Hydrogen Infrastructure in Japan

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1. Strategic Energy Plan (updated by Cabinet on 11th April 2014) ~ H_2/FC Field ~

(1) Promotion of Stationary Fuel Cells (FC)

- Residential FC (Ene-Farm): Target 1.4 mil unit by 2020, 5.3 mil unit by 2030
  - Installation subsidy toward self-sustained market (by FY2016), continuous support for R&D/standardization for cost reduction
- Stationary FC in commercial/industry application
  - Support for RD&D toward early commercialization (mainly for SOFC)

Prime minister Abe

(2) Creation of preferable market conditions for FCV commercialization

- Build 100 HRSs by FY2015 and streamline regulations/R&D for cost reduction

(3) Promote new technologies such as H_2gas-based power generation and wider H_2 applications

- Promotion of new H_2 technologies such as H_2gas-based power generation can contribute to increase mass introduction of H_2 in the market, reducing the H_2 cost

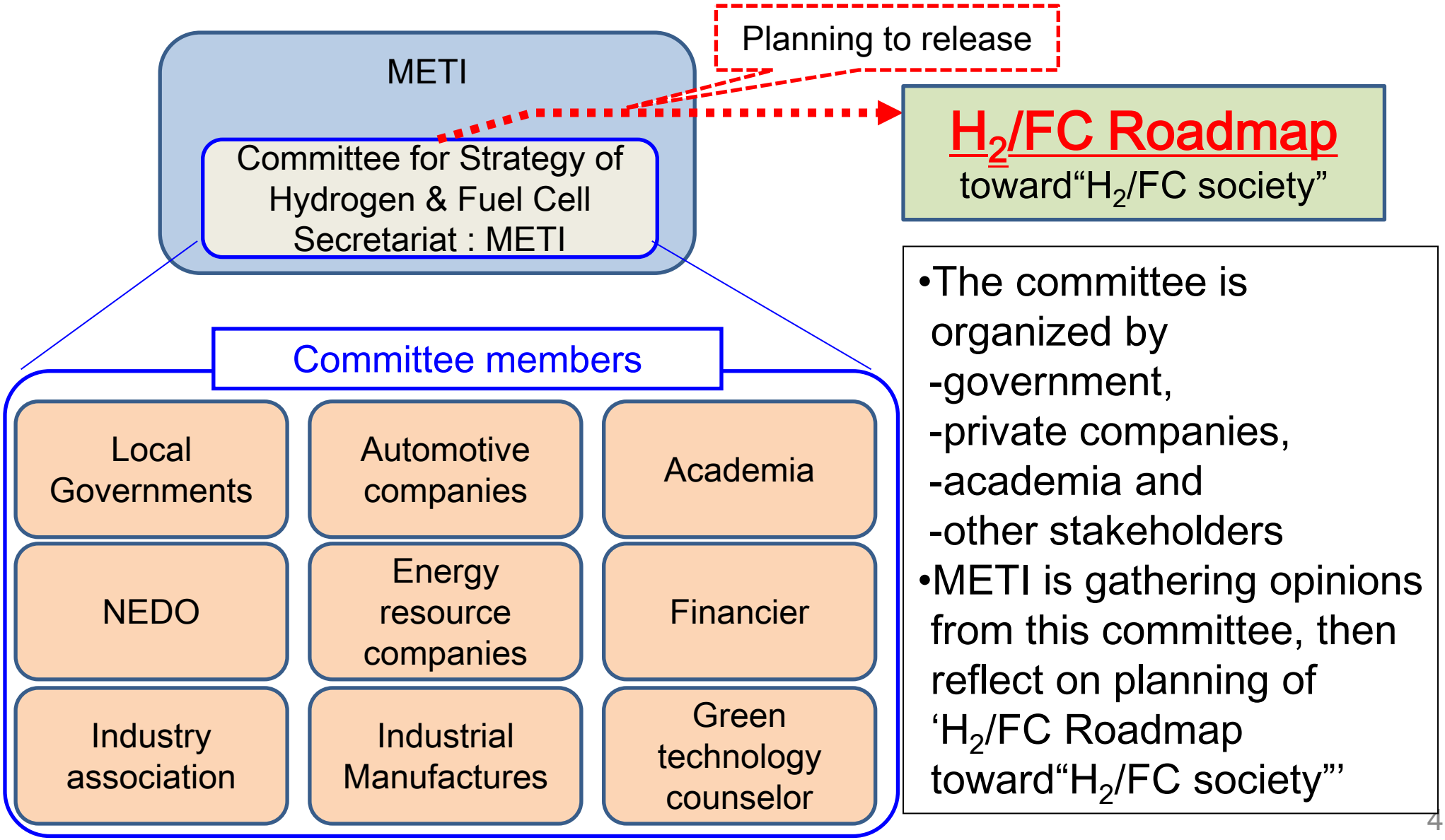
(4) R&D for large-scale H_2 production/storage/delivery technologies for stable supply

