SEOUL METROPOLITAN GOVERNMENT

Electric Vehicle Delivery Plan for Seoul

2011. 05. 11(wed)

Environment Protection Headquarters,
Seoul Metropolitan Government

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Air Quality in Seoul

Air Quality Management

Efforts to Improve Air Quality

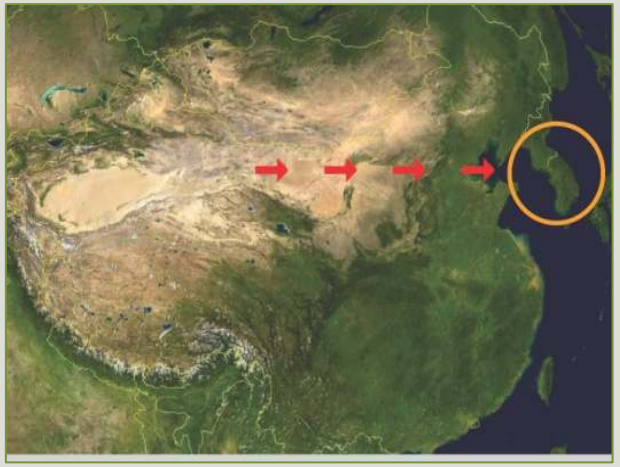
Successful Air Quality Improvement

Necessity to Introduce Green Cars

Air Quality Management Challenges in Seoul

Problem Located on basin surrounded by mountains

- Low wind speed, difficult to disperse pollutants
- Rainfall concentration during summer & frequent fog formation can cause smog



Problem Pollutants from mainland China, Incheon & Gyeonggi area travel to Seoul on Westerly winds

- Most of PM10(62,322ton/year) emission sources affecting metropolitan area are from west of Seoul
- Around half of PM10 in Seoul are influenced by outside such as China

Efforts to Improve Air Quality

Total 7,600 inner city buses

- Replaced 6,800 units (90%)
- Aim 100% replacement by end of this year

DPF Installation,
LPG Conversion,
Early Scrapping

- 209,239 units by 2010
- Reduce 810 ton of PM10 (By 2010)

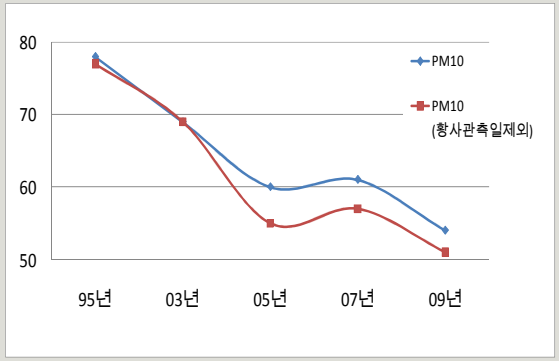
Increase street cleaning at nights, special cleaning for yellow dust and ozone control

- Remove maximum 69% of road dust
- Distance of cleaned streets : 280km(2009)

Successful Air Quality Improvement

Recorded lowest pollution since monitoring started in 1995

Efforts to improve air quality – replacement of all inner city buses with CNG vehicles & DPF(Diesel Particulate Filter) installation- resulted record clean days in Seoul since air monitoring was launched



Point❶ Recorded lowest PM10(54㎍/㎥) in 2009

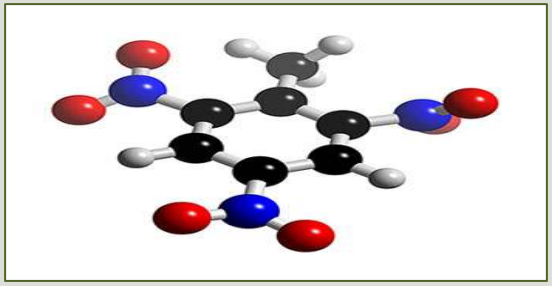
□72㎍/㎥('97) □ 60㎍/㎥('06) □ 61㎍/㎥('07)

□ 55㎍/㎥('08) □ 54㎍/㎥('09)

Point❷ Number of days with more than 30km (able to see Incheon) of visibility increased

□ 0 day('05) □ 18 days('09)

□ More than 20km of visibility : 73days('06) □ 119days('09)



