Implementation of NGV in South Korea

Regional Gas Competence Seminar

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Maputo, Mozambique
Implementation of NGV in South Korea

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Background

Economic Growth and Vehicle Registration

Rapid economic development called for increase of road transportation

- Increase of cars with economic growth
  - 130K cars in the 70’s
  → 20.12 million cars by the end of 2014

(million vehicles)
Background

Pollutant Emission from Vehicles

Deepening problem of air pollution (PM)
- Seoul: 71 μg/m³, London: 20 μg/m³, Tokyo: 40 μg/m³

Air Pollution Comparison
Background

Analysis on Metropolitan Air Pollution

Source of air pollution[PM10] in metropolitan area
- Non Road Transport: 30.3%
- Mobile Pollutant Source of Road: 47.4%
- Manufacturer: 7.5%

PM10 emission by vehicle type in the road traffic sector
- Truck: 66.75%
- RV: 24.1%
- BUS: 3.45%

* Source: National institute of Environmental Research
Background

Policy Measures for Air Pollution

Strengthening of Emission Standard

Retrofitting Existing Vehicles

Promotion of Low Emission Vehicles

Adopting Global Standards (EURO 5, SULEV)

Emission Reduction Equipment (DPF: Diesel Particle Filter)

Natural Gas Bus EV, HEV, etc.

Natural Gas Bus is the most cost-effective method for reducing Air Pollution
**NGV Characteristics**

**Clean**
- Lower emission (vs diesel)
  - PM: 100% reduction
  - CO: 90.6% reduction
  - NOx: 38% reduction
  - HC: 64.6% reduction

**Practicality**
- Already commercialized technology
  - 22 million NGV worldwide (as at Jul. 2015 – The GVR)

**Economic**
- Cheaper fuel
  - NG : Diesel = 100 : 170
  - based on an inner-city bus; savings of 58K US$/year (‘08)

**GHG reduction**
- Low carbon content allows reduced CO2 emission
  - CO2 Emission Factor (LNG : Diesel = 100 : 132)
Progress

Natural Gas Infrastructure

<table>
<thead>
<tr>
<th>Existing LNG Terminals</th>
<th>Pyungtaek</th>
<th>Incheon</th>
<th>Tongyeong</th>
<th>Samcheok</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity (Million KL)</td>
<td>3.36</td>
<td>2.88</td>
<td>2.62</td>
<td>0.6</td>
<td>9.46</td>
</tr>
<tr>
<td>Tanks</td>
<td>23</td>
<td>20</td>
<td>17</td>
<td>3</td>
<td>63</td>
</tr>
</tbody>
</table>

Coverage → 230 Municipalities after 2017

Households → 17 M HH by 2016

Supply rate → 77.5% by 2015

Main pipeline length → 4,766 km by 2016
Progress

Major Steps

- G7 Project: Develop CNG Bus (MOE, MOKE, MOST)
- Pilot Operation of CNG Bus
- 「Clean Air Conservation Act」 amendment
- Establishment of legal basis for NGV promotion
- Beginning of CNG Bus Supply
- 「Special Act on Metropolitan Air Quality Improvement Act」
- Obligation of Low Emission Vehicles
- Mass Production of CNG Garbage Truck
- Introduction of new NGV types: intercity bus/airport shuttle bus /commuter bus/School bus
- CNG Hybrid Bus supply plan
- Pilot project plan (11.7)
- Establishment of "Eco Friendly Vehicle Development Agency"
- Research on HCNG, CNG Hybrid Bus Technology and Infra
- CNG Hybrid Bus demonstration project
Achievement

NGV Status

- Registered NGV: 40,066 (PV: 7,625, Bus: 31,184, Garbage Truck: 1,254, etc.)
- CNG stations: 194 nationwide
- Total subsidized CNG buses: 36,162 ('00~'14, incl. scrapped ones)
- 82% of inner-city buses are running on CNG (6 major cities: 98%, small/mid. Cities: 67%

NGV Growth Trend

* Source: Min. of Land, Infra. & Transport
Achievement
Achievement
Achievement

Improvements

• Natural Gas Bus Promotion helped reduce vehicle pollutant emission and improve atmospheric environment of metropolitan areas.

