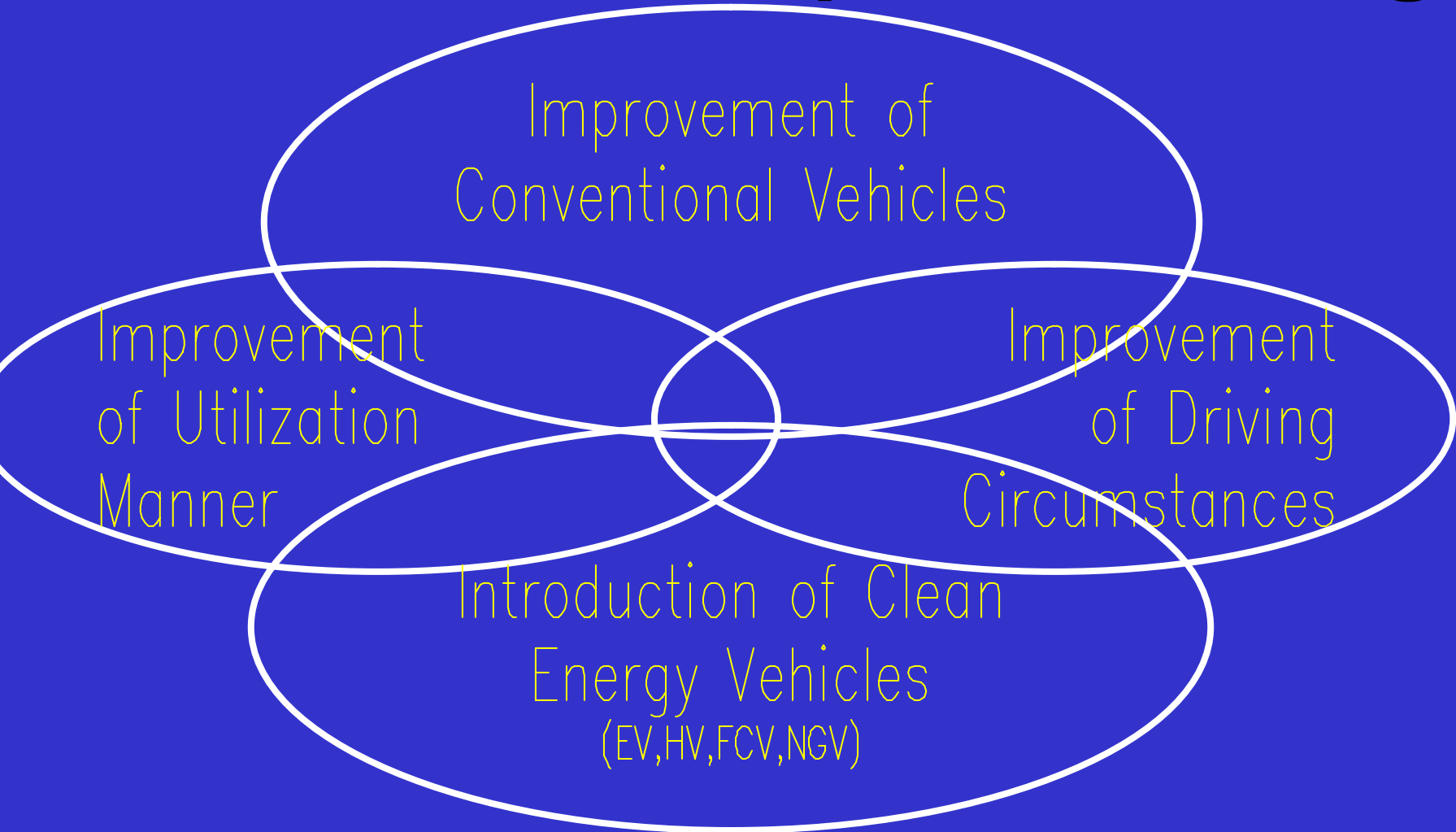


Joint UK/Japan Automotive Technology Forum
on Low Carbon Vehicles (2 December, 2003)

Japanese Situation of Clean Energy Vehicles Development

Hisashi Ishitani
Professor, Keio University

Policies for Energy-saving & Environmental Impact reducing



Background and Incentives for R&D of FCV

Local and Regional Environmental Issues:USA(Ca), JPN

Emissions=>Californian Mandate (2003- ZEV, EZEV)

=> difficulty of EV promotion, search for alternatives

request for cleaner fuels and vehicles

Global Environmental Issues:EU & JPN

CO2 emission reduction=> higher efficiencies

Energy conservation and security: USA, EU and Jpn.

