

Electric Vehicles in Japan

Japan Automobile Research Institute
FC-EV Research Division

2012.2.17

Norikazu OGINO

Outline of **J**apan **A**utomobile **R**esearch **I**nstitute

JARI is an independent and non-profit research organization, will perform its mission as a public service corporation to contribute to healthy development of the motorized society in the 21st century.

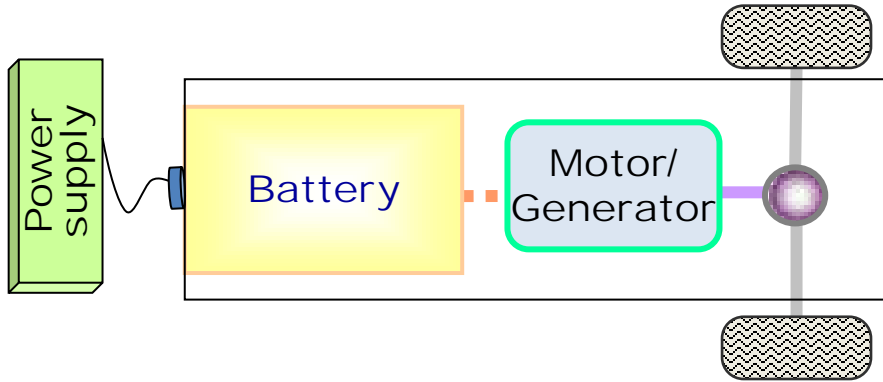
1. Year of foundation : in 1969
2. Extent
 - Tsukuba area : 820,000m²
 - Shirosato area : 3,060,000m²
3. Number of employees : 363 (2011)

International Standardization

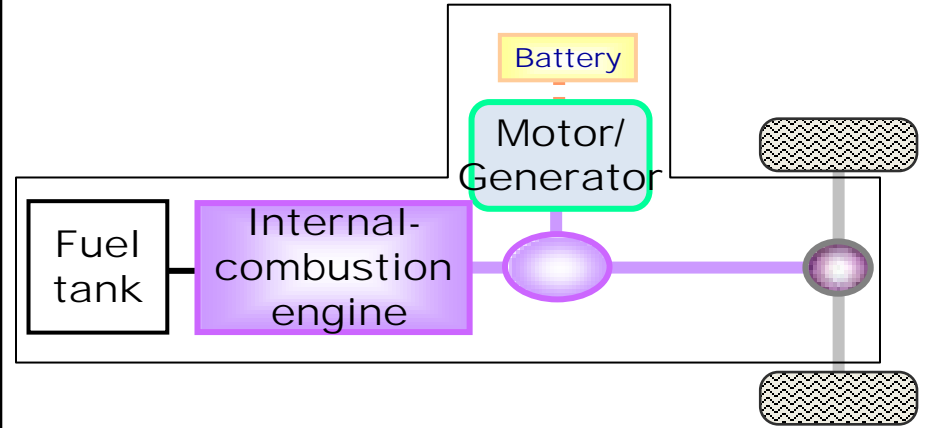
Member Body: IEC/TC69, ISO/TC22/SC21

Example of basic structure of electrically propelled vehicles

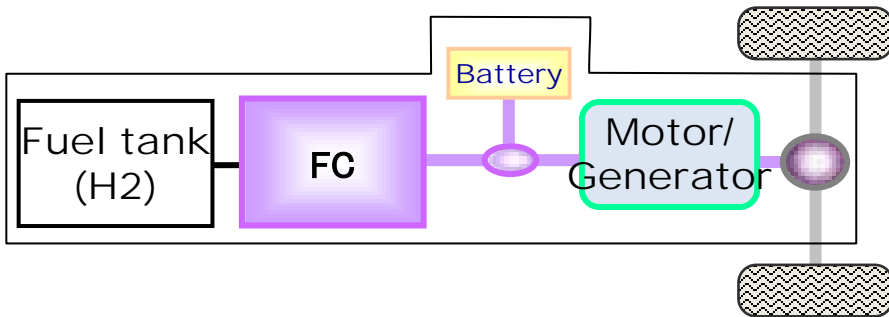
Battery Electric Vehicle (BEV)



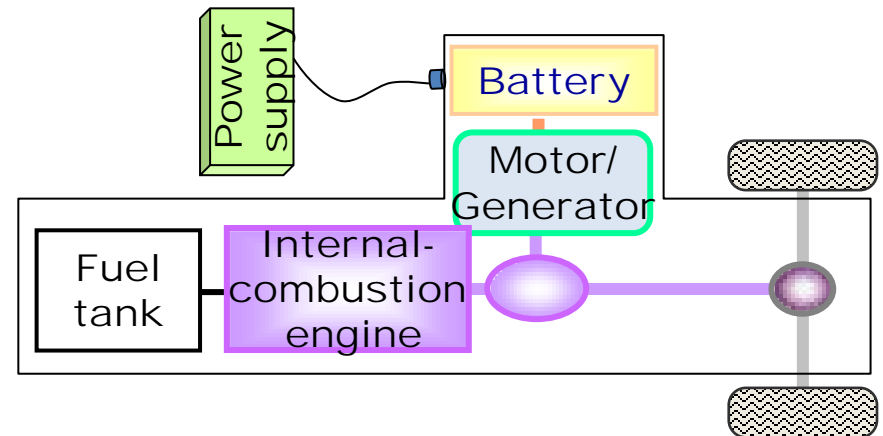
Hybrid Electric Vehicle (HEV)