• Environment Improvement Benefit (‘00~‘08) : 1.47 B US$

• Job Creation & Export Increase (‘05~‘12) : 1.2 B US$

Accumulated CNG Bus subsidy

Improvement in fine dust conditions (PM10) in Seoul

Reduction in pollutant emissions (‘00~‘08)

- PM 7,794 tons
- NOx 190,126 tons
- CO 74,236 tons
Government Support

NGV Bus Support from MOE

Subsidies for CNG Bus Purchases
- Subsidy budget funding (State:Local = 50:50)
  - CNG Bus (Large / Medium): 10K / 5.8K US$
  - Garbage Truck (11t / 5t): 35K / 22.5K US$
  - CNG HEV Bus: 33K US$

Fuel Cost Assistance
- Maintain over 0.058 US$/m³ price difference from diesel (expired)

Loans for CNG Station construction
- Loan Size varies according to type
  - Fixed Station: 583K US$
  - Mobile Station: 166K US$ (expired)
- 5-yr deferment, 10-yr repayment period with variable interest rate

Natural Gas Bus Support Policy
Legal Base: Clean Air Conservation Act

Tax Exemption
- Vehicle: VAT(10%), Acquisition Tax(4%), Tariff
- CNG Station: Corporate Tax (3%)
Finance: Special Account for Environmental Improvement
- Purpose: to expand investments in environmental improvement
- Source: environmental improvement tax, waste tax, etc.

Period: '00~'14
Amount: 432M US$
Conditions: Matching Fund (State/Local Funding: 50% each)
Implemented by: Ministry of Environment/local governments

Purchase/Fuel Cost
- Period: ‘00~‘14
- Amount: 432M US$
- Conditions: Matching Fund (State/Local Funding: 50% each)
- Implemented by: Ministry of Environment/local governments

Loan For CNG Station
- Period: ‘00~‘14
- Amount: 225M US$
- Condition: 5 year deferment, 10 years amortization
- Implemented by: Ministry of Environment

Total Subsidy

Support Amount: 662M US$ ('00~'14)
Government Support

Roles of Ministries

Planning & support of CNG Bus Promotion

- Green car promotion/support
  - Planning for CNG bus & Infra. promotion
  - Purchase subsidy

- Clean Air Conservation Act
- Special Act on Metropolitan Air Quality Improvement

CNG Bus Safety Management

- Car making/safety management
  - technology/safety check
  - regular check on operation
  - cylinder & parts certification

- Automobile Management Act
- Automobile Safety Standard Rules

CNG Station Safety Management

- High Pressure Gas Safety Control Act
- Technology Standard (KGS CODE)

- Construction/safety management
  - facility/tank certification
  - operation safety check

Ministry of Environment
- Ministry of Land, Infrastructure and Transport
- Ministry of Trade, Industry & Energy
Government Support – Safety Management

Lifetime inspection of NGV

- After a CNG bus accident in 2010, government strengthened safety check on NGV and made TS (Transportation Safety) fully responsible for the procedure.

Regular Inspection

- **Passenger Vehicle**: every 4 years
  - 3yr
  - 4yr
  - 8yr
  - 12yr

- **Commercial Vehicle**: every 3 years
  - 3yr
  - 6yr
  - 9yr

Temporary Inspection

- Cylinder damage
- Damage on safety check certificate (seal and contents)
- Change of gas type or change of cylinder
- Leakage due to car rollover or crash
- Removing and reinstalling cylinder after car accident
Future NGV Application

- EURO VI standard has come into effect from 2015. Bus manufacturers are promoting CNG Hybrid bus at the moment.

- The HCNG is considered as the next generation technology applicable to natural gas vehicles, which can result in better fuel efficiency and lower GHG emissions.

CNG Hybrid
- Natural gas + electric energy
- Converts vehicle’s kinetic energy into electric energy to charge battery
- Fuel efficiency potential: more than 30%

HCNG
- Natural Gas + Hydrogen(20~30%) mix
- Increased thermal efficiency and GHG reduction with combustion stabilizing

Future Direction
Implementation of NGV in South Korea

Thank You

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