

Outline of Next-Generation Environmentally Friendly Vehicle (EFV) Development Promotion Project

Transmitted by Japan

1. Background and Objectives

In order to find a fundamental solution to air pollution problems caused by motor vehicles and to protect the global environment, the development and commercialization of the next-generation EFVs that will replace heavy-duty diesel vehicles will have to be promoted. To pave the way for the popularization of such vehicles, therefore, next-generation EFVs will be developed and manufactured on a trial basis, and standards regarding safety and conservation of the environment will be formulated.

2. Project Implementation Period

2002 - 2004 (3-Year Plan) (See Figure 1)

3. Project Scale

2002: Approximately 10 million euros

[Total 3-year expenditure: Approximately 30 million euros are scheduled]

4. Organization Formed to Promote Project (See Figure 2)

Commissioned by the Road Transport Bureau and the Road Bureau of the Ministry of Land, Infrastructure and Transport, this project will be executed with the National Traffic Safety and Environment Laboratory, an independent administrative institution, acting as the principal research agency with the cooperation of automobile manufacturers, people of experience or academic standing, and others. Consequently, the Ministry of Land, Infrastructure and Transport established the "Next-generation Environmentally Friendly Vehicle Development Promotion Committee," comprised of members such as people of experience or academic standing, automobile manufacturers, and transportation company representatives. In addition, working groups made up of people with expertise in different types of EFVs were set up within the National Traffic Safety and Environment Laboratory.

5. How the Project Will Be Implemented

In order to set a target of 2010 for the practical application of alternative EFVs with the below-mentioned environment performance, we invited public participation regarding the development and trial manufacture of vehicles or power systems that would live up to the name "next-generation EFVs." The developed vehicle or power system prototypes will be exhibited at the 2004 Tokyo Motor Show.

* Final Development Targets (See Figure 3)

- (1) Exhaust gas
Nitrogen oxide: Further reduction to one-tenth of the level set by new regulation (to be started in 2005)
Particulate matter: Zero or infinitely close to zero
- (2) Fuel efficiency
Preserve the excellent fuel consumption of diesel vehicles and aim to improve it further.

6. Development Models

The following development models were selected from the results of our public solicitation. (See Table 1)

DME (dimethyl ether) truck (18-ton class) (See Figure 4)

Natural gas truck (25-ton class) (See Figure 5)

Series-hybrid diesel bus (78-passenger seating capacity) (See Figure 6)

Parallel-hybrid diesel truck (13-ton class) (See Figure 7)

Super-clean diesel engine (for 25-ton class trucks) (See Figure 8)

7. Reflecting Development Models in Resultant Standards Formulated

Development models will be divided into the following groups and data will be obtained to formulate Japanese standards according to the distinctive features of each group.

- i) Alternative fuels (DME, CNG)
Exhaust gas test method and fuel consumption measurement method for heavy-duty alternative-fuel engines
(Reference fuel properties, correction formulae needed for exhaust gas measurement, evaluation of carbon balance method, exhaust condition of unregulated substances, etc.)
- ii) Hybrids
Exhaust gas test method and fuel consumption measurement method for heavy-duty hybrid vehicles
(Evaluation of battery control technologies, energy regeneration performance evaluation, study of engine bench test methods that replace a chassis dynamometer test, etc.)
- iii) Conventional engines
Ultra-low concentration exhaust gas test method
(Evaluation of exhaust gas reducing technologies that use after-treatment system and electronic control, evaluation of effects of fuel properties on exhaust gas tests, etc.)