Fuel Cell Vehicle (FCV)



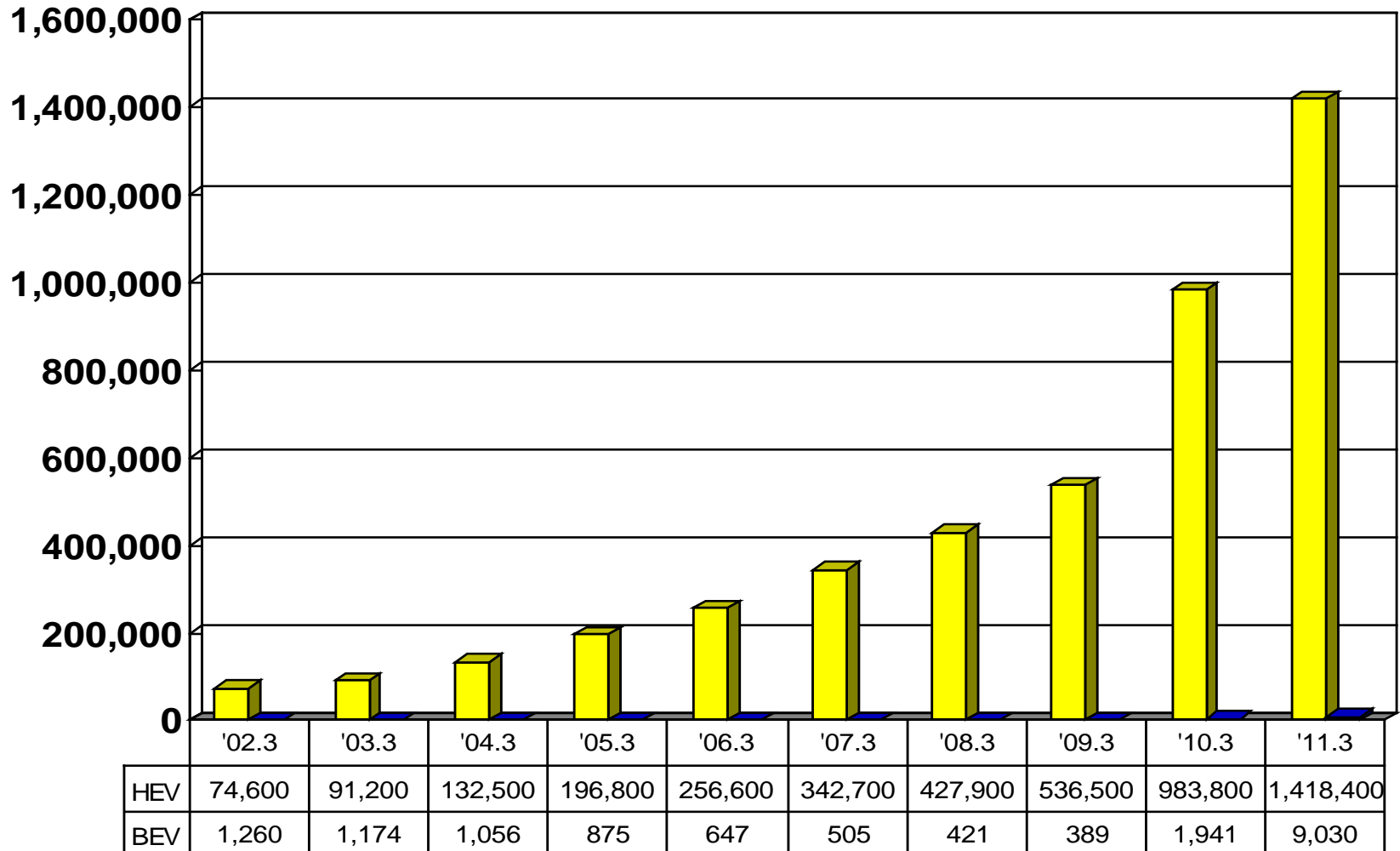
Plug-in HEV (PHEV)