- R&D effort on H_2 production/storage/delivery technologies that can contribute to large-scale storage/long-distance delivery with low-cost/large volume hydrogen supply

(5) Develop H_2/FC Roadmap toward"H_2/FC society"

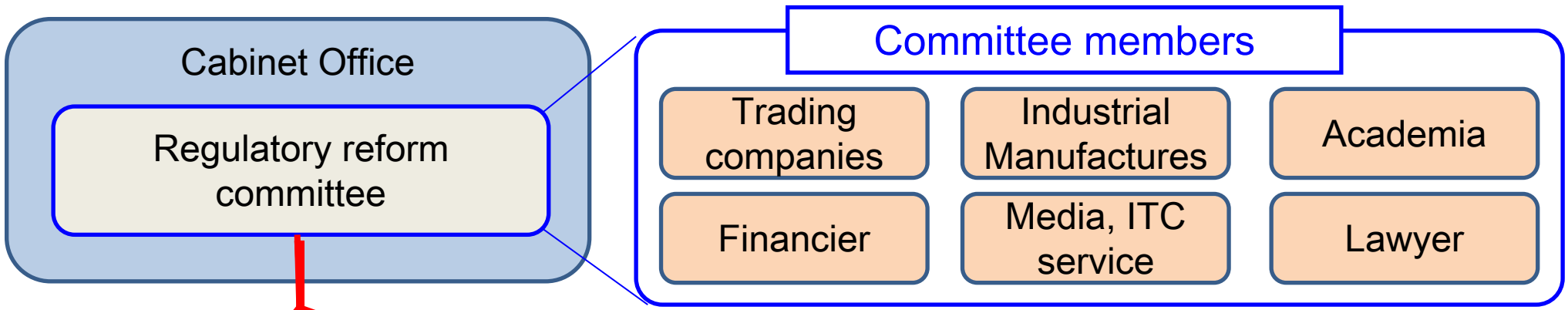
- Develop a roadmap toward H_2/FC society and establish a committee to follow the progress

2. Cooperation between Industry, Academia and Government ~ toward 'H_2/FC society' ~



- The committee is organized by
  -government,
  -private companies,
  -academia and
  -other stakeholders
- METI is gathering opinions from this committee, then reflect on planning of 'H_2/FC Roadmap toward"H_2/FC society"'

