



Current Status of JHFC Project

IPHE Infrastructure Workshop
February 25 & 26, 2010
Sacramento, CA

Overview

- Name of program : JHFC Project
(Japan Hydrogen & Fuel Cell Demonstration)
- Program goal : To demonstrate feasibility of FCV's
- Timeframe : 2002 – (2010)
- Partners(Participants) : see Attachment
- Funding : Infrastructures supported by METI/NEDO

Program phases

- 2002-2005 (Phase 1)
 - Goal in this phase : National demonstration project.
- 2006-2010 (Phase 2)
 - Goal in this phase : Technical & regional enhancement.
- 2011-2015 (? Phase 3 or New Program)
 - Goal in this phase : Under discussion.

Outline of JHFC2

Vehicles	Hydrogen FCV's, ICE vehicles and other small carriers
Fuel Supply	Compressed gaseous hydrogen and liquid hydrogen
Project terms	FY2006 - 2010
Project budget	FY2006 1,300 million JPY FY2007 1,800 million JPY FY2008 1,300 million JPY FY2009 1,000 million JPY

Objectives of JHFC Phase 2

1. To clarify remaining issues under the actual using conditions.
2. To collect data to develop regulations, codes and standards.
3. To formulate and implement public relations and educations for dissemination and promotion.
4. To verify the energy savings (fuel economy) and environmental impact
5. To identify technology and policy trends of FCV's, fuel cell powered small vehicles and hydrogen ICV's as well as hydrogen infrastructures

Features of JHFC Phase 2

Fleet tests by third parties

Increase of hydrogen users (not limited to FCV's but small FC carriers and hydrogen ICV's)

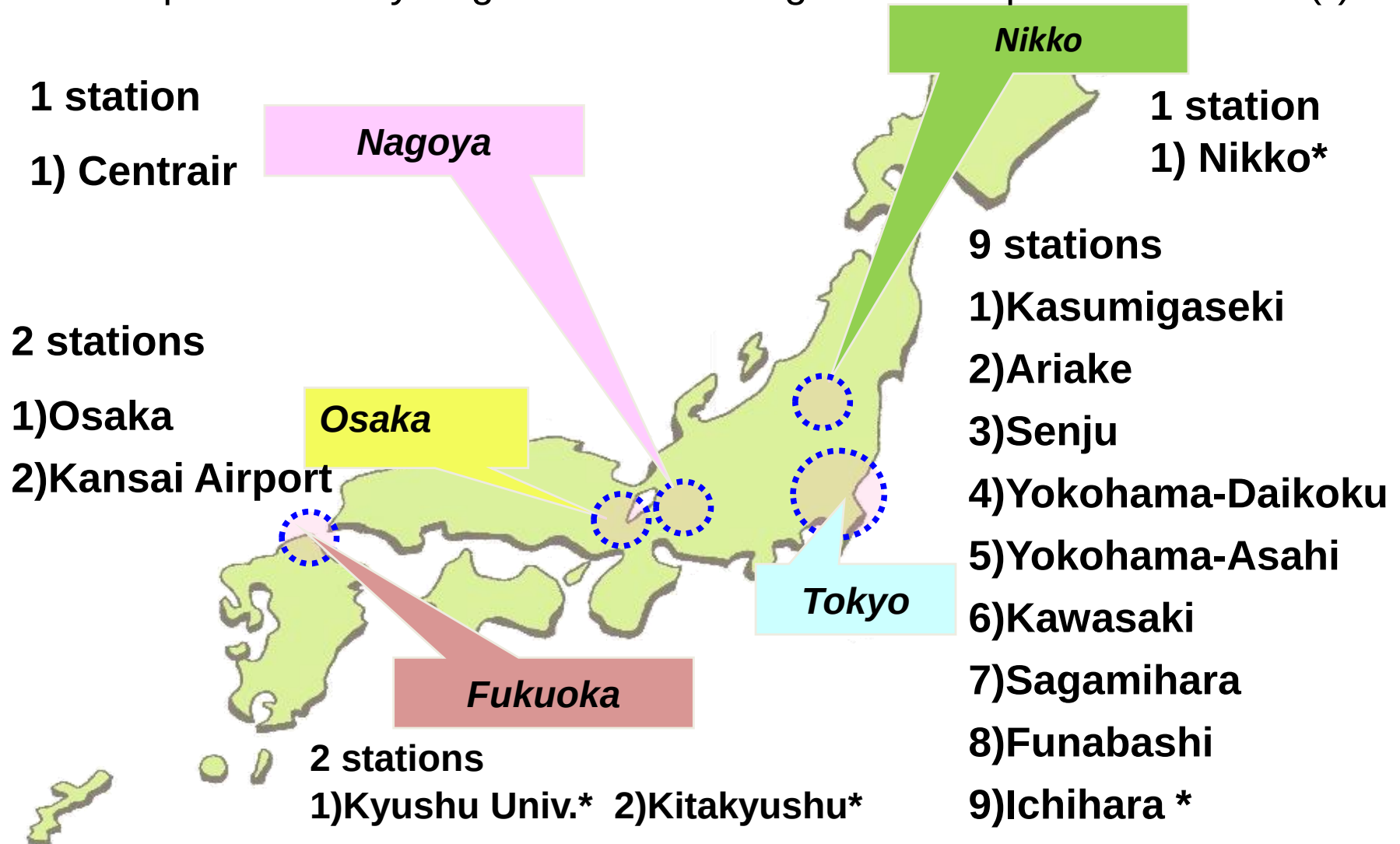
Area extension (metropolitan Tokyo, Nagoya and Osaka)

Operation of FC buses and hydrogen station in Centrair Airport region

Operation of FC wheel chairs, FC carts and FC-assisted bicycles and operation of hydrogen stations for them in Osaka region

Map

JHFC operates 11 hydrogen stations along with 4 cooperative stations(*).