RECENT EVS IN JAPAN

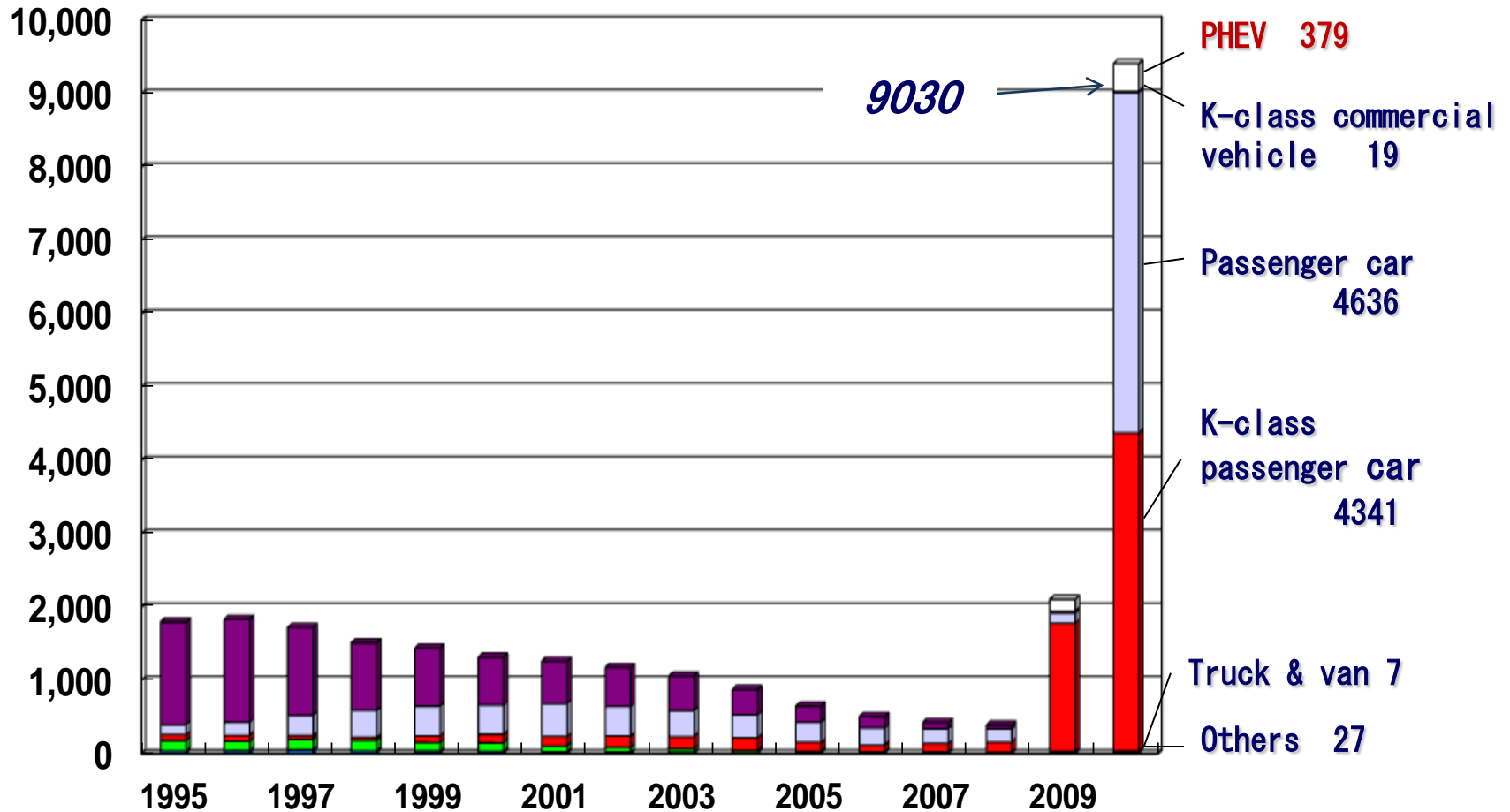
The number of BEV·HEV in operation

JAPAN





The number of BEV in operation

JAPAN



• "K-class" is the Japanese classification for vehicles which are less than 3.4m long and with an engine displacement of 660cc or less.

BEV

		Mitsubishi Motors i-MiEV	Nissan LEAF
Photo			
Seating capacity		4	5
Dimension(L x W x H)		3,395 x 1,475 x 1,610mm	4,445 x 1,770 x 1,550mm
Max Speed		130km/h	140km/h<
Cruising Distance		160km	200km
Motor		47kW	80kW
Battery		Li-ion 16kWh	Li-ion 24kWh
charging time	Normal	1Φ100V:14h 200V:7h	1Φ200V:8h
	Quick	DC500V:0.5h(80%)	DC500V:0.5h(80%)
Price(with tax)		¥4,599,000⇒¥3,980,000 ⇒¥2,660,000~3,880,000	¥3,764,250(with NAVI)



Quick Charger




Input: 3-phase 200V Output :Maximum DC 500V

Plug-in HEV(TOYOTA)