dependencies on Petro., Energy Crisis=>energy diversification

demand increase in LDC, depletion of North Sea Oil

=>Alternative Energy (NG, Renewable =>auto. Fuels H, GTL)

Recent Advance of PEMFC technology:all

Creating High Tech. Industry, Tech. Initiative,

International Competition:Industrial Policy

Fuel Cell

- High efficiency
 - .Decrease CO2
- Hydrogen as a fuel
 - .Enhance energy security
- Wide industry
 - .Create industries and jobs



Gov. Actions for RD&D and Promotion of Fuel Cells in Japan around 2000

POLICY STUDY GROUP for FUEL CELL COMMERCIALIZATION”
as an advisory committee for D.General of Agency of Natural Resource and Energy, MITI (now METI) focusing on PEMFC for automotive and stationary use, from '99/12 until 2001/Jan.

Meeting members:

Universities:8, Car Manufacturers:3, NGO:2, Journalist:1, Energy industries(Utilities:Elec.power and Gas, Industrial associations, related non-profit org.):8, Nat. Institutes:3, Electric & electronics(FC makers):3, Membranes:1

Objectives

- to understand of current state of arts, its significance as a future tech.**
- to identify issues or barriers in promotion or commercialization, and**
- to recommend Strategy to overcome those issues, or propose RD&D policy for FCVs and FCs to the government.**

Strategy of FC R&D in Japan

**announced in Jan. 2001. as the report of
POLICY STUDY GROUP for FUEL CELL COMMERCIALIZATION**

Merits and importance of FC realization and promotion

Current Status and its understanding

**relevant industries (domestic and overseas),
Governmental actions in US**

Issues and Barriers for realization and promotion

technical, economical and institutional barriers

Strategy to overcome those issues

**identifying roll of government, industries and research areas
RD&D plan by development phases, short term to long term
strategy by issue areas**

Target and Policies

Target

FCV

2010 50,000 FCVs
2020 5 million FCVs

Stationary PEFC

2010 2.1GW
2020 10 GW

Policies

2002 -

R&D Stage

2005-

Introduction Stage

2010-

Diffusion Stage

Infra

Demonstration Project

Stepwise Construction

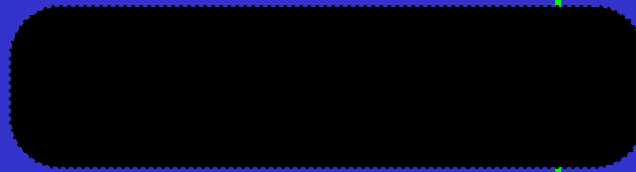
Grow Naturally

Codes

Review of Regulations

R&D

R&D on FC and H₂



(1) Base Preparation and Technology Verification (until 2005)

**period for establishing regulatory and technical R&D
base, and Demonstration of key technologies**

**Establishment of test and evaluation methods for FC safety and
reliability**

**=> Standardization, overview of existing regulation for FCV
education to establish human resource**

Standardization of Fuels

**Fleet Tests=>to verify technical and economic issues and
demonstration for public acceptance**

**Evaluation of well to wheel efficiencies and environmental
impact for available fuel paths, its methodology**

Fleet tests and demonstration of hydrogen station

(2) Initial introduction (2005-2010)

Introduction of Practical use FCV, and accelerate market introduction phase

**Performance improvement, cost cut, FC & FCV
at the same time, Stepwise installment of fuel supply system**

Strategy planning for the second phase of FC R&D

Government should promote common basic technologies R&D

**Initial demand creation, model projects for FCV market:
promote purchase of FCVs by public transportation, and
governmental organization**

(3) Self-dependent Market Expansion (after 2010)