2. Cooperation between Industry, Academia and Government ~toward 'Regulatory reform '~



Regulatory reform request

Minister | Minister | • • • • • | METI

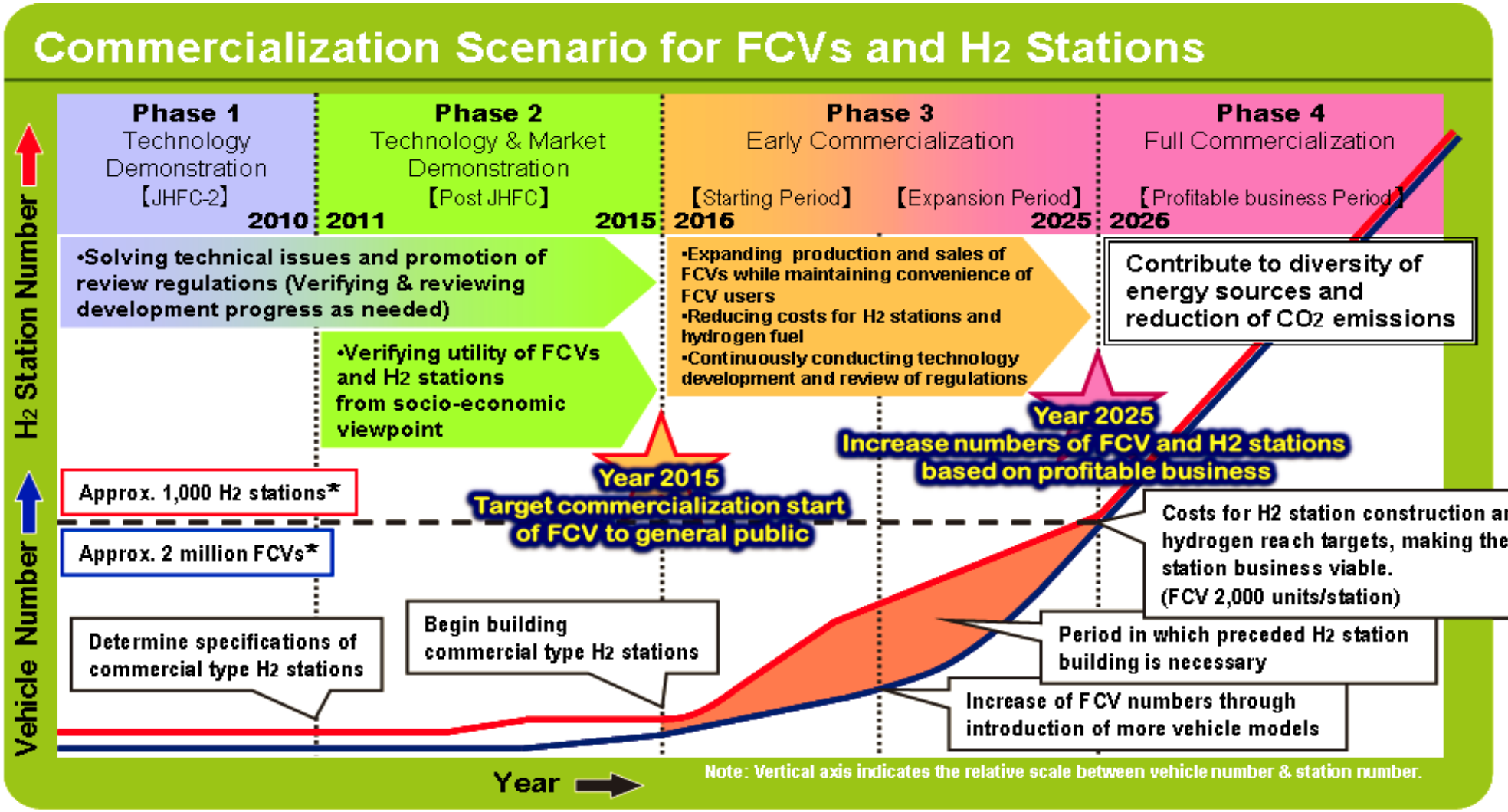
Regulatory reform requests for the world's fastest dissemination of FCEV & HRS

- FCEV's Hydrogen vessel
- Filling pressure for FCEV
- According with GTR
- -Standards for Liquid Hydrogen utilization in HRS
- Materials for HRS
- Location and place limits for HRS

•Cabinet Office is strongly promoting Regulatory reform for the world's fastest dissemination of FCEV & HRS.