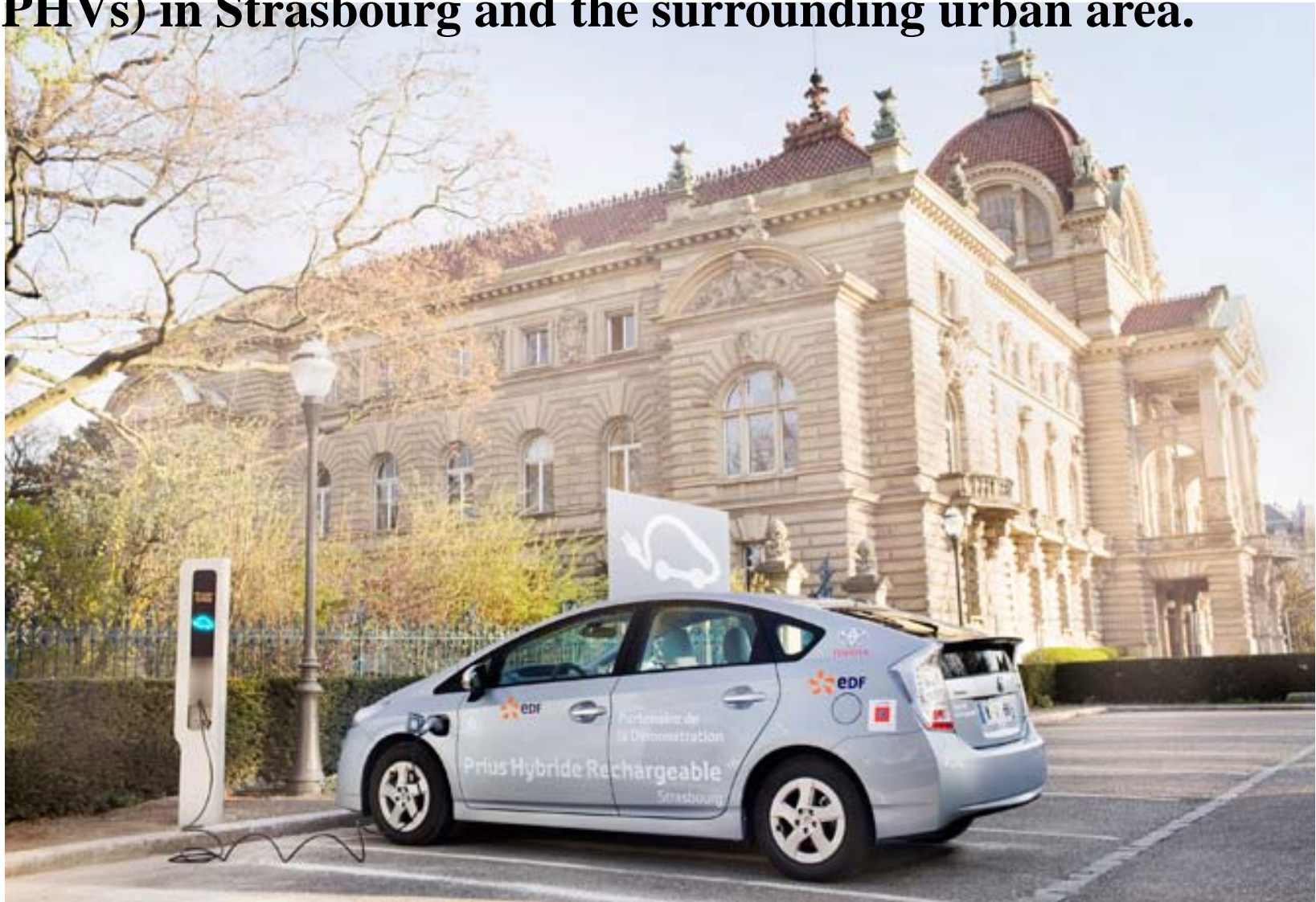
- Worldwide: 600 limited lease sale in December 2009
Japan: about 230 units USA: about 150 units
Europe (mainly France): about 200 units Others: about 20
- Market introduction in Jan. 2012: 60,000 units per year
(¥3,200,000 in JAPAN)

TOYOTA Plug-in HEV



		NEW PRIUS	Plug-in PRIUS	
photo				
Dimension (L × W × H)		4,460 × 1,745 × 1,490mm		4,480 × 1,745 × 1,490mm
Weight (Vehicle)		1,310kg	1,490kg	1,410kg
Seating Capacity		5	5	5
Engine		1,797cc		
Motor		60kW		
Battery		Ni-MH 1.3kWh	Li Ion 5.2kWh (Grid charge 3.56kWh)	Li Ion 4.4kWh
Fuel Efficiency (JC08)		32.6 km/L	PHV: 57.0km/L HEV: 30.6km/L BEV: 6.57km/kWh	PHV: 61.0km/L HEV: 31.6km/L BEV: 8.74km/kWh
BEV Driving	Max Speed	—	100km/h	—
	Cruising Distance		23.4km	26.4km
Fuel Tank		45L	—	45L
Price(with tax)		¥2,050,000~3,270,000	¥5,250,000 (Dec. 2009)	¥3,200,000 (Jan. 2012)

TOYOTA Plug-in Prius in Strasbourg

A demonstration of around 100 plug-in hybrid electric vehicles (PHVs) in Strasbourg and the surrounding urban area.



Renault

		KANGOO Z.E.	FLUENCE Z.E.	TWIZY URBAN/ TWIZY URBAN 45
photo				
Seating Capacity		2(photo)/5	5	2
Dimension (L × W × H)		4,213/4,597 × 1,829 × — mm	4,748 × 1,813 × — mm	2,337 × 1,191 × 1,461mm
Max Speed		130km/h	135km/h	80km/h ,45km/h
Cruising Distance		170km(NEDC)	185km(NEDC)	100km
Motor		44kW	70kW	13kW,4kW
Battery		Li-ion 22kWh	Li-ion 22kWh	Li-ion ??kWh
Charging Time	Normal	1 Φ 220V16A:6–8h	1 Φ 220V16A:6–8h	1 Φ 220V10A:3.5h
	Battery Switch (exchange)	—	3minutes	—
Price (TTC)	Vehicle	€15,000/€17,000 (5 000 € de bonus)	€21,300 (5 000 € de bonus)	€7,690,€6,990
	Battery	€75 /month	€82/month	€49 /month , €45/month
Year on the market		2011	2011	2011