Table 1. List of Developing Environmentally Friendly Vehicles

Vehicles to be developed		DME truck	Natural gas truck	Series hybrid bus	Parallel hybrid truck	Super clean diesel engine
Current targeted values	NOx	< 0.5g/kWh	< 0.5g/kWh	< 0.5g/kWh	< 0.2g/kWh	< 0.2g/kWh
	PM	□ ≈0.0g/kWh	□ ≈0.0g/kWh	□ ≈0.007g/kWh	□ ≈0.003g/kWh	<0.013g/kWh
	Fuel efficiency	Equivalent to base diesel engines	Less than a diesel engine with CO2 emission	Over doubled	Over doubled	Improved by 10% from the current level
	Engine (Power)	Power : 200kw	Power: 235kw-257kw	Engine : 5L Generator : 40kw Motor : 90kwx2	Engine : 4L Generator: 110kw Motor : Approx. 70kw	Power : 280kw
Description	GVW	18 t	25 t	14t	13 t	25 t (assumed)
	Major new R&D items	*DME fuel injection system *High pressure DME fuel supply system *Special EGR system *NOx absorber type De-NOx catalyst	*3-way catalyst, EGR for natural gas engines *Optimized engine control for pure methane fuel *Turbo-intercooler system for natural gas engines	*New combustion method based on HCCI (Homogeneous Charge Compression Ignition) *High performance Li+ battery and Electric brake system (EBS) *Electric driven axially power system	*High efficiency permanent magnet synchronous motor *Electronics controlled transmission *Inductive power transmitter (IPT) system	*Electric controlled turbo charging and advanced EGR system *Engine construction for high Pmax *high pressure common-rail system *After-treatment system for simultaneous NOx and PM reduction

Appendix

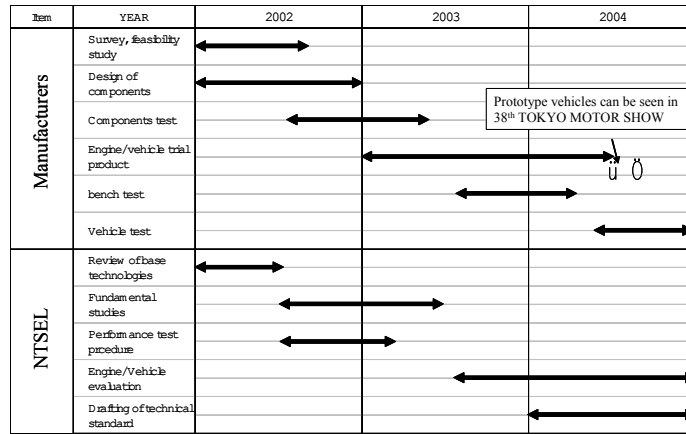


Figure 1. Schedule of the Project

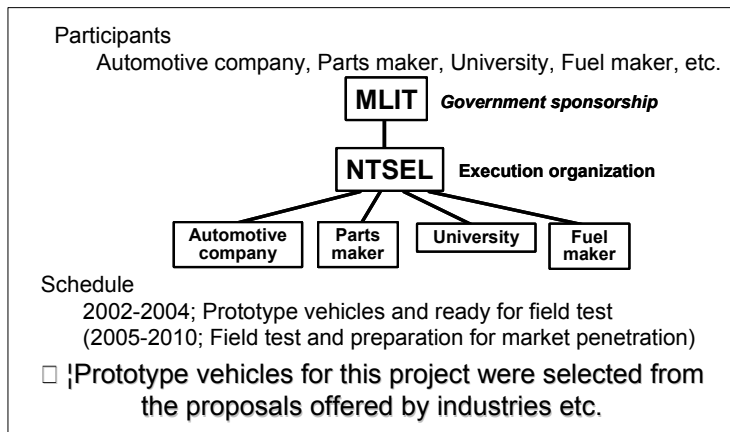


Figure 2. Scheme of the Development Project of Next-Generation Environmentally Friendly Heavy Duty Vehicles in Japan