Important points

- Progress

 - 8-year operation without serious accidents

 - Various outreach activities

 - Demonstrating technical advances

- Challenges

 - 70 MPa infrastructure technologies

 - Cost reduction (vehicles and stations)

 - Codes and standards



Questions?

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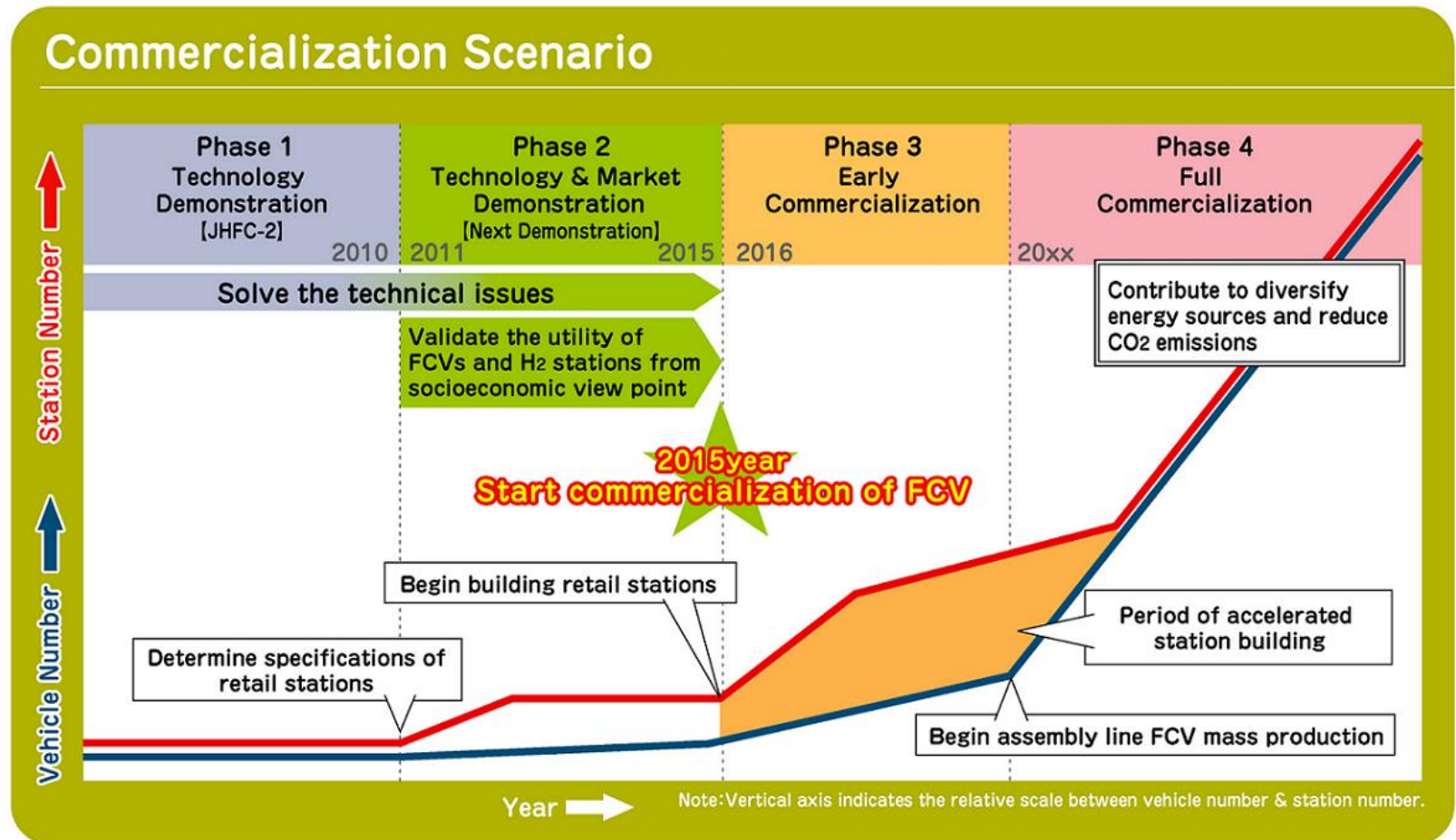


BACK-UP INFORMATION

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Fuel Cell Market Entry

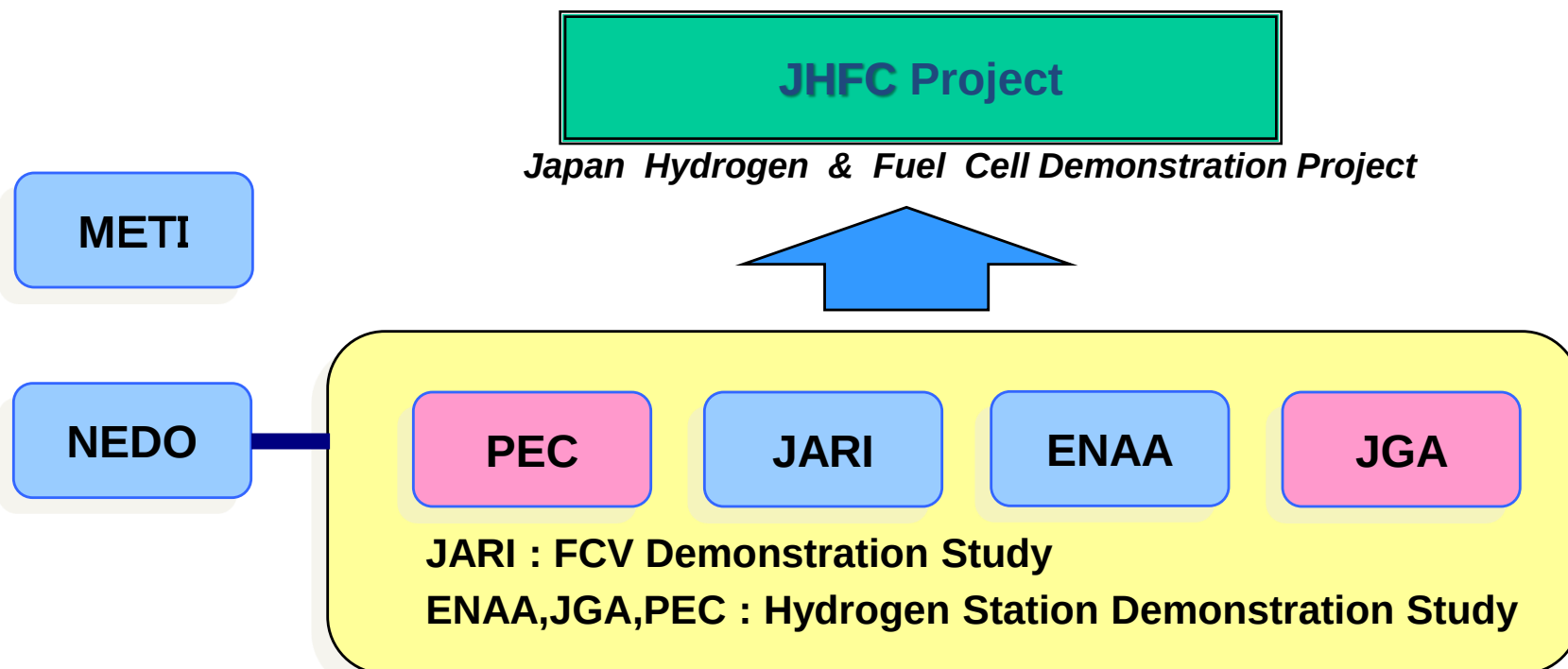
Fuel Cell Commercialization Conference of Japan(FCCJ) is preparing an update of this scenario and is expected to disclose it in the middle of 2010.