Expected Introduction of EVs & PHEVs

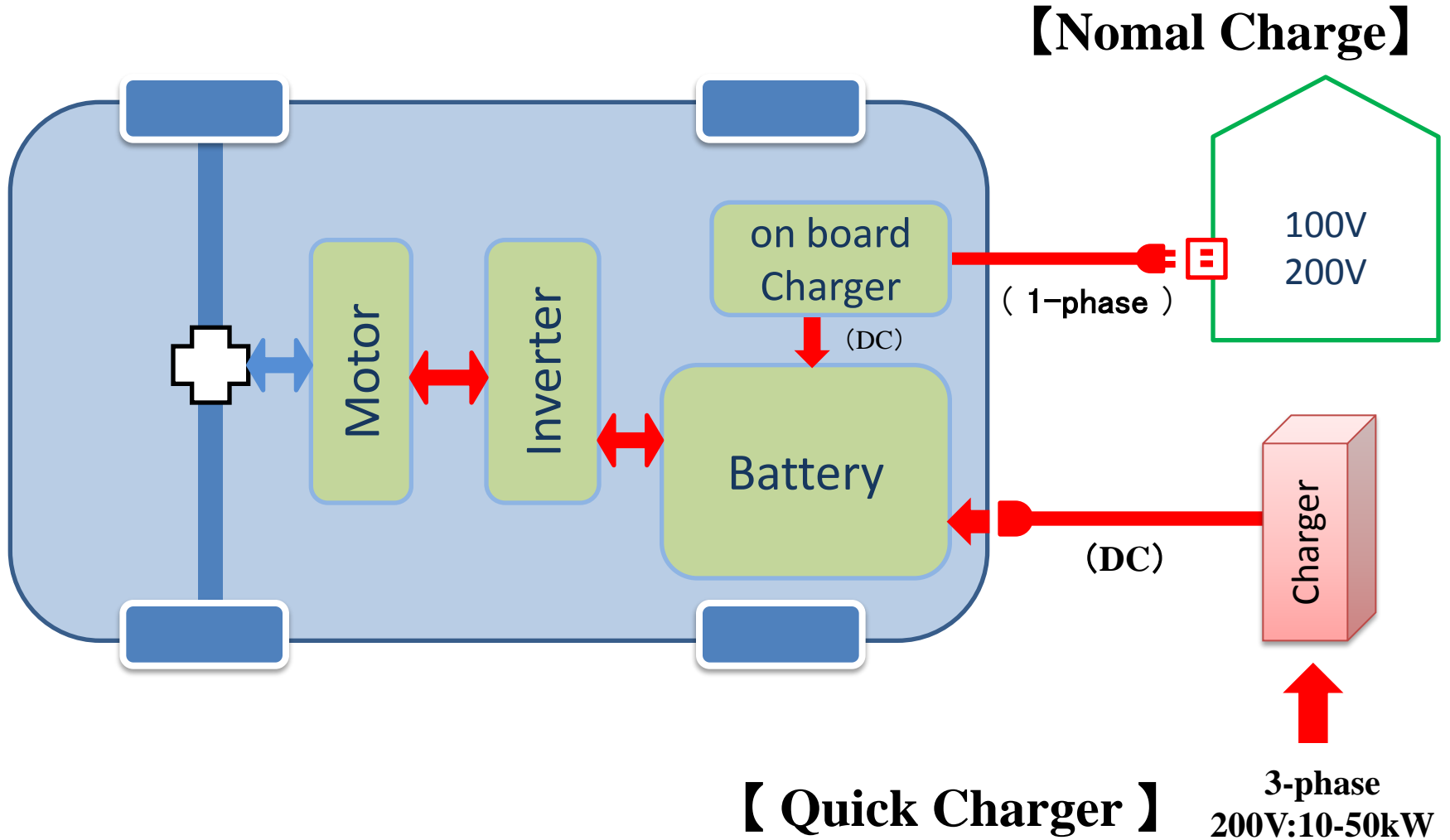
		FY2009	FY2010	FY2011~
BEV	Mitsubishi	Δ: 2009.7 iMiEV (1,400(J)+200(W) /FY2009) (2,600(J)+5,600(W) /FY2010) (25,000(all) /2011Plan)		
	Fuji	Δ: 2009.7 Plug-in STELLA (170(J)/FY2009)		
	Nissan	Δ: 2010.12 LEAF (6,000(J)/FY2010Plan, 50,000(all)/year)		
	TOYOTA	Δ: 2012		
	Ford	Δ: 2010		
	Daimler	Δ: 2009 SMART		Δ: 2012
	BMW	Δ: 2009 MINI		
	RENAULT	Δ: 2011		
PHEV	TOYOTA	Δ: 2009 Prius (230(J)/FY2009 / 600(all)/FY2010)		Δ: 2012 (60,000 units per year)
	GM	Δ: 2010 VOLT		
	Ford	Δ: 2012		

(J):JAPAN (W):WORLDWIDE except JAPAN (all):WORLD

FOR WIDESPREAD USE

OF ELECTRIC VEHICLES IN JAPAN

Structure of BEV in Japan (general use)



