ANNEX 2

Automotive fuel quality regulations and strategies in Japan





Contexts

- "New National Energy Strategy" 2006.5
- "A Next Generation Automobile Fuel Initiative" 2007.5

3E Requirements of Automotive Fuels





NIPPON OIL

Reduction of Emissions





"New National Energy Strategy" By METI, 2006.5

<Objective>

1.Establishment of energy security measures that people can trust and rely on.

2.Establishment of the foundation for sustainable development through a comprehensive approach for energy issues and environmental issues all together.

3.Commitment to assist Asian and world nations in addressing energy problems.



2.Breakthrough by the world's most advanced technologies.

3.Strategic collaboration between the government and private organizations and government-wide efforts to strengthen the scheme of carrying out the strategy.





Specific numerical targets

<Concerning to automotive fuel in "New national energy strategy">







"A Next Generation Automobile Fuel Initiative" By METI, 2007.5.28

Achieving energy security, environmental preservation and enhancement of competitiveness at the same time.

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Strategy 2: Hydrogen/Fuel Cells

--Development of Fuel Cells and Establishment of Infrastructures

Innovation of Innovation of

Fuels

Engines

Strategy 3: Clean Diesel--Refurbished Image of Fuel-Efficient and Clean Engine

Strategy 4: Biofuels--"Worry-Free, Safe and Fair" Expansion and the Second-Generation Bio

Innovation of Infrastructure

Strategy 5: World's Most Friendly Automobile Society Initiative Creation of the World's Most Friendly Automobile Society, Capitalizing on IT



"A Next Generation Automobile Fuel Initiative"

By METI, 2007.5.28

Targets

		Current	2010	2015	2020	2030
Battery	Usage	Small EV for electric power company	Commuter EV for limited use, High performance HV	FCV, Commuter EV for general use, Plug-in HV	High performance Plug− in HV	EV
CO2▲50%(HV)	Performance	1	1	1.5	3	7
CO2▲75%(EV)	Cost	1	1/2	1/7	1/10	1/40
	COSL	200,000¥/kwh	100,000¥/kwh	30,000¥/kwh	20,000¥/kwh	5,000¥/kwh
Hydrogon	Cruising	300km	400km		800km	
	Vehicle Cost	× 20	× 3–5		× 1.2	
	Cost	Several million ¥/kl	5,000¥/kw		4,000¥/kw	
	Durability	2,000hr	3,000hr		5,000hr	
Clean	Diesel		Emission, Performance, Cost= Same as gasoline vehicle			
Biomass	Resource			Waste wood from factory, Straw	Waste wood by thinning, Energy crop	
Fuel				100¥/L ″Biomass NIPPON″	100¥/L "Biomass NIPPON"	
CO2▲3% ″Biogasoline″	Cost			40¥∕L, Efficiency ≥35% ″Innovation″ case	40¥∕L, Efficiency >35% ″Innovation″ case	
ITS CO2~▲30%	Average speed at Tokyo, Osaka, Nagoya	Todav's	topics	× 1.5 CO2 ▲20%		× 2.0 CO2 ▲ 30%



"Bio-Gasoline"

Ethanol production from lignocellulose

Gasoline quality standards

		JIS		Fuel quality	
		No.1	No.2	maintainance law	
Research octane num	ber	96.0min.	89.0min	-	
Density 15°C g/cm3		0.783max		-	
T10	S	70max		-	
<u>.</u> T50	S	75min	75min 110max		
	S	180	180max		
EP	S	220	220max		
Residue	vol%	2.0max		-	
Copper corosion(50°C	C、3h)	1max		-	
Sulfur	mass%				
RVP(37.8°C) kPa		44~	44~78 ¹⁾		
Existent gum	mg/100ml				
Oxidation stability min		240min		_	
Benzene vol%					
MTBE vol%					
Ethanol vol%					
Oxygen mass%					
Colour		Orange			
Kerosene	vol%	vol% – 4max		4max	
Methanol			_	Non detective	
Lead			_	Non detective	

93kPa max in Winter season 55kPa max in Summur seasor Unwashed gum 20mg/100ml max

CO2 emission of transport sector





Bio-Gasoline Introduction Scenario by PAJ



Demonstration Programs for bio-ethanol in Japan





Supply Chain of Automotive Biomass Fuel



"A Next Generation Automobile Fuel Initiative"



Bioethanol conversion from lignocellulose







Market trend New fuels for diesel

Diesel vehicle and fuel market trend



Moves toward clean diesel "Diesel shift"



CO2 reduction by diesel "Diesel shift"



Diesel is better with fuel economy.