Source : FCCJ, <http://www.fccj.jp/pdf/20080704sks1e.pdf>

Organizational Framework of JHFC

JHFC consists of demonstrations of FCVs and hydrogen stations financially supported by NEDO & METI. From FY2009 on, PEC and JGA, representing oil industries and city gas industries respectively, have been involved in JHFC.



METI : Ministry of Economy, Trade and Industry
NEDO : New Energy and Industrial Technology Development Organization
PEC : Japan Petroleum Energy Center
JARI : Japan Automotive Research Institute
ENAA : Engineering Advancement Association of Japan
JGA : The Japan Gas Association

Steering of Current JHFC Phase 2

Planning and Promotion Committee

Chairperson : Prof. Hisashi Ishitani
Vice Chairperson : Prof. Ken Okazaki

WG1 : Hydrogen Supply Infrastructure

Chairperson : Prof. Takeshi Okazaki
Vice Chairperson : Prof. Masanori Monde

WG2 : Fuel Cell Vehicle

Chairperson : Prof. Youichi Hori

WG3 : Interface Area between Vehicle and Infrastructure

Chairperson : Prof. Yasuo Takagi
Vice Chairperson : Prof. Masanori Monde

WG4 : Promotion of Awareness

Co-Leader : Mr. Noriaki Osao
Co-Leader : Mr. Katsumi Yoshida

WG5 : International Collaboration

Advisor : Prof. Hisashi Ishitani
Leader : Dr. Shogo Saegusa

WG6 : Demonstration in Local Areas

Leader : Mr. Jin-ichi Tomuro

JHFC Participating Companies

Auto manufacturers: 8

Energy & Infra. Related companies : 16



HONDA



Iwatani



Nippon Steel Corporation



JHFC Participating Vehicles

6 FCVs, FC Bus and Hydrogen ICV have been participating



Toyota FCHV-adv



Nissan X-TRAIL FCV



Honda FCX Clarity



Mercedes Benz
A-Class F-Cell



GM HydroGen3



Suzuki SX4-FCV

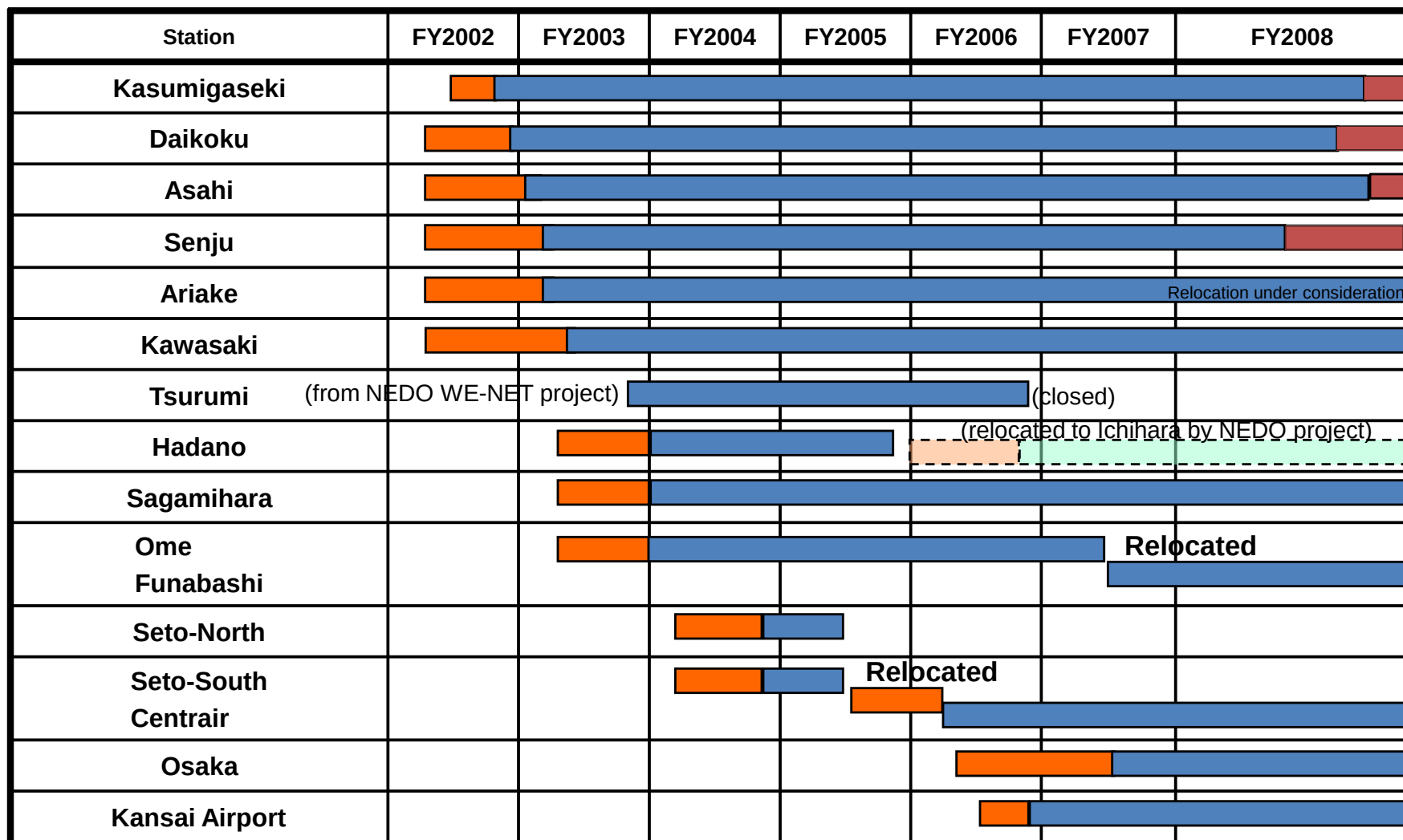


Mazda RX-8 Hydrogen RE



Toyota/Hino FCHV-BUS

Status – Hydrogen Stations

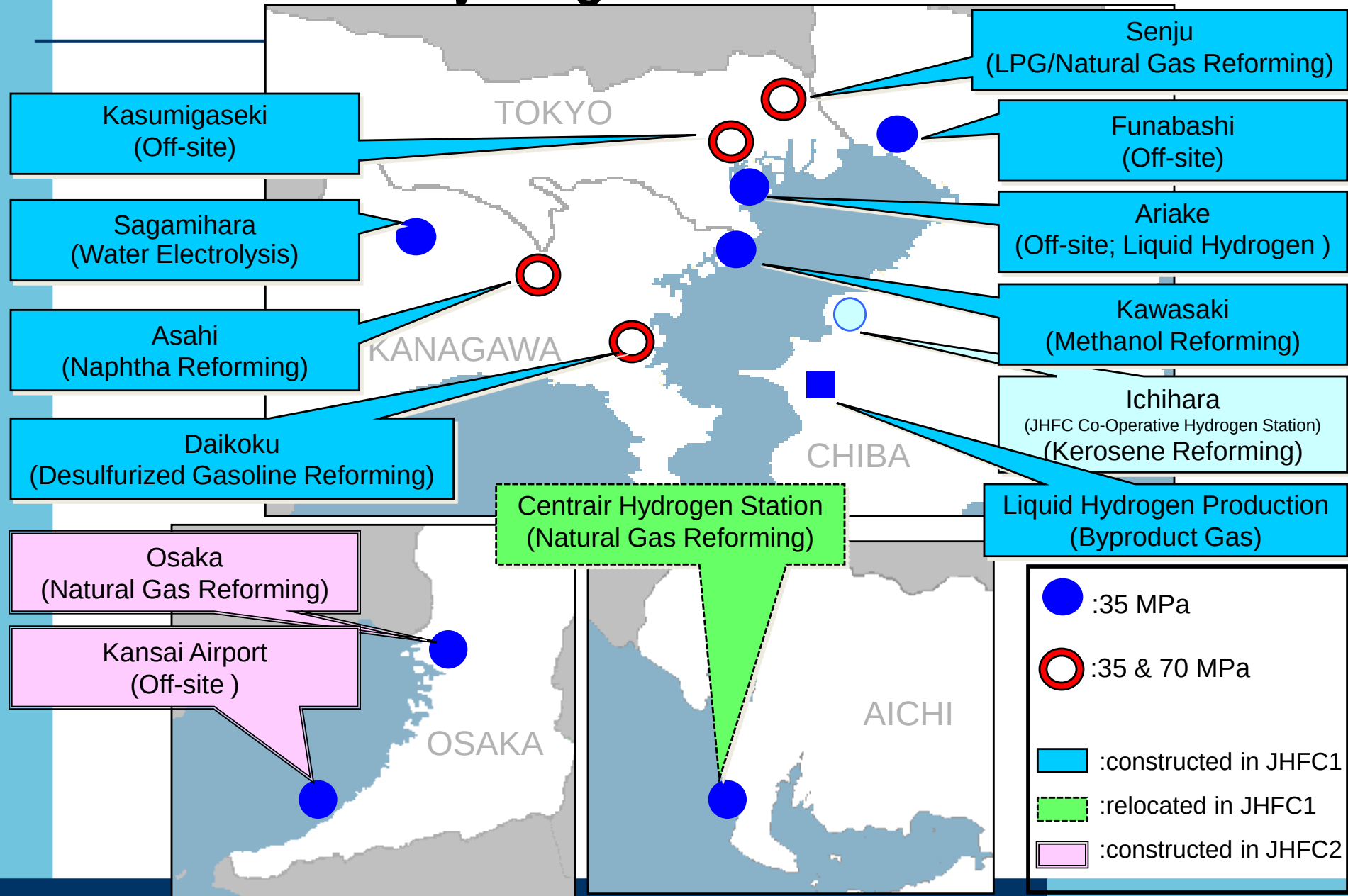


 : Design & Construction

 : Operation

 : 70 MPa Facility Addition

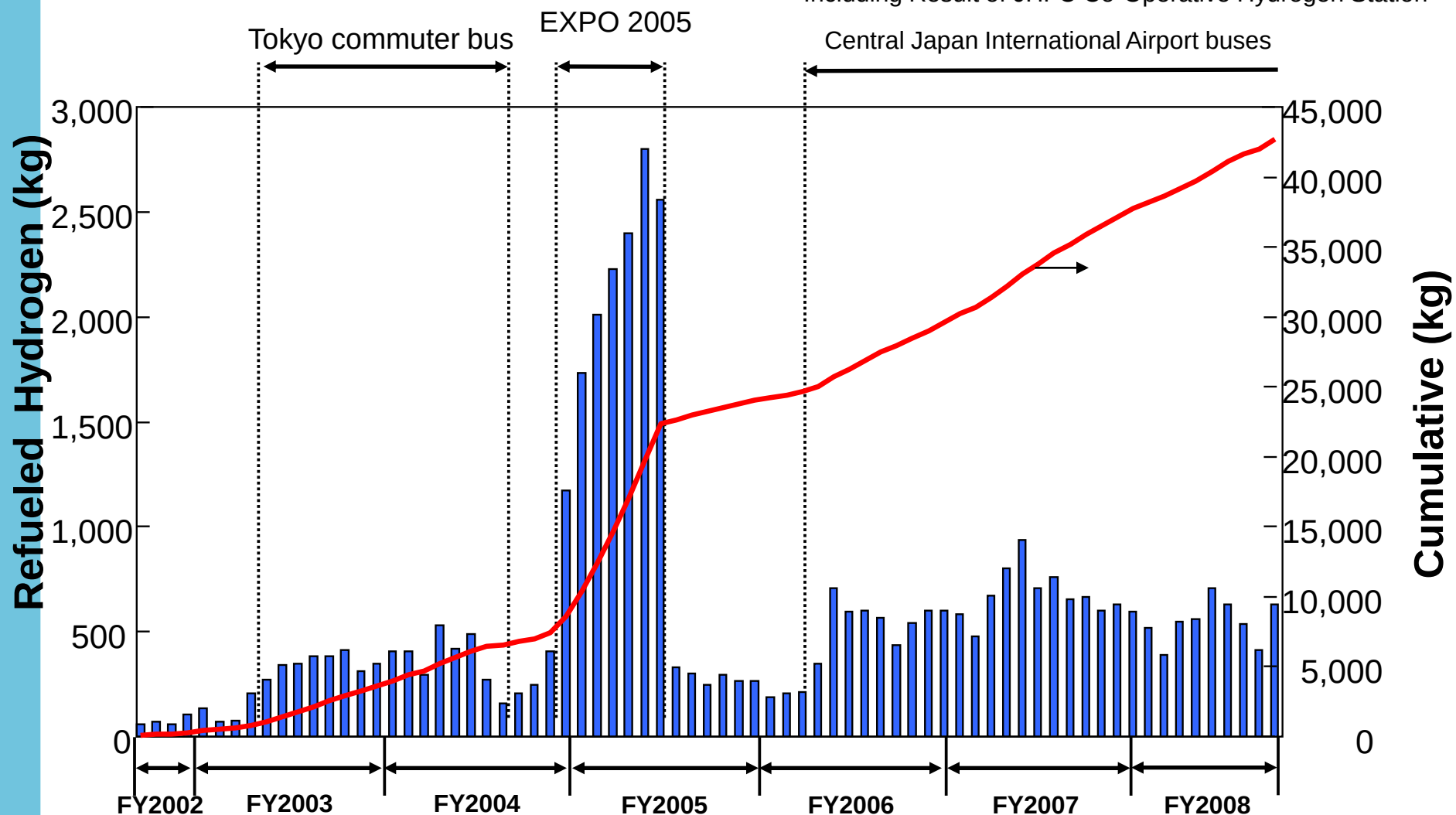
Location of Hydrogen Stations



Refueling – All JHFC Stations (1)

H₂ Refueling : 42,658kg* (Dec. 2002 – Dec. 2008)