Infrastructure for EVs in Japan



【Normal Charger】

1-phase 100V:1.5kW

1-phase 200V:3kW



【Quick Charger】

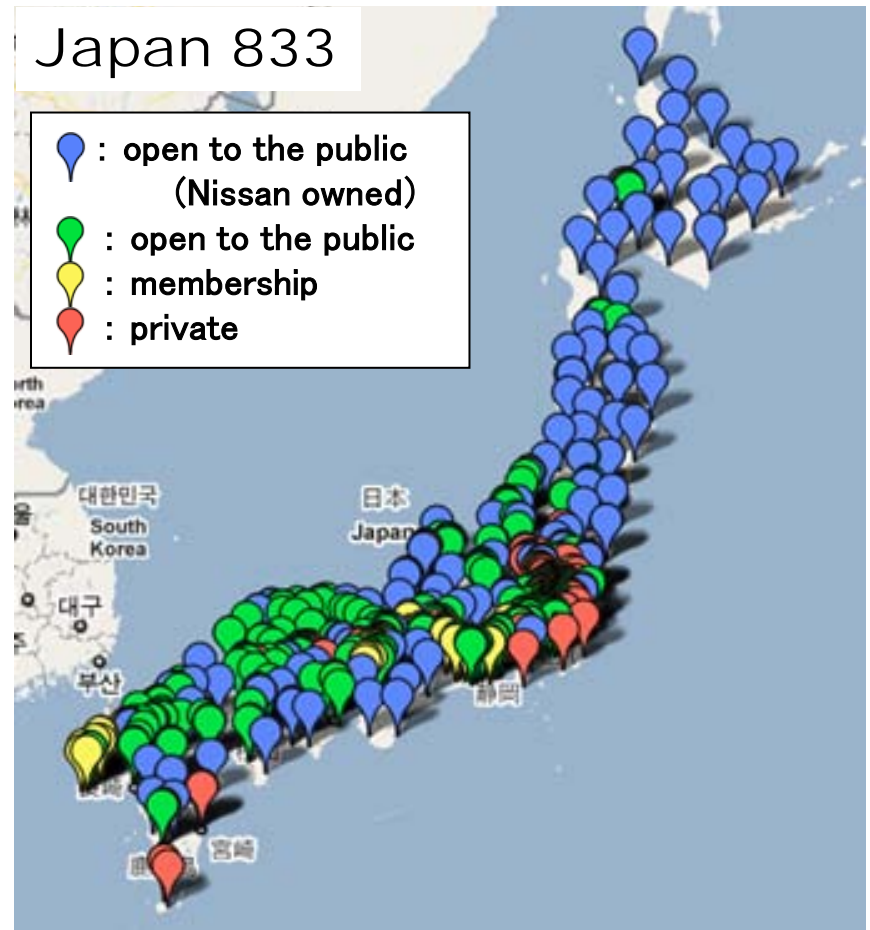
3-phase 200V:10-50kW

CHAdemo :DC Quick Charger Locations Map

Europe 160



Japan 833



Other 16

Total: 1,009 (2012.1.24)

Quick Charger




Nissan Developed New Quick Charger (2011.12~)



Input	AC200V,49kW
output voltage	Maximum DC500V
output current	Maximum DC125A
H×W×D (mm)	1,840x380x665
Price(without tax)	¥570,000~
purchase subsidy	¥280,000~

Nissan aims to sell 5,000 of the new quick chargers by the end of 2015 (March 2016) to contribute to the ongoing development of the EV quick charging infrastructure in **Japan**.

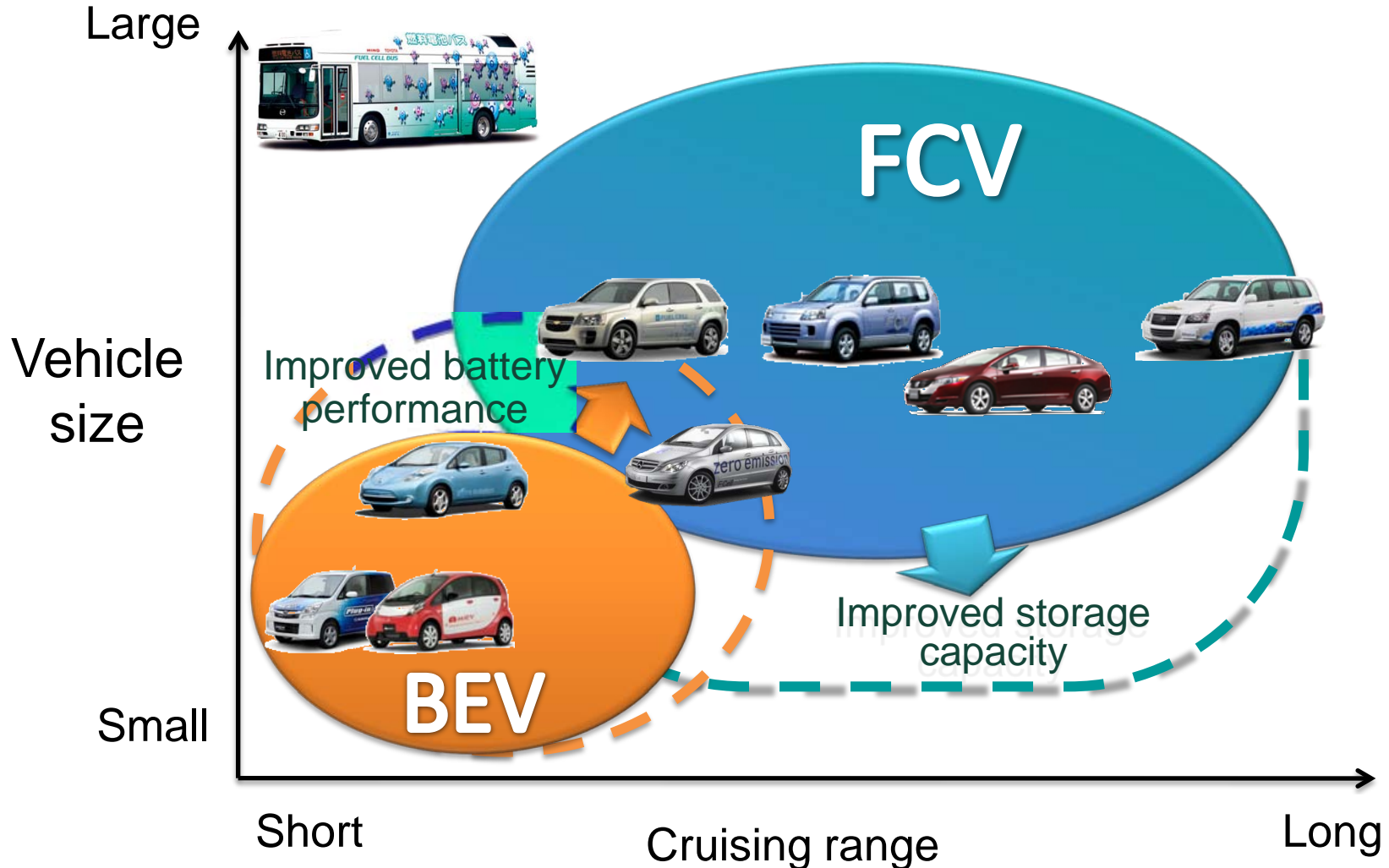
Purchase Subsidy for EV (2011)