Point❸ Significant improvement in lowering heavy metals (i.e. toluene) & stench

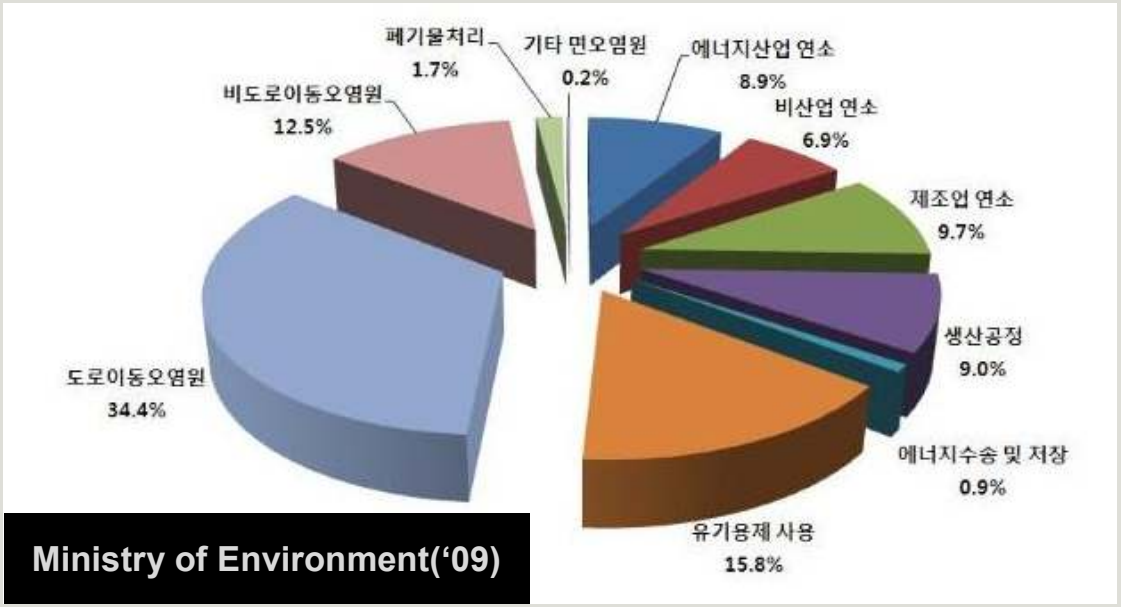
□ Compared to 2003 harmful pollutants decreased by 60~70%

□ Harmful heavy metals in air such as lead (Pb) continue to fall every year

Necessity to Introduce Green Cars

Need to reduce PM10 & gas pollutants

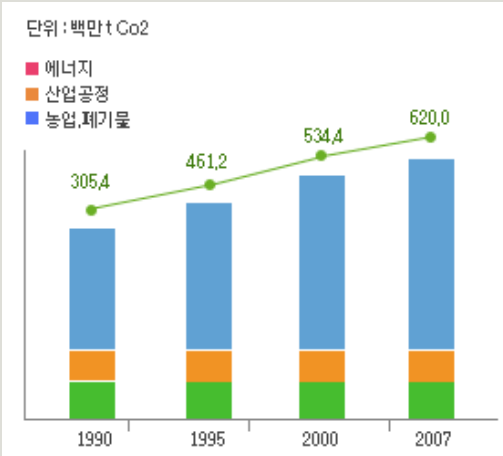
Need to reduce Nox, GHG & secondhand pollution



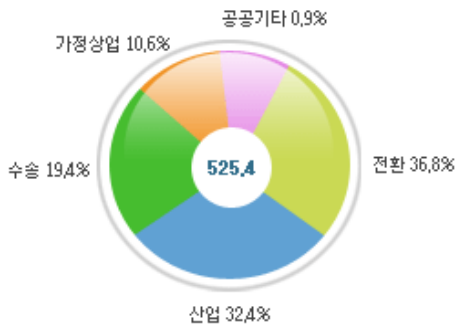
Ministry of Environment('09)

Point! Transportation is the biggest contributor to pollution

- Road transportation accounts the biggest share of 34.4%



Green Growth Committee('07)