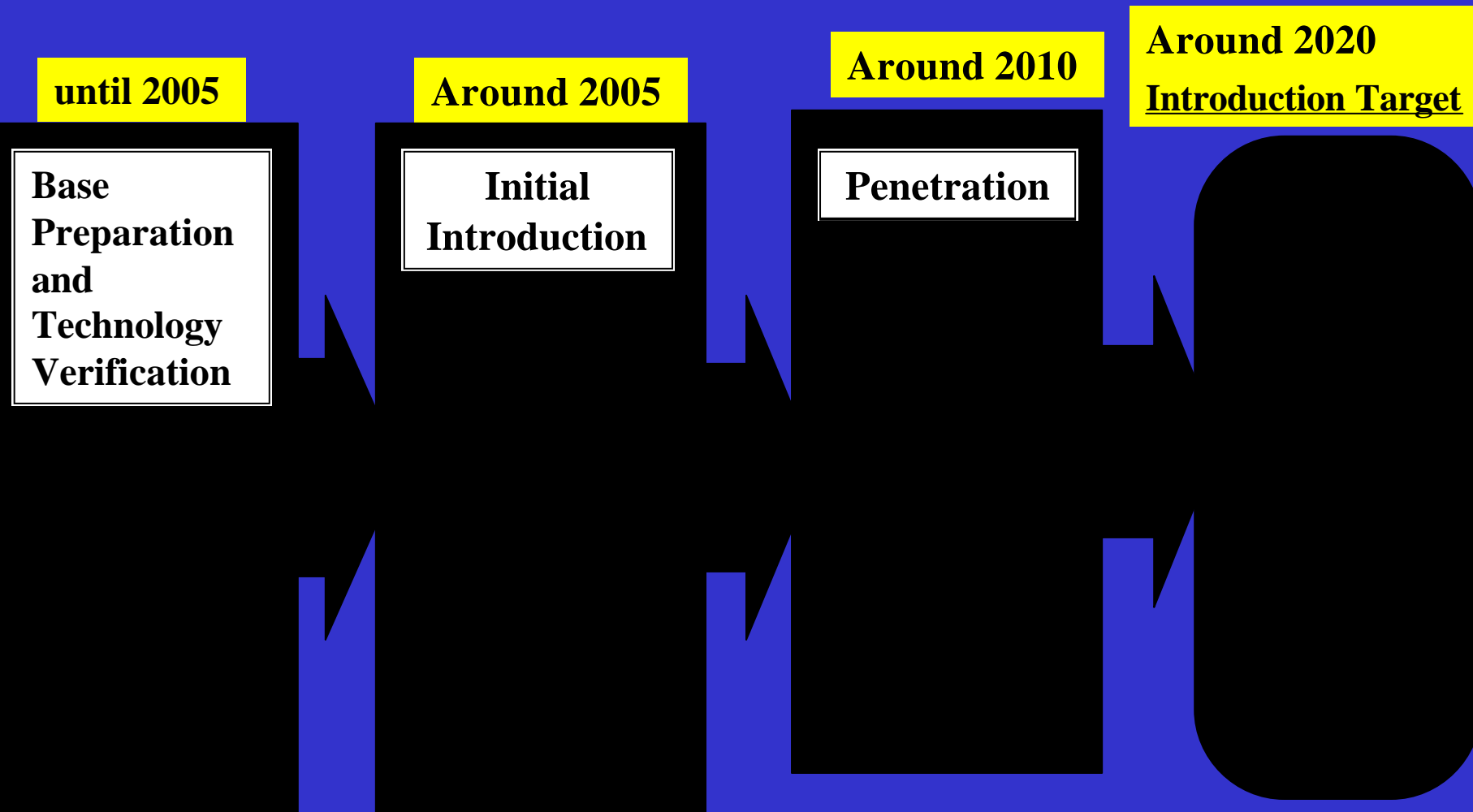
**Penetration of FCV and establishment of infrastructure
Cost cut by mass production, expecting sustainable
market expansion .**

**Gov.:promotion of FCV use by private sectors, fostering mass
production systems**

**Industries: Cost cut by mass production and technology
improvement, performance improvement**

Summary: Scenario for Commercialization and Promotion of FC

The policy Study group recommended R&D strategy for realization/commercialization of FCVs into the three phases shown below



Summary: Urgent/Significant Targets of Technology R&D

Considering technical difficulty and influence or significance at commercialization of pure Hydrogen FCVs, the following items are selected as urgent targets.

Fundamental base technology
(Membrane, Electrodes, Catalysts, Separators)

- .common for automotive and stationary**
- .Performance improvement, cost cut and material saving is required for realization.**

R&D of Hydrogen Storage Technologies

- .In long term, Hydrogen may be selected as the most promising clean fuel for FCVs,**
- .H2 Storing Tech. is essential to expand range of H2 FCVs, and thus influence on the success of their commercialization.**

R&D of Onboard Reforming Technology of Liquid Hydrocarbon Fuels (Clean Gasoline, GTL)

- .availability of existing infrastructure**
- .accelerate early phase penetration of FCVs and expand commercialization**

Establishment/Improvement of GTL production

- .improve diversity of energy source, other than oil.**
- .Clean non sulfur automotive fuels**

Fuel Cell Commercialization Conference (FCCJ) (Kyogikai)

- **founded in 2001/03 by related industries, responding the recommendation by the Study Group reports**