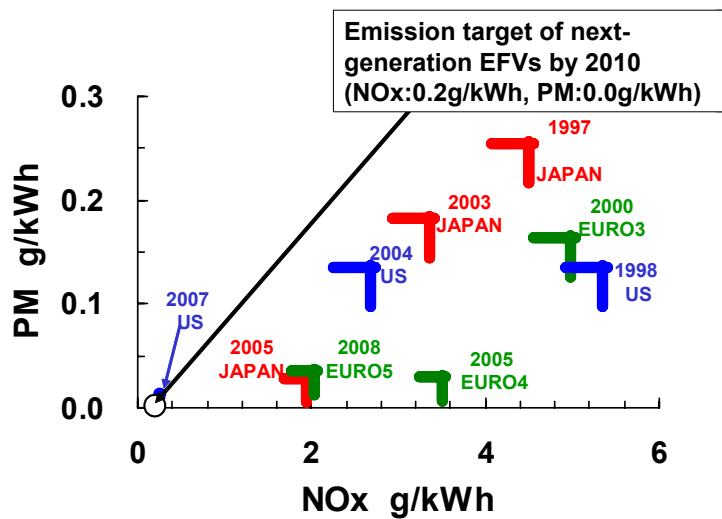


Figure 3. Ideal Emission Target of Next-Generation EFVs (Heavy-duty vehicle)