Point! Continuous increase in GHG

- Transportation account for 19.4%

2

Green Car Strategies

Seoul's Green Car Vision

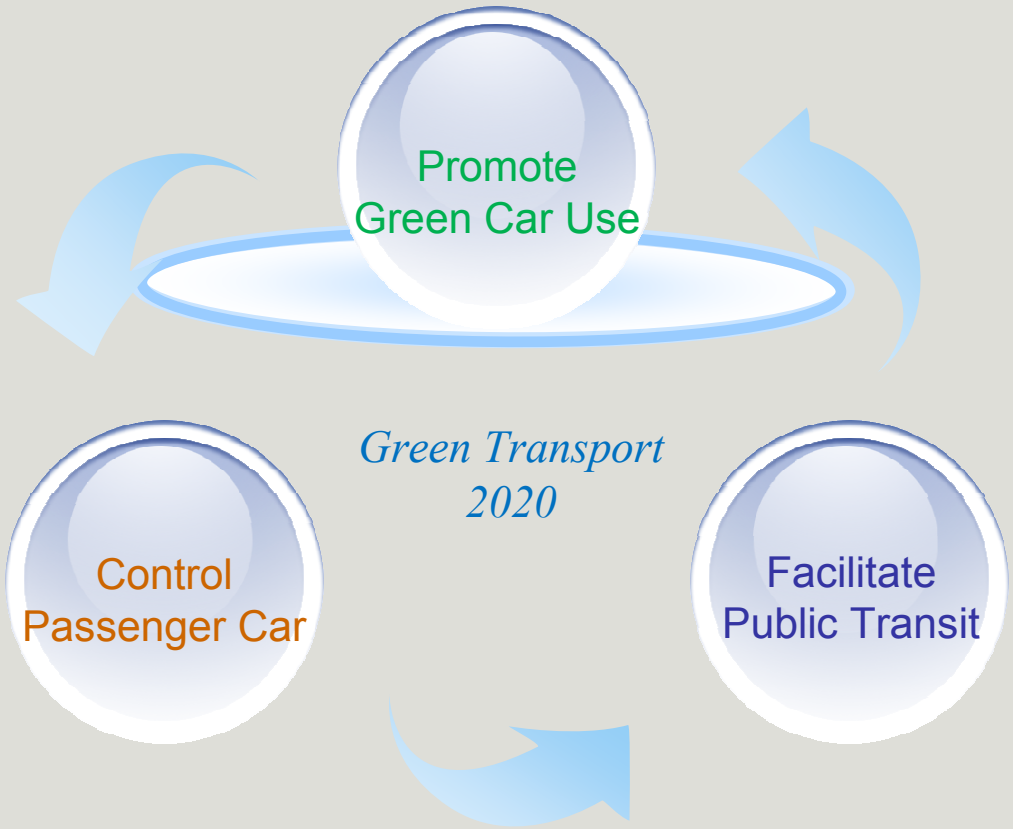
Introduction of Green Car

Green Car Provision Target

Vision - Green Transport 2020 : Urban Transportation System Focused on Green Car

Green Car Oriented Eco-Friendly Urban Transportation

Encourage use of green cars for those who drive for economic reasons



Clean & Attractive Global City, Seoul

Introduction of Green Car

Point ❶ Public sector to lead green car use to promote technical development and then expand the scope to private sector

- Encourage technical development by creating demand from public sector – Vehicles for official use, public transportation fleet, etc.
- Establish charging facilities and pricing system which are necessary for introduction of electric vehicles
- Promote green cars to private sector through various incentives – tax exemption for purchase or operation of the vehicle, subsidies, discount on congestion fees, etc.

Point ❷ Introduction of technical development in stages

- As the first step, apply technologies that are developed for different vehicle types, such as hybrid car
- In the long-term, all vehicles will be replaced with “Zero Emission Vehicles” such as electric vehicles and fuel cell vehicles

Green Car Provision Target (2020)

Public Fleet	Taxi Bus Official Use	72,000 7,600 4,200
Private Fleet	Small Passenger Cars Mid, Large Sized Cars	560,000 2,316,000

□ Hybrid Vehicle : 50%

□ Electric Vehicle : 50%

⇨ Convert all public vehicle fleet into green car

□ Small Passenger Cars
Electric Vehicle :10%
Hybrid Vehicle : 16%

□ Mid, Large sized Cars
Electric Vehicle :1%

⇨ Convert 6% of private vehicle fleet into green car

Point! Total number of registered vehicles in Seoul : 2,960,000

□ Convert 177,000 units(6%) into hybrid and 121,000(4%) into electric vehicles by 2020