3. FCV and HRS Deployment
~ Commercialization Scenario by FCCJ*~

* Fuel Cell Commercialization Conference of Japan



* Precondition: Benefit for FCV users (price/convenience etc.) are secured, and FCVs are widely and smoothly deployed

Reference : FCCJ, March 2010 http://fccj.jp/

3. FCV and HRS Deployment
~ History of Japanese FCEV development ~

NISSAN
to launch 1st commercial model

2017

2015

TOYOTA / HONDA
to launch 1st commercial model

HONDA

FCX Clarity

2008

FCHV-adv

TOYOTA

2003

2002

X-TREIL FCV

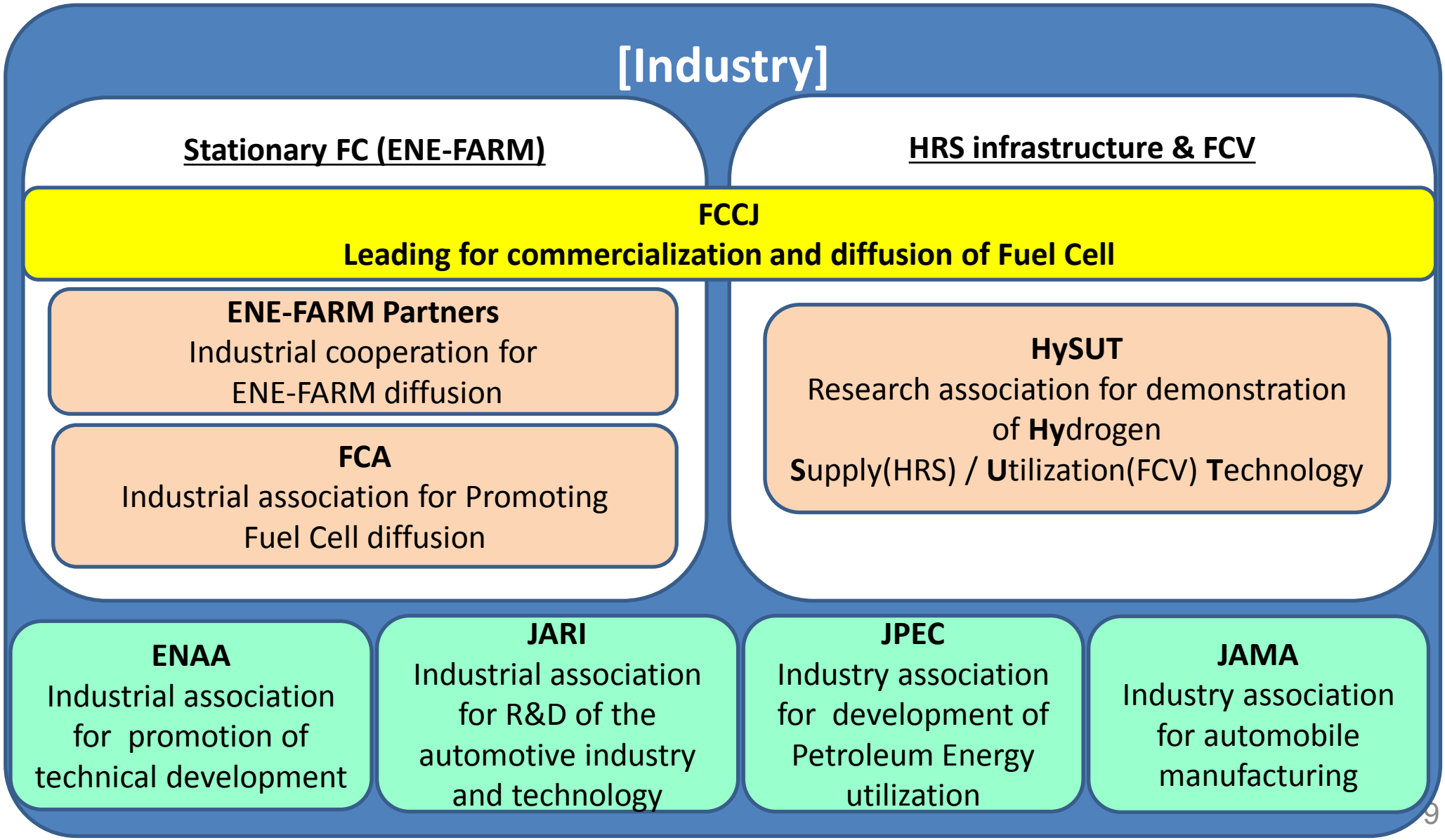
3. FCEV and HRS Deployment

Automakers' Worldwide Cooperation

Toyota = BMW	Nissan = Daimler = Ford	Honda = G M
(announced on Jan 24, 2013) - Agreed on joint development of a fundamental fuel-cell vehicle system aiming for next-generation in 2020. - Launch of FCVs in 2015	(announced on Jan 28, 2013) - Agreed on joint development of common fuel cell electric vehicle system. - Launch of mass-production FCEVs in 2017	(announced on July 2, 2013) - Agreed on joint development of fuel cell system and hydrogen storage technologies, aiming for next-generation in 2020. - Launch of FCVs in 2015
		

- Joint announcement by 13 companies including automakers and energy companies (Jan 13, 2011)
  - (1) introduction of FCEV in 2015,
  - (2) installation of 100 hydrogen refueling stations in four major metropolitan areas
- "Japan Revitalization Strategy" (June 14, 2013)
  - (1) installation of 100 hydrogen refueling stations in four major metropolitan areas
  - (2) the world's fastest dissemination of FCVs

3. FCEV and HRS Deployment
~ Industry cooperation toward 'H_2/FC society' ~



3. FCEV and HRS Deployment
~ Industrial Cooperation for RD&D ~

*About HySUT**

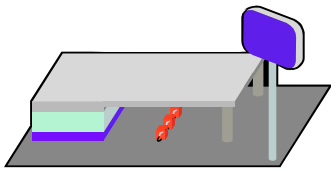
*The Research Association of **Hy**drogen **S**upply / **U**tilization **T**echnology