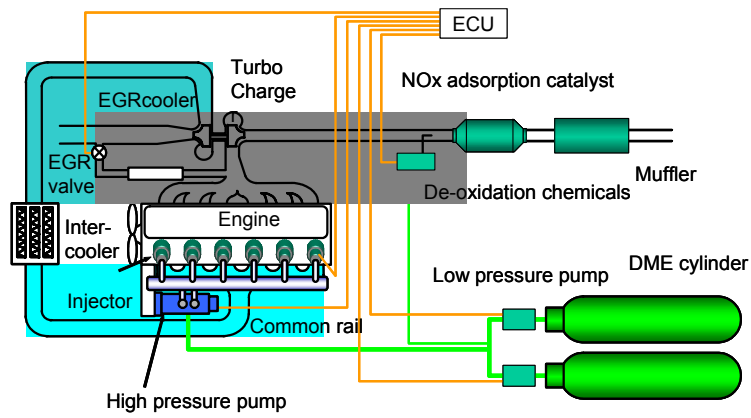


Figure 4 Configuration of DME Engine System

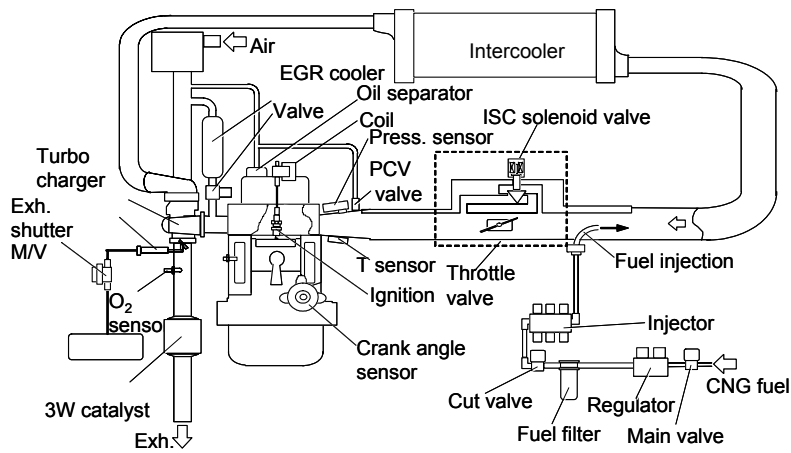


Figure 5 Heavy-Duty CNG Engine System

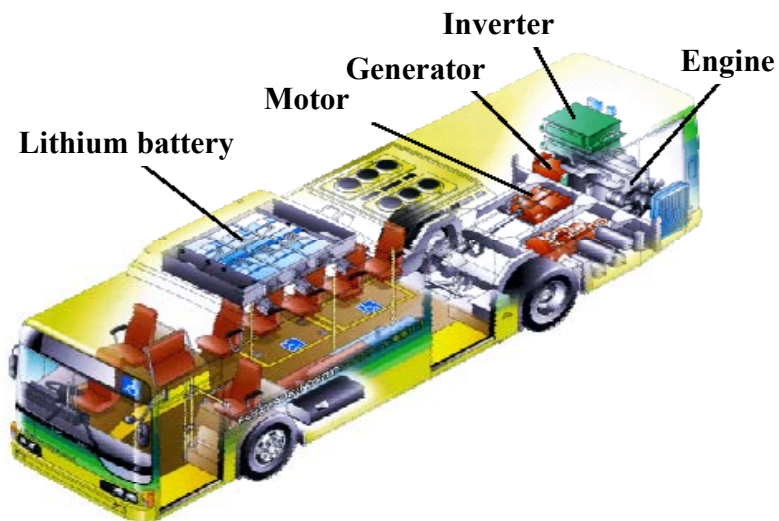


Figure 6. Outline of Series Hybrid Bus

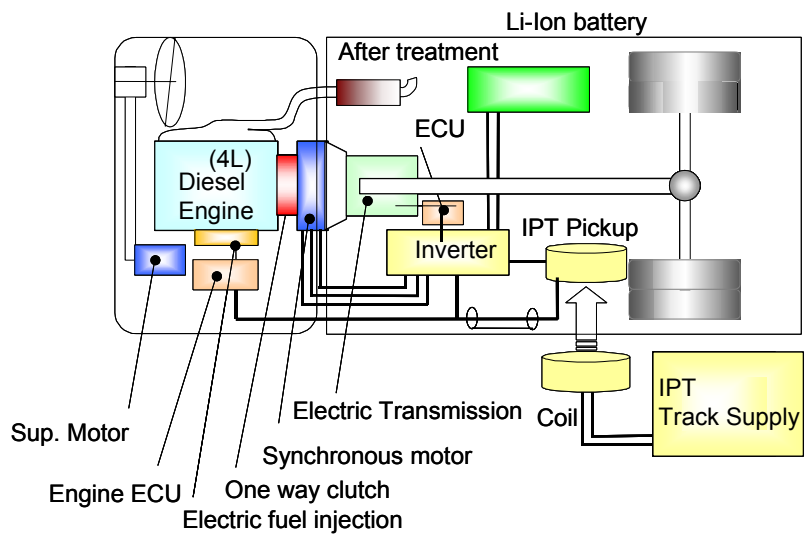


Figure 7. Outline of Parallel Hybrid Truck

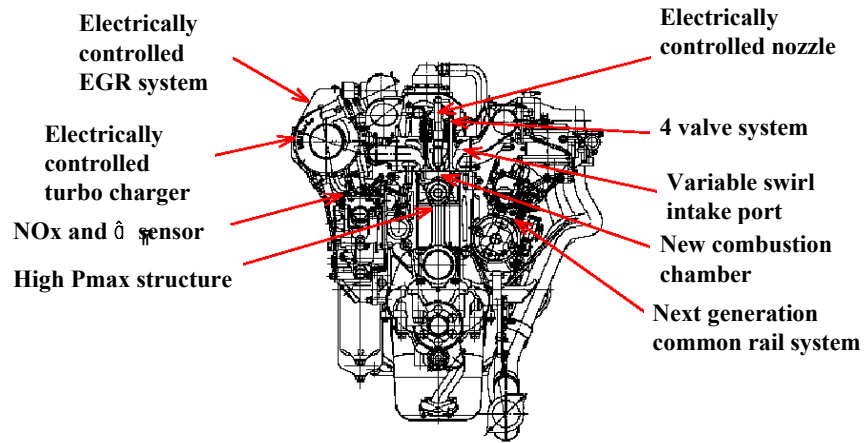


Figure 8. Outline of Super Clean Diesel Engine