	Mitsubishi Motors						Nissan LEAF
	i-MiEV	i-MiEV G	i-MiEV M	i-MiEV M (normal charge only)	MINICAB-MiEV		
Photo							
Price without tax (×k)	¥3,790	¥3,620	¥2,530	¥2,480	¥2,950	¥2,400	¥3,590
Purchase Subsidy (×k)	¥1,000	¥960	¥740	¥720	¥930	¥670	¥780
Battery Capacity	16kWh	16kWh	10.5kWh		16kWh	10.5kWh	24kWh
Cruising Distance (10-15mode)	160km	180km	120km		150km	100km	200km

SUMMARY

Positioning of FCV and BEV

- FCV can replace existing internal combustion engine vehicle in aspects of vehicle size and cruising range.
- BEV, for small and short-distance applications, and FCV can coexist to spread more widely.



Diffusion projections by type of vehicle (with private-sector efforts)

- Diffusion projections assuming private-sector efforts (scenario where auto makers make the utmost efforts to improve fuel efficiency and develop next-generation vehicles) were made.
- Next-generation vehicles will account for less than 20% of new vehicle sales in 2020 and 30-40% in 2030.

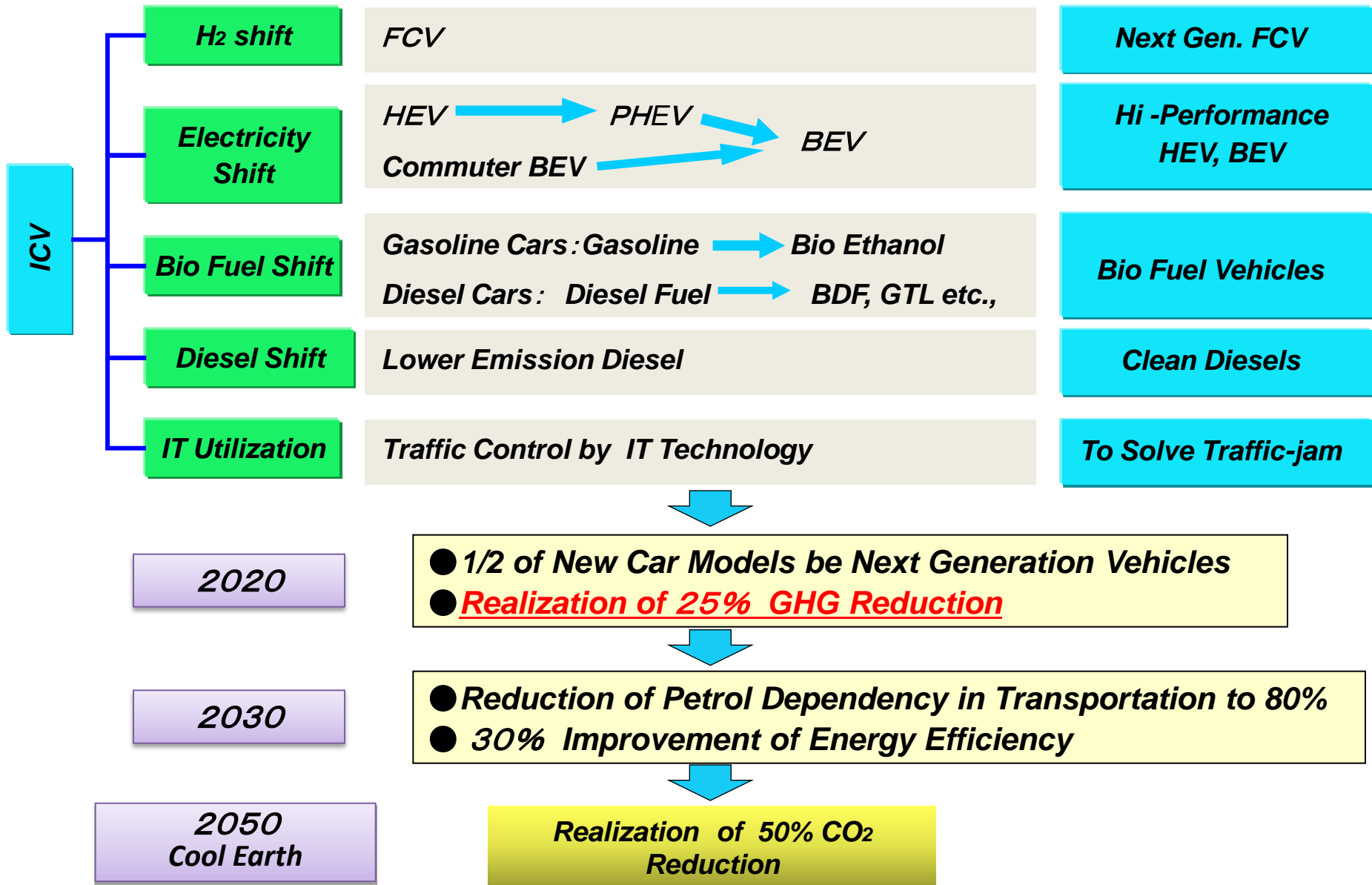
	2020	2030
Conventional vehicles	80% or more	60 - 70%
Next-generation vehicles	Less than 20%	30 - 40%
Hybrid vehicles	10 - 15%	20 - 30%
Electric vehicles	5 - 10%	10 - 20%
Plug-in hybrid vehicles	Miniscule	1%
Fuel-cell vehicles	Miniscule	- 5%