- Goal and Objective -

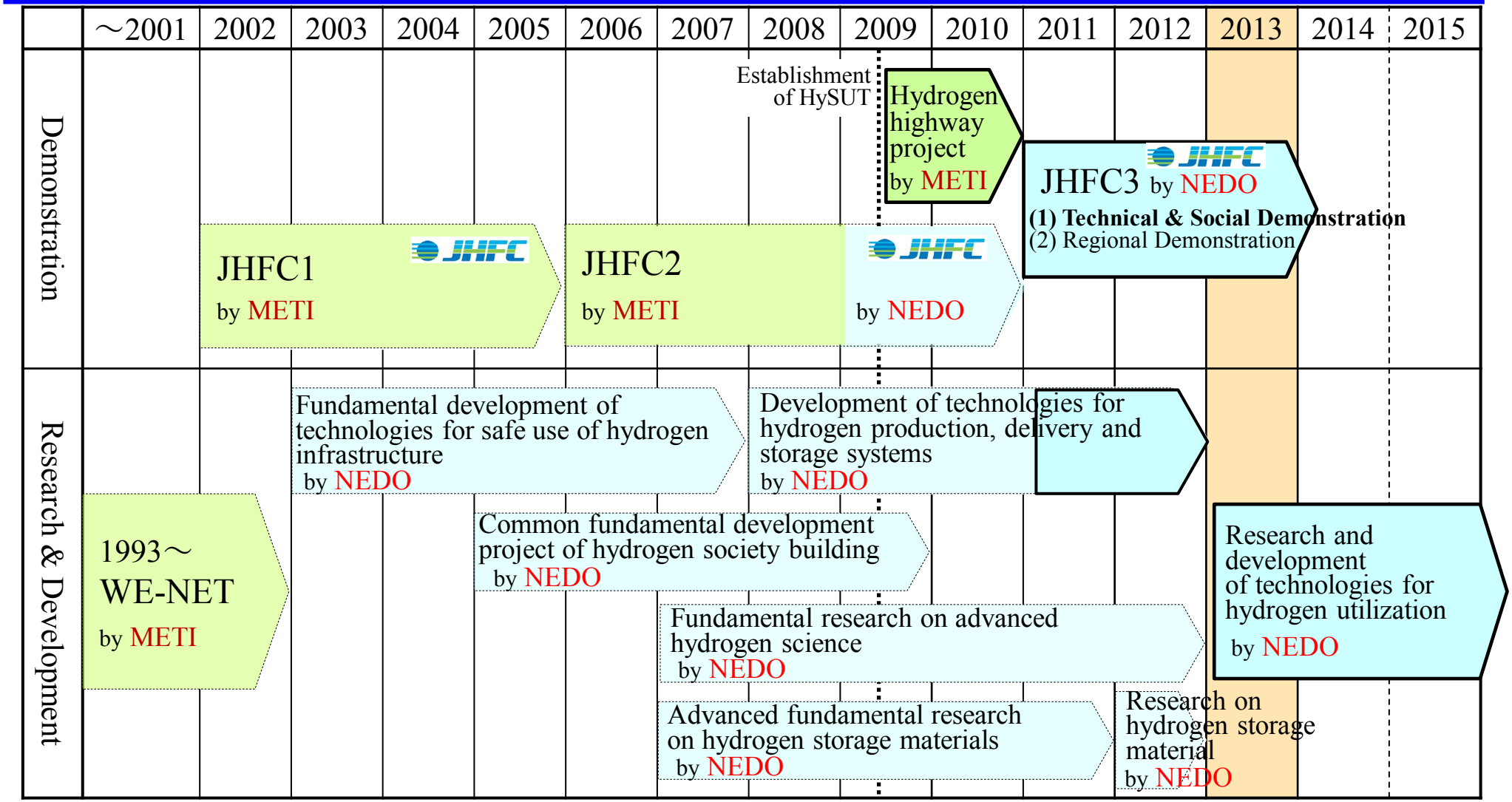
- ✓ HySUT's goal is **commercialization of hydrogen supply business and FCVs** by private companies.
- ✓ HySUT's objective is to **solve the issues of technology, consumer awareness, social acceptance and to assist business establishment** through our demonstration program.

Date of establishment	July 31st, 2009
Members	19 Companies and Organizations
	4 Petroleum / 4 City gas / 6 Industrial gas, Devices, Engineering & Materials
	3 Automotive / 2 Related organizations
Term	2009 to FY2015

3. FCEV and HRS Deployment
~ HySUT member companies

Members	19 Companies and Organizations
4 	JX Nippon Oil & Energy Corporation, Idemitsu Kosan Co., Ltd., Cosmo Oil Co., Ltd., Showa Shell Sekiyu K.K.
4 	Tokyo Gas Co., Ltd., Osaka Gas Co., Ltd., Toho Gas Co., Ltd., Saibu Gas Co., Ltd
6 	Iwatani Corporation, Air Liquide Japan Ltd., Kawasaki Heavy Industries, Ltd., Mitsubishi Kakoki Kaisha, Ltd., Taiyo Nippon Sanso Corporation, The Japan Steel Works, Ltd.
3 	Toyota Motor Corporation, Nissan Motor Co., Ltd., Honda R&D CO., Ltd.
2 	Engineering Advancement Association of Japan (ENAA), Japan Petroleum Energy Center (JPEC)