□ Supply around 300,000 environment-friendly green cars by 2020

3

Development of Charging Infrastructure

Charging Infrastructure Establishment Plan

Charging Infrastructure Establishment Goal

Charging Infrastructure Installation Plan

Point! Public sector will lead private sector supply

□ Gradual expansion of EV charging infrastructure

- Install EV chargers first at public agencies, public parking space, bus depots, large retailers/buildings, gas stations, etc.

□ Expand supply of household chargers supply : Introduction of mandatory installation of chargers at newly constructed community housings

	2010	Short Term('10~12)	Mid to Long Term('13~)
Installation Plan	Public Building To charge vehicles for official use Public Transit Depot Combine with vehicle supply	Preliminary Projects -Markets, department store apartments, public parking Pricing System - Develop EV charging price system	Institutionalize charging facility installation - Mandatory installation of chargers at newly constructed public houses, large buildings, etc.

Charging Infrastructure Installation Goal

Point! EV Charger Installation Goal : Supply 110,000 charging devices by 2020

- Install more private charging devices than vehicles : 70,000 units
- Install regular chargers at roadside, outdoor public parking space : 39,000 units
- Install fast charging devices at depots, gas stations, outdoor parking lots : 2,400 units

Type		(Unit)	Total	Roadside		Outdoor			At buildings		Gas Station	Depot (Taxi, Bus)
				Residents	City, District Owned	City Owned	District Owned	Private Owned	Housing	Commercial		
Parking Space		(1,000 space)	3,114	145	20	9	41	84	1,783	1,032	705	390
Charging Points	Private Owned Normal Charging	(1,000)	70	-	-	-	-	-	70	-	-	-
	Fast Charging	(1,000)	39	-	10	9	20	-	-	-	-	-
		(1,000)	2.4	-	-	0.1	0.5	-	-	-	1.4	0.4
	Total	(1,000)	111.4	**-**	**10**	**9.1**	**20.5**	**-**	**70**	**-**	**1.4**	**0.4**

4

EV(Electric Vehicle) Projects

LPi Hybrid Taxi

Namsan Ring Road Electric Bus

Seoul Grand Park OLEV

Expanding Foundation for FCEV

Electric Scooters for Private Sector

Support for NEV Supply

Test Operation of Charging Infrastructure

LPi Hybrid Taxi

- Introduction of LPi Hybrid Vehicles in the Market (’09. 7)

’04 □ ’08	’09. 6	’09. 7
Gasoline hybrid vehicle (Led by public sector) < Subsidized 824 cars >	LPi Hybrid Vehicle Technology development (First time in the world) < Manufacturer >	LPi Hybrid Vehicle Introduced in the Market < Support : tax exemption, etc.>