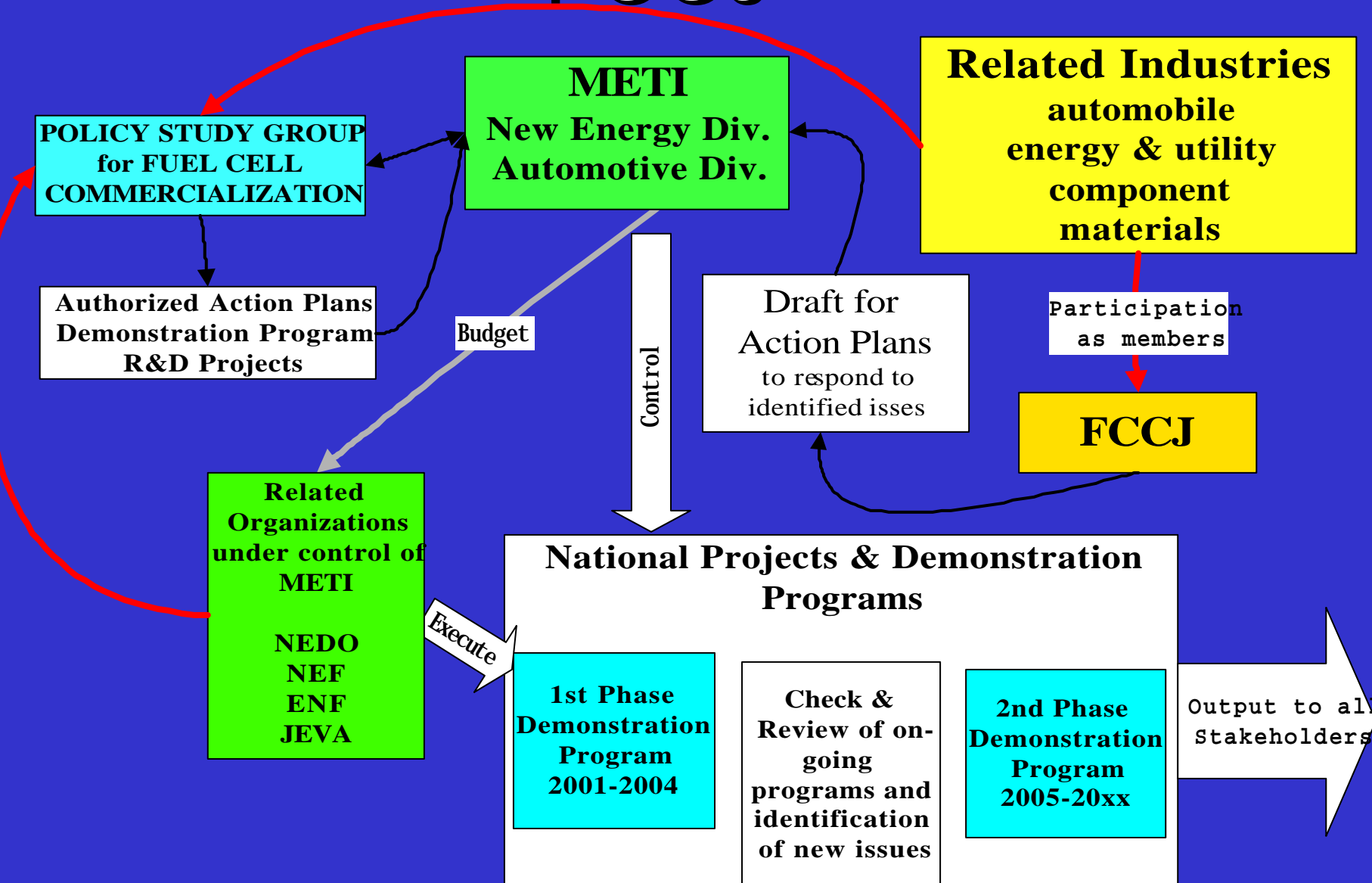
Objective

- **To identify specific issues in commercialization & widespread use of FCs,**
- **To submit policy proposals to resolve the issues to the government**
- **Thus Contribute to FCs commercialization and promotion, establishing FC industries in Japan**

The Organization of the FCCJ



Relation and Position of FCCJ



JHFC Demonstration Project

(2002FY.2004FY)

Overview

- 37 FCVs (in Nov. 2003) from both domestic and overseas auto manufactures
- 10 hydrogen stations with different H₂ sources
- Study on energy efficiency from well to wheel



Stationary Fuel Cell Demonstration

(2002FY.2004FY)

- 31 stationary PEFC from 11 manufactures
- Various conditions
- Various fuels (Natural Gas, LPG, Kerosene)