* Including Result of JHFC Co-Operative Hydrogen Station



Refueling – All JHFC Stations (2)

Refueled Hydrogen (kg)

Station	Opening	FY2002 (-Mar.'03)	FY2003 (Apr.'03-Mar.'04)	FY2004 (Apr.'04-Mar.'05)	FY2005 (Apr.'05-Mar.'06)	FY2006 (Apr.'06-Mar.'07)	FY2007 (Apr.'07-Mar.'08)	FY2008 (Apr.-Dec.'08)	Total**
Kasumigaseki	Dec.'02	234	758	1007	883	694	886	604	1962
Daikoku	Mar.'03	65	354	597	511	409	406	309	2651
Asahi	Apr.'03	-	171	184	253	236	176	65	1086
Senju	May.'03	-	279	376	424	383	308	240	2009
Ariake	May.'03	-	1670	1540	734	515	1050	396	5906
Kawasaki	Aug.'03	-	50	104	98	116	156	98	621
Tsurumi	Dec.'03	-	14	21	15	4	-	-	53
Hadano	Apr.'04	-	-	160	145	-	-	-	304
Sagamihara	Apr.'04	-	-	20	36	16	52	21	145
Ome & Funabashi	Jun.'04	-	-	19	271	88	220	187	785
Seto-North	Feb.'05	-	-	445	5866	-	-	-	6312
Seto-South	Feb.'05	-	-	547	6183	-	-	-	6730
Centrair	Jul.'06	-	-	-	-	3075	4387	2759	10221
Kansai Airport	Mar.'07	-	-	-	-	2	62	54	117
Osaka	Aug.'07	-	-	-	-	-	214	141	355
Ichihara *	Dec.'06	-	-	-	-	70	159	68	297
Total**		299	3294	5019	15419	5607	8076	4942	42658