→ Reduces CO2 from vehicle



Diesel reduces CO2 from refinery.



New fuels for diesel "Diesel shift"



Governmental action toward "Diesel shift"

"A Next Generation Automobile Fuel Initiative"

Strategy 1: Battery Strategy 2: Hydrogen/Fuel Cells

Strategy 3: Clean Diesel

OSetting up the <u>clean diesel promotion council</u> (The industrial, academic and government sectors cooperate with each other in studying measures to <u>improve the image</u> of diesel engines and <u>incentives to encourage</u> the introduction of diesel engines)

OResearch and development of gas oil-based new fuels (<u>GTL</u> [FY2007: 6.9 billion yen or 24 billion yen for five years], hydrogenated bio light oil], <u>bio</u> <u>hydro-fined diesel</u>, etc.)

OAiming at full-scale introduction of clean <u>diesel passenger cars</u> in the Japanese market in and after 2009 where the emission control is most rigorous in the world.

Strategy 4: Biofuels Strategy 5: World's Most Friendly Automobile Society Initiative



Clean diesel phase-in schedule











Establishment: Jointly established by the following six Japanese private companies on October 25th 2006

Purpose:In order to conduct GTL Demonstration Test Project with
JOGMEC to develop commercial GTL Technology



Bio-diesel Fuel





FAME Concerns Quality of fuel product

Quality and influences on vehicle performance



Fuel Quality Maintenance Law FAME containing Diesel Fuel Standard (2007.3.31-)

		FAME containing	Conventional Diesel		
	Sulfur Content	0.001mass% max.			
Existing	Cetane Index	45	5 min.		
	T90	360°C	C max.		
	FAME Content 5.0mass% max		0.1mass% max.		
	Triglyceride	0.01mass% max.			
	Methanol 0.01mass% max.		-		
New	Acid Number	0.13mgKOH/g max.	-		
requests	Formic/Acetic /Propionic Acid	0.003mass% max.	-		
	Oxidation Stability	0.12mgKOH/g max.	-		

FAME Field Test Program

Period: Objective: FY2006~FY2007 (supported by METI) To verify FAME concerns at delivery stage -Quality stability (storage / delivery) -Material compatibility (Diesel containing FAME / FAME 100%)





Transesterification and Hydro-fining



Biomass Fuel for Diesel : Comparison

	Fat oil Direct blend	FAME	Bio Hydro-fined Diesel	Sulfur-free Diesel
Volatility	×	0	0	0
Viscosity	×	0	0	0
Cold Flow	×	Δ	Δ ~ Ο	0
Stability	×	×∼ ∆	0	0
Car Performancess	×	Δ	0	0
CO2	0	0	0	Δ
Cost	0	Δ	Δ	0

Bio Hydro-fined Diesel is the best option



R&D Program for BHD

【R&D】 ①Research (complete) Scale: 0.15BPD Participation: NOC、Toyota Place: NOC Laboratory ②Demonstration -----under consideration



[Toward Global Use]

 Tokyo Metropolitan Government has done demonstration of its own two buses in cooperation with NOC and Hino since October 2007.
NOC is preparing to organize an global group supporting the technology.



Hydrogenated Bio-diesel in the world





BF for Diesel : Resources? "Waste Oil"





Summary

➤"Sulfur-free" has been achieved. Next targets are energy security and CO2 reduction.

➤The government has established "New national energy strategy" and "A Next generation automobile fuel initiative" which contains 5 strategies, "Battery", "Hydrogen", "Clean diesel", "Biomass fuel" and "ITS".

➢Gasoline : Bio-gasoline introduction has been started. All Japan development program of bio-ethanol production from lignocellulose will start in FY2008.

Diesel : Clean diesel promotion has been started. The development of new fuels for diesel, "GTL","FAME" and "BHD" is now on the move.