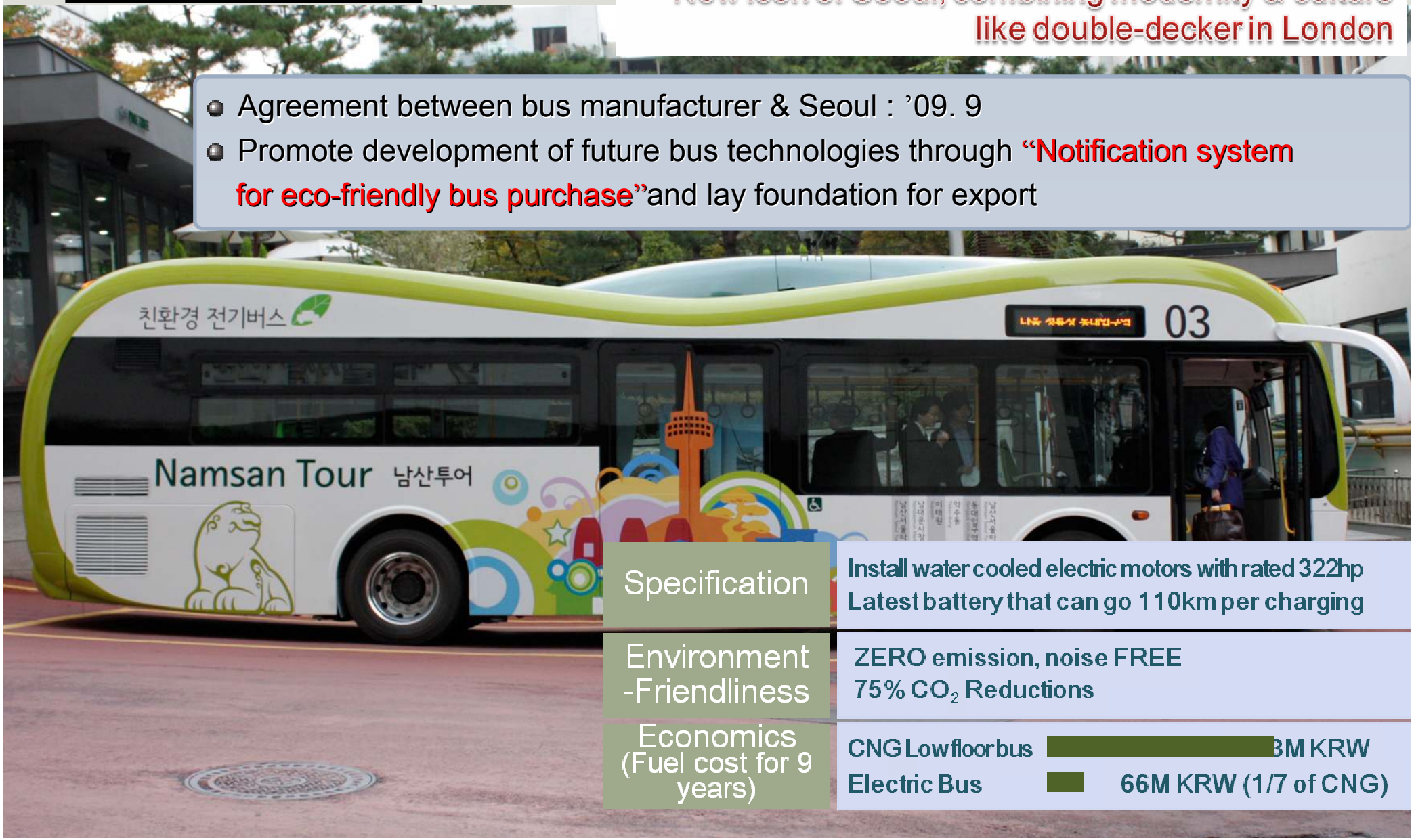
Point! Preliminary introduction of LPi Hybrid Taxi(’09. 12)

- □ Established introduction plans by signing MOU between manufacturer, taxi company and SMG
- □ Save fuel → Improve environment, operation profit, service
- □ Mandatory purchase of LPi hybrid vehicles at public agencies to replace outdated cars
- □ Encourage LPi hybrid vehicle purchase through incentives, such as registration & acquisition tax exemption

Namsan Ring Road Electric Bus

Integration of world leading Korean EV technologies
New icon of Seoul, combining modernity & culture
like double-decker in London

- Agreement between bus manufacturer & Seoul : ’09. 9
- Promote development of future bus technologies through “Notification system for eco-friendly bus purchase”and lay foundation for export

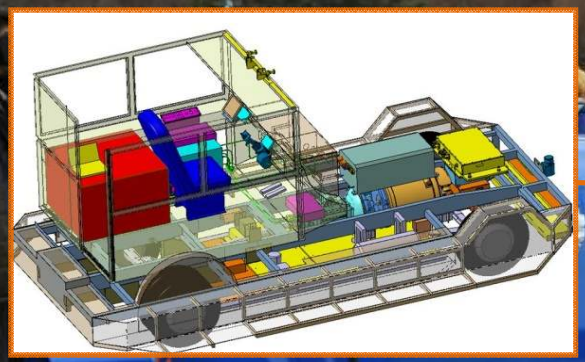


Specification	Install water cooled electric motors with rated 322hp Latest battery that can go 110km per charging
Environment -Friendliness	ZERO emission, noise FREE 75% CO_2 Reductions
Economics (Fuel cost for 9 years)	CNG Lowfloor bus — 3M KRW Electric Bus — 66M KRW (1/7 of CNG)