4. FCEV/Hydrogen Infrastructure Projects in Japan



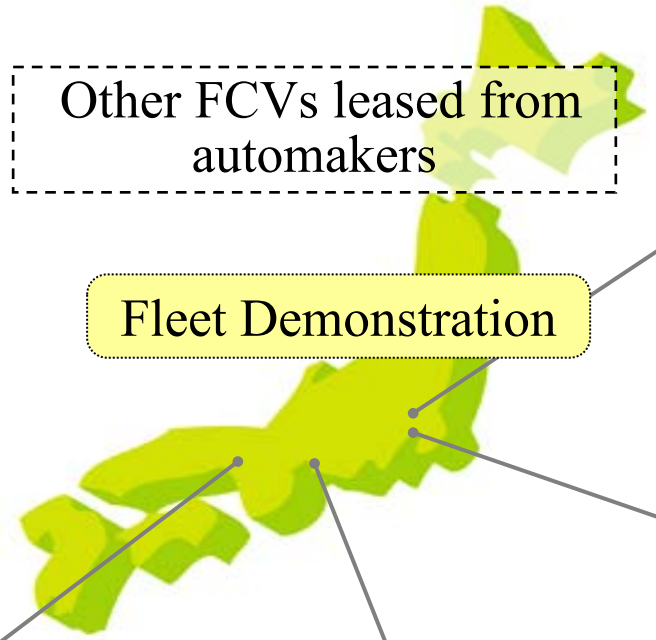
METI : Ministry of Economy , Trade and Industry
NEDO: New Energy and Industrial Technology Development Organization
WE-NET: International Clean Energy Network using Hydrogen Convention (World Energy- NETwork)
JHFC: Japan Hydrogen & Fuel Cell Demonstration Project

4. FCEV/Hydrogen Infrastructure Projects in Japan ~ FCVs & FC Buses Served for JHFC3 ~

FCHV-adv (Toyota)

X-TRAIL FCV (Nissan)

FCX CLARITY (Honda)



Other FCVs leased from automakers

Fleet Demonstration

Manzaki Transport Co., Ltd.

FCX CLARITY (Honda)
ANA Welcome-home Taxi Service

New Kansai International Airport Co., Ltd.

FCHV-BUS (Toyota, Hino)
Shuttle Bus

ANA CHUBU AIRPORT CO., LTD.

FCHV-BUS (Toyota, Hino)
Ramp Bus

Airport Transport Service Co., Ltd.

FCHV-BUS (Toyota, Hino)
Airport Limousine

4. FCEV/Hydrogen Infrastructure Projects in Japan ~HRSs in JHFC3 (FY2013)~


Toyota Ecoful Town
(70/35MPa, On-site)


Ebina Chuo
(70MPa, Off-site)


Yokohama-Asahi
(70/35MPa, On-site)


Tokyo-Suginami
(35MPa, Off-site)


Senju (70/35MPa, On-site)

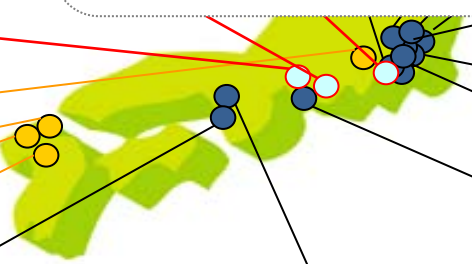

Narita (35MPa, Off-site)


Kaminokura
(70MPa, On-site)


Kasumigaseki (70/35MPa, Off-site)

Technical & Social Demonstration by HySUT and HySUT's members

Regional Demonstration by local governments etc.



Yamanashi (35MPa, Off-site)

Kitakyushu (35MPa, Off-site)

Kyushu-Univ. (35MPa, On-site)

Tosu (35MPa, On-site)


Ariake (35MPa, Off-site)


Kansai-airport (35MPa, Off-site)


Osaka (35MPa, On-site)


Centrair (35MPa, On-site)

