio Mass

Coal
Natural Gas

Nuclear

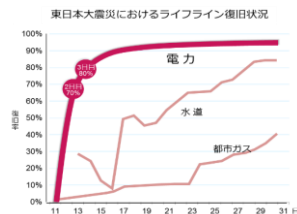
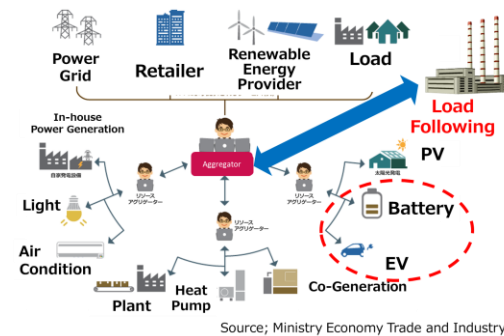
Hydrogen

Water, Wind
Solar

Energy Source output



- Leisure, Work
- Power to House, Building
- Power back to Grid
- Power Transfer
 - To isolated Area
 - Provided by Battery on Truck
- Sharing (Car, Battery)
 - Vacant situation of Share Car
- Emergency
 - Supply to Shelter, Damaged Area
 - Mobile Energy Source





Localization

Safe and Compatible



Standard/Guideline



System(Hard/Soft)

Certificate Agency



Merit of Certification

- Certification goes **Localization**
 - Support “Made Locally”, “Operated Locally”
 - Support Technical improvement on Industry
- Certification assure **Safety and Inter-operability**
 - Third Party Certification
 - Reliable, Flexible, Fair, Convenient, and Market Oriented
 - Both Charge and Feed Certification Available
 - Global Certification Network
 - Certification Committee



- Candidate has comes for Russia, Canada, and Spain
- Further Expansion to China, and More



Glocal; Open Platform Strategy



Glocal

Target

- Designed, Made, Certified, Sold, Charged **Locally**
- Commonality, Similarity Makes Export Easy (**Global**)

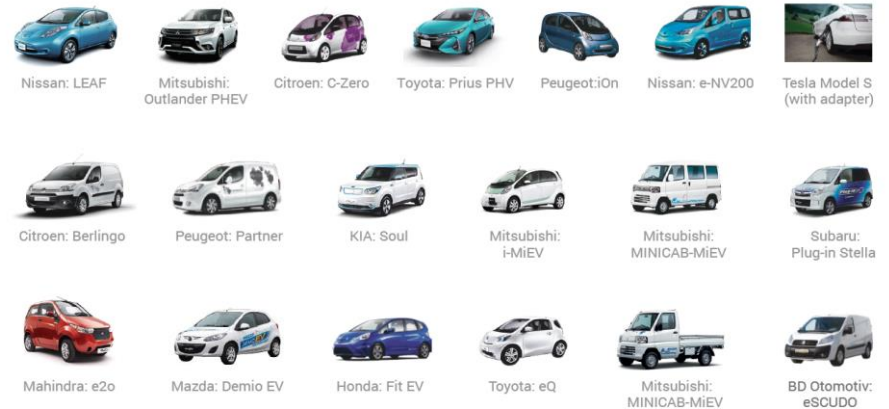
Proposal

- **Localize the Certification Scheme**
- **Empowerment** to Local Organization
- Open All the **Intellectual Property**
- With Local Companies to **Minimize Cost**
- Local Standards with **Common Core Protocol**





Thank You Very Much



yoshida@chademo.org

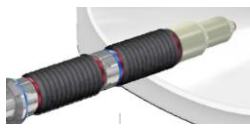
@2025

Wireless

while Driving

Automated

High Power Charge



Just Charge

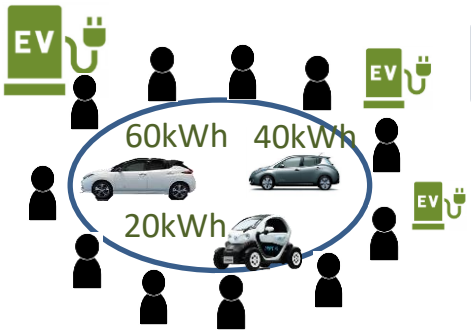
No Man Charging

Various Charging



Car Share

Energy Source



Variation



Car Share

V2X