An Electric Vehicle Delivery Plan for Seoul

Seoul Grand Park OLEV

OLEV (On-Line Electric Vehicles)
Project Area : Entrance path at Seoul Grand Park
Future technology of picking up power while running
Supported new technology by working with school & business – KAIST, Hyundai Heavy Industries
Launched test operation of OLEV at Seoul Grand Park : Mar. '09



Electric Vehicle
Powered by electricity supplied from the road

Power Supply Inverter
Non-contact power supply from underneath the road

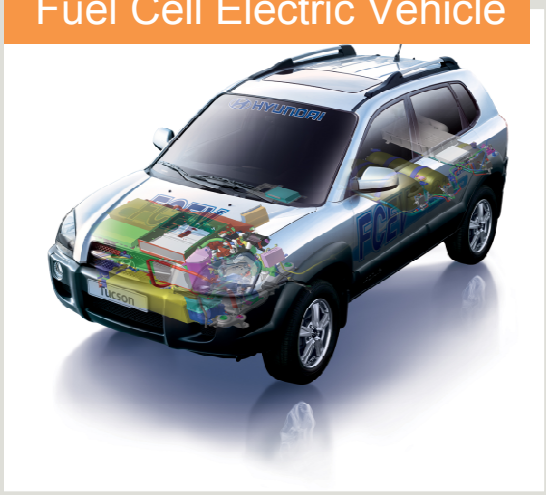
Expanding Foundation for FCEV (Fuel Cell Electric Vehicle)

Point! Foundation for future hydrogen fuel cell vehicles, which can run long distance at high speed

- Operate 2 hydrogen fuel cell buses as shuttles at World Cup Park : ’10.11~
- Expand pilot operation of FCEVs and support technical development
  - Two second-generation fuel cell vehicles (Model : Tucson) are in pilot operation : 09.3~
  - Expand pilot operation of third-generation FCEVs (34 units) jointly conducted between central government, city of Seoul and Hyundai Motors : 2010
- Establish hydrogen stations in each district including World Cup Park, develop hydrogen charging infrastructure (‘11.9)

Hydrogen Fuel Cell Bus

Fuel Cell Electric Vehicle



World Cup Park Hydrogen Station

Electric Scooters for Private Sector

Point! Supply electric scooter to private sector to reduce air pollution caused by scooters

- Electric scooters at public agencies('05 ~ '08) :
  Supplied 211 electric scooters - Hangang Citizen Park, large parks, etc
- Signed an agreement to supply to private sector (MOU between SMG, manufacturer, delivery companies) : 27 scooters were supplied and are now in operation
- Joint development of electric scooters with leading companies (Daelim, S&T) to earn confidence
- Plan to supply 250 units by 2010 including 100 units for private sector

Support for NEV(Neighborhood Electric Vehicle) Supply

Point! Support NEV supply for private sector : NEVs can be used at short distances in daily life

□ Preliminary introduction : 5 NEVs at World Cup Park, Hangang Citizen Park, Seoul Grand Park, Seoul Forest Park (’09.11)

□ Expand supply for public agencies & establish ground for private supply (2010)

- Additional supply to fire stations and parks to be used as maintenance vehicles (15 NEVs)
- Enact related laws on allowing NEVs on roads (‘10.3), announce NEV allowing zones (‘10.4.14~4.15)

NEV made in Korea

NEV Charging Post

Development of High Speed EV & Test Operation of Charging Infrastructure

Point! Preliminary introduction of charging infrastructure to prepare for EV supply to private sector after 2011

□ Manufacture 5 RVs & acquire vehicle accreditation

⇨ First EV to run on regular roads

□ Establish EV recharging infrastructure for price charging

- Develop a system that charges price by reading cards without contacting depending on the amount of electricity recharged
- Prepare for installing chargers at public sector by manufacturing and operating normal/ fast chargers

’09.11	’09.11~ ’10.05	’10.05
Preliminary Project Select vehicles for conversion	Manufacture vehicle Manufacture chargers Vehicle accreditation	Namsan annex to the installation For test


Clean Future Seoul, will be realized by Eco-Friendly Cars
Seoul Green Car Project
Thank you.
Environmental Protection Headquarters
Seoul Metropolitan Government