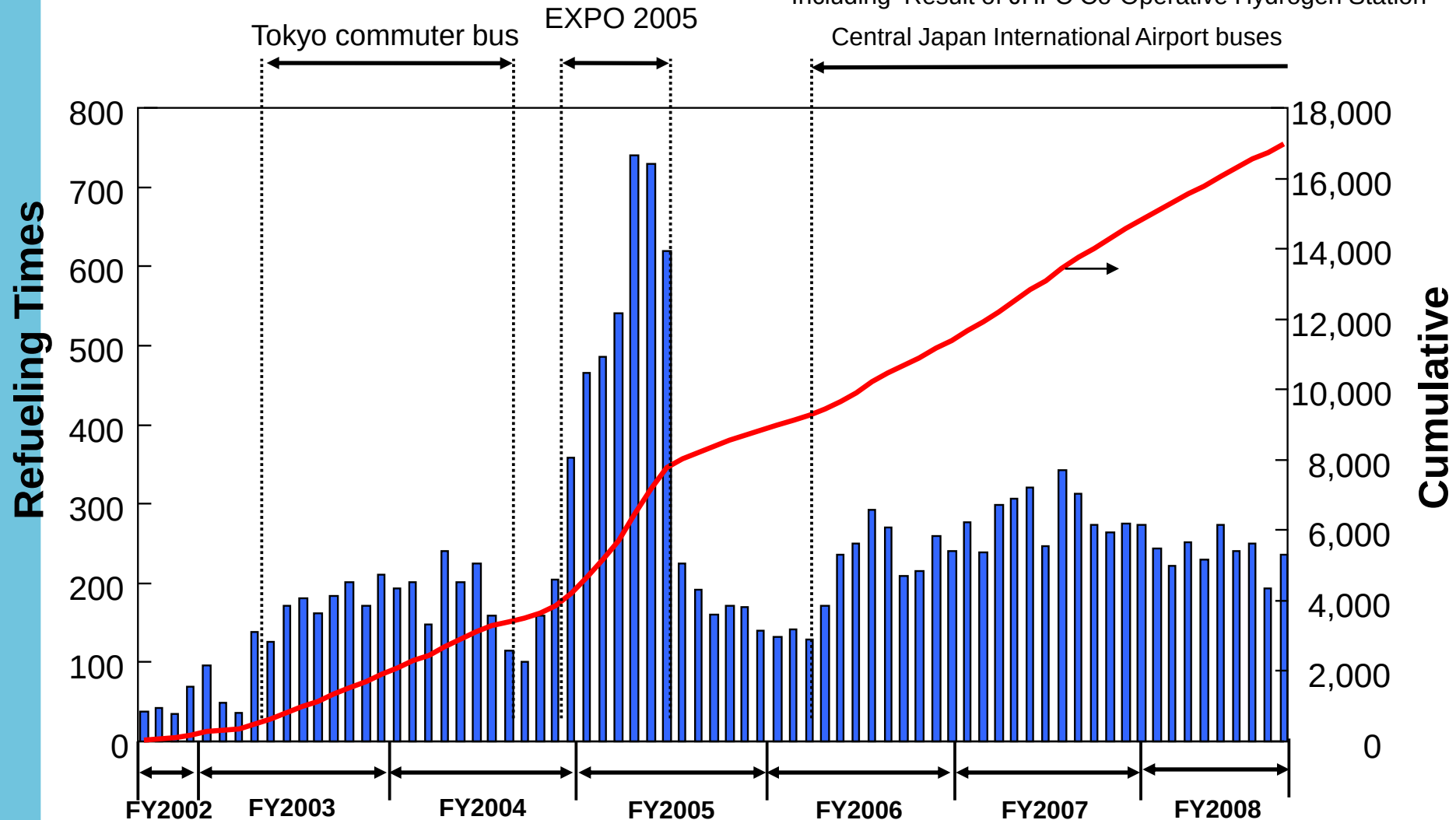
* JHFC Co-Operative Hydrogen Station

** Total amount may slightly differ from the sum in the table above due to a significant figure rounding.

Refueling – All JHFC Stations (3)

H₂ Refueling : 16,969 times* (Dec. 2002 – Dec. 2008)

* Including Result of JHFC Co-Operative Hydrogen Station



Refueling – All JHFC Stations(4)