Diffusion targets by type of vehicle (government targets)

- The government has set diffusion targets to pursue for each type of vehicle for accelerating the spread of next-generation vehicles.
- Next-generation vehicles should account for up to 50% of new vehicle sales in 2020.
- To achieve this target, the government should provide effective incentives.

	2020	2030
Conventional vehicles	50 - 80%	30 - 50%
Next-generation vehicles	20 - 50%	50 - 70%
Hybrid vehicles	20 - 30%	30 - 40%
Electric vehicles	15 - 20%	20 - 30%
Plug-in hybrid vehicles	-	20 - 30%
Fuel-cell vehicles	- 1%	- 3%
Clean diesel vehicles	- 5%	5 - 10%

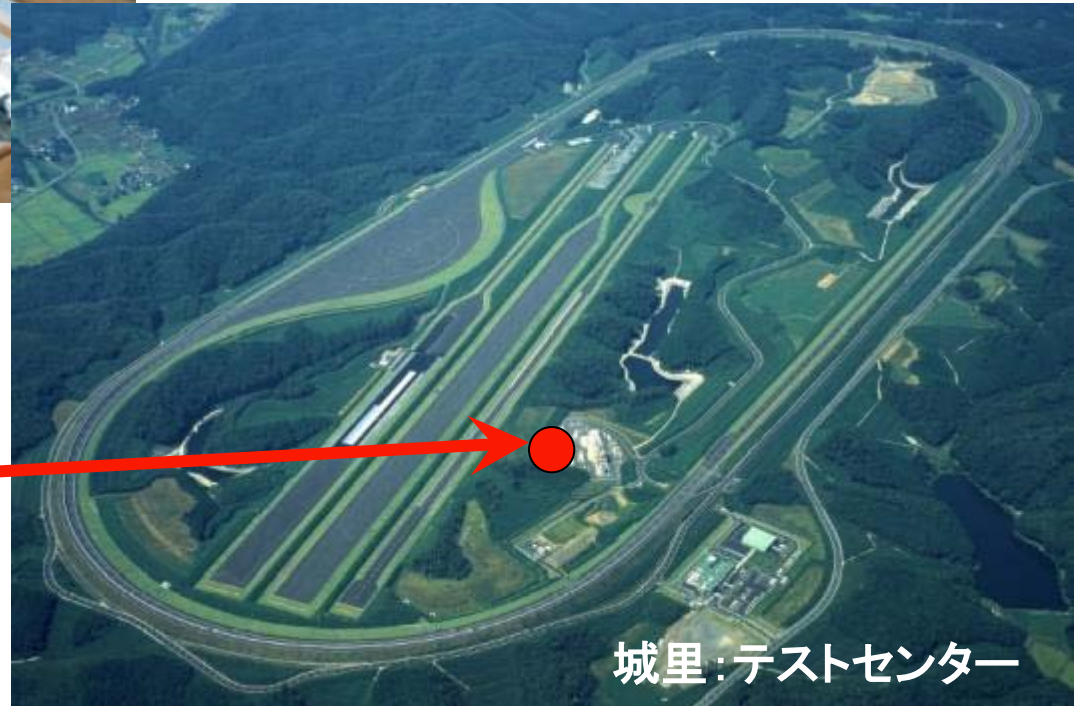
Future Prospect for Next Generation Vehicles and Fuels in Japan



Merci de votre attention!



燃料電池自動車
安全性評価試験棟



城里:テストセンター

Reference Materials

Electric Vehicles and Smart Grid

Vehicle to Home (V2H)	From BEV • PHEV To Home
Grid to Vehicle (G2V)	From Grid To BEV • PHEV
Vehicle to Grid (V2G)	from BEV • PHEV To Grid

Toyota

Prius will be equipped with an external electric power supply function as an option.

Max electric power supply

:1.5kW

Duration potential for supply

:2days



Nissan New Power Supply System Development



- ◆ Power Control System(PCS)
Rating: **6kW** System power: **200V single-phase**
- ◆ Connection Specification
Quick charge connector (CHAdeMo specification)

Vehicle output : DC

PCS input : DC

PCS output : AC 200V single-phase

Energy Path for Vehicles in the Future

The introduction of new technologies is needed to reduce CO₂ emissions, believed to contribute to global warming, and to decrease dependence on oil, a limited resource. One of these new key technologies is the FCV/EV and R&D should be continued in effort to reduce CO₂ emissions and to decrease dependence on oil in the transportation sector.