Review of Regulations

- **28 items with 6 laws**
- **Government decided to complete by 2004FY (2005. 3)**
- **To remove obstacles for introduction of FCVs, H2 stations and stationary fuel cells**

METI's Budget for Fuel Cell

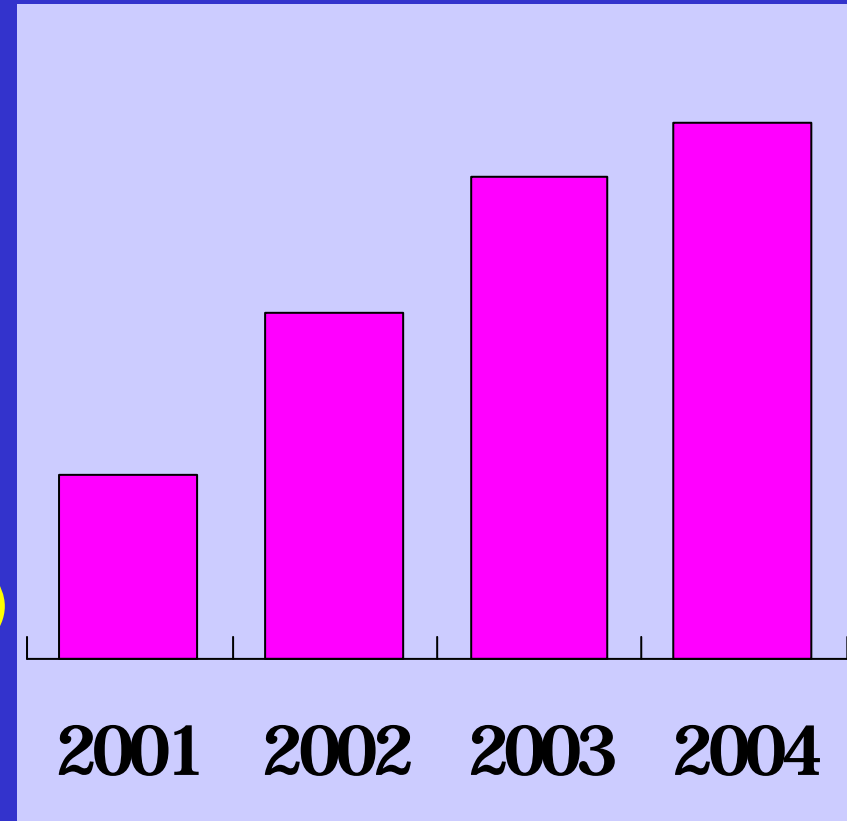
2001FY: 11.7

2002FY: 22.0

2003FY: 30.7

2004FY: 34.1 (requested)

(Billion Japanese Yen)



Koizumi Initiative

- Test Drive by Prime Minister (December, 2001)
- Basic Policy Speech by Prime Minister to the Diet (February, 2002)
- Introduction of First Commercially Released FCVs by the Government (December, 2002)



Prospects of FCVs Commercialization

Long Term Prospects of Commercialization of FCVs

Project	2000	1	2	3	4	5	7	8	10	12	2020	
ETI(FCCJ)			Establishing Infra & Technical Verification, i.e. RD&D			Initial Introduction to the Market			Commercialization		Market Penetration	
FreedomCar			Tech. Feasibility Demo.		Continuous Fleet Tests & Evaluation			Commercial Readiness Demo.		Commercialization		
Daimler Chrysler prospect	Ph.,1, Feasibility	Ph.2. Market Preparation		Fit for Daily Use			Ramp- Up		Commercialization			

Short Term Demonstration Projects

V now

	2001	2	3	4	5	6	7
JHFC		5 +5	7car makers+8 infra	?	Now Planning future e.g, Nagoya EXPO bus operation?		
			5 cars	7 cars planned fleet courses			
		Station 5+1+1		Bus Performance Evaluation			
II Bus demo.			Kick Off		Reguration & Codes		
kyo Local Gov.				Bus line operation		??	
CUTE & ECTOS	Europe 6 countries, 10 cities, 30 buses, + Australia 3 buses operation						
	CITARO	Kick Off	Bus Delivery				
	Bus			Bus Operation & Evaluation			
CEP	Ph.1. Plan & Vehicle supply			P2. Station & Co. Operation	Phase 3. Station & Customer Op.		
CITYCELL	FP5:basic research?		FP6				
				MADRID by CityClass			
CaFCP	20 passenger cars, 3 buses, 3 stations,			Planning	PARIS by CRISTALIS user owned & operate		

Recent Function and Position of FCCJ