Hydrogen Refueling Times

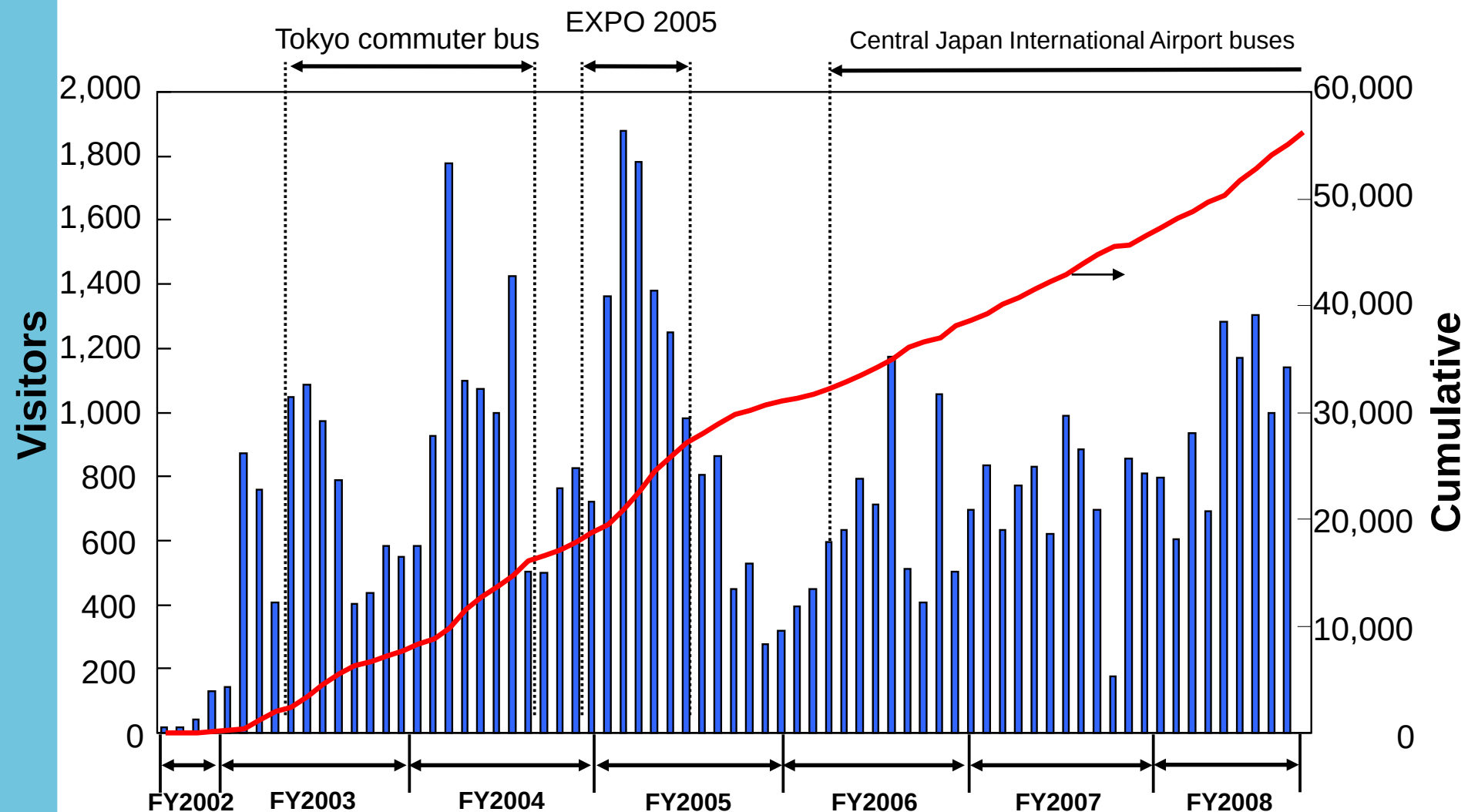
Station	Opening	FY2002 (-Mar.'03)	FY2003 (Apr.'03-Mar.'04)	FY2004 (Apr.'04-Mar.'05)	FY2005 (Apr.'05-Mar.'06)	FY2006 (Apr.'06-Mar.'07)	FY2007 (Apr.'07-Mar.'08)	FY2008 (Apr.-Dec.'08)	Total
Kasumigaseki	Dec.'02	136	379	466	462	486	640	403	1416
Daikoku	Mar.'03	48	316	466	388	275	316	206	2015
Asahi	Apr.'03	-	141	106	167	146	121	52	733
Senju	May.'03	-	246	298	313	263	210	131	1461
Ariake	May.'03	-	569	557	549	435	559	289	2958
Kawasaki	Aug.'03	-	60	66	72	74	114	70	456
Tsurumi	Dec.'03	-	15	16	12	3	-	-	46
Hadano	Apr.'04	-	-	107	106	-	-	-	213
Sagamihara	Apr.'04	-	-	17	32	17	41	19	126
Ome & Funabashi	Jun.'04	-	-	11	158	75	152	108	504
Seto-North	Feb.'05	-	-	88	1136	-	-	-	1224
Seto-South	Feb.'05	-	-	105	1244	-	-	-	1349
Centrair	Jul.'06	-	-	-	-	727	1020	657	2404
Kansai Airport	Mar.'07	-	-	-	-	1	40	36	77
Osaka	Aug.'07	-	-	-	-	-	114	116	230
Ichihara *	Dec.'06	-	-	-	-	48	101	52	201
Total		184	1726	2303	4639	2550	3428	2139	16969

* JHFC Co-Operative Hydrogen Station

Additional 183 times for metal hydride canister storages.

Visitors to Hydrogen Stations (1)

56,267 Visitors* (Dec. 2002 – Dec. 2008) * Including Result of JHFC Co-Operative Hydrogen Station



Visitors to Hydrogen Stations (2)

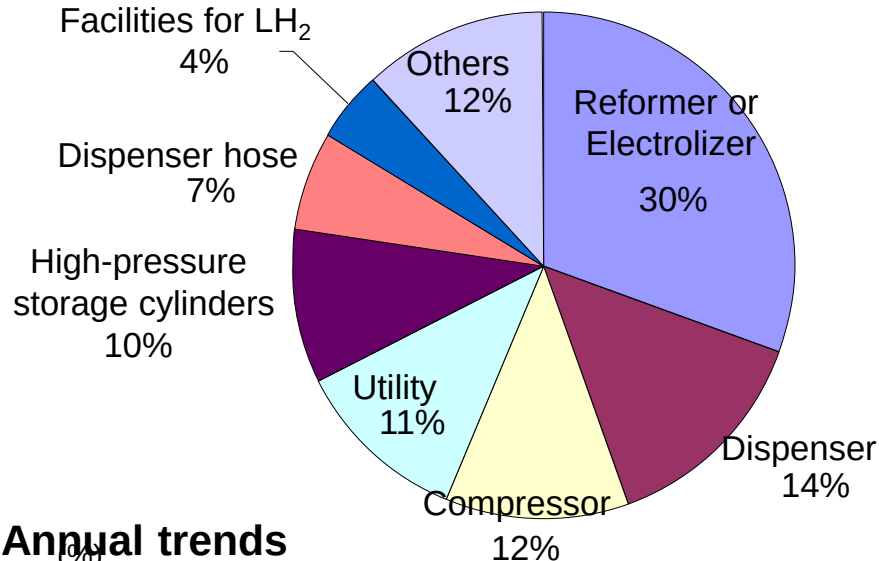
Station	Opening	FY2002 (-Mar.'03)	FY2003 (Apr.'03-Mar.'04)	FY2004 (Apr.'04-Mar.'05)	FY2005 (Apr.'05-Mar.'06)	FY2006 (Apr.'06-Mar.'07)	FY2007 (Apr.'07-Mar.'08)	FY2008 (Apr.-Dec.'08)	Total
Kasumigaseki	Dec.'02	45	73	91	8	33	42	14	306
Daikoku	Mar.'03	36	1681	1977	1902	1892	2266	2485	12239
Asahi	Apr.'03	-	344	359	159	122	201	16	1201
Senju	May.'03	-	2026	4540	3294	2462	2184	2605	17111
Ariake	May.'03	-	3254	2578	2448	1058	454	394	10186
Kawasaki	Aug.'03	-	220	386	151	145	172	176	1250
Tsurumi	Dec.'03	-	32	82	39	13	-	-	166
Hadano	Apr.'04	-	-	499	230	-	-	-	729
Sagamihara	Apr.'04	-	-	198	81	30	56	57	422
Ome & Funabashi	Jun.'04	-	-	315	725	21	182	1169	2412
Seto (North & South)	Feb.'05	-	-	0	3236	-	-	-	3236
Centrair	Jul.'06	-	-	-	-	1478	1356	714	3548
Kansai Airport	Mar.'07	-	-	-	-	-	421	148	569
Osaka	Aug.'07	-	-	-	-	-	438	315	753
Ichihara *	Dec.'06	-	-	-	-	293	1024	822	2139
Total		81	7630	11025	12273	7547	8796	8915	56267

* JHFC Co-Operative Hydrogen Station

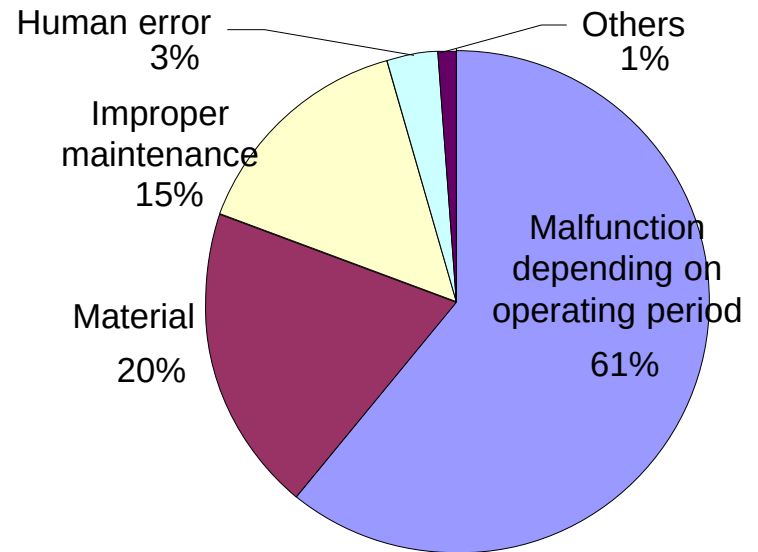
Safety Learning Analysis

JHFC hydrogen stations experienced 92 incidents and malfunctions for 3 years from FY2006 to FY2008.

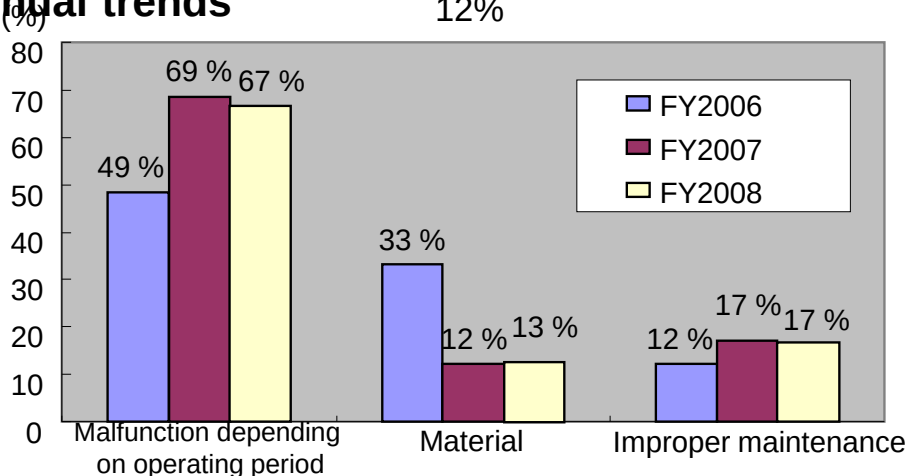
(1) Equipment



(2) Causes



(3) Annual trends



Further attentions should be paid especially for 70 MPa equipment.

Current cost of Major Components

	Current cost (million yen)	Parameter ^{*)} dependence
Reformer	150 – 186	No
Compressor	50 – 110	Yes (strong)
High-pressure storage cylinders	39 -	Yes (very strong)
Dispenser	15 -	Yes (fairly strong)
Pre-cooler	17 -	Yes (fairly strong)
total	roundly 300 -	Yes (250 million yen difference between 35 MPa and 70 MPa stations)

Construction, piping and wiring costs are extra.

^{*)}parameter : filling pressure, filling period, filling method

Results cannot be directly compared with those previously disclosed in the JHFC product.

Further cost reduction is definitely necessary.

Cost Reduction Feasibility

Reformer	Simplified system, reduction of parts Target is 50% of current cost.
Electrolizer	Key components (electrode, separator), power supply, rectifier
Compressor	Cylinder type, oil-driven booster, &c.
High-pressure storage cylinders	Large-scale cylinder, mass production through standardization, cost reduction using material other than steel, number reduction through the combination of cascade and compressor-drive filling.
Dispenser	Target is 50% of current cost.
Common (parts & equipments)	Imported parts, similar equipment widely used
Others	Layout optimization, cost reduction of general installation at the site.

Investigation to be continued.

Please visit our web site for the latest results!
<http://www.jhfc.jp/e/>

Important or Novel Program Features

- Entry-Level Station Configurations & Strategies
- Government Incentives/Policies
- Reducing Risk to Station Owners
- Information and Education for Retailers & Customers