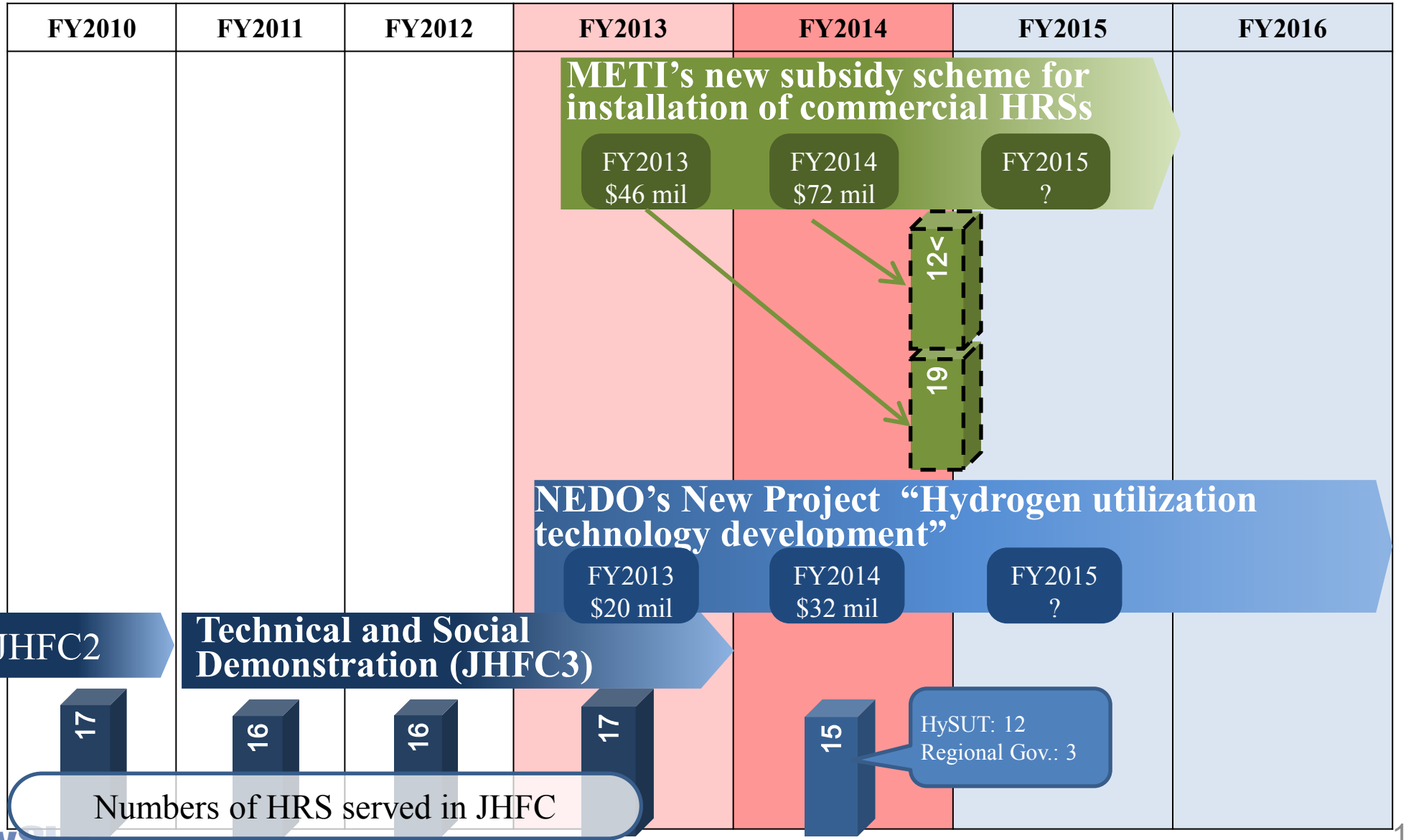

Haneda (35MPa, On-site)

HySUT

4. FCEV/Hydrogen Infrastructure Projects in Japan ~HRS with commercial scale fueling ability~

City	Ebina	Nagoya	Toyota
Name	Ebinachuo	Kaminokura	Toyota ecoful town
Type	Off-site	On-site	On-site
Hydrogen Resource	Compressed H_2 gas	LPG	City gas
Characteristic	・ Establishment in commercial GS. ・ Hydrogen trailer utility	・ Establishment in commercial GS.	・ Packaging equipments （ Iwatani/Linde ） ・ Large amount fueling for FC bus
Photo			

5. Promotion of HRS Installation ~HRSs in Japan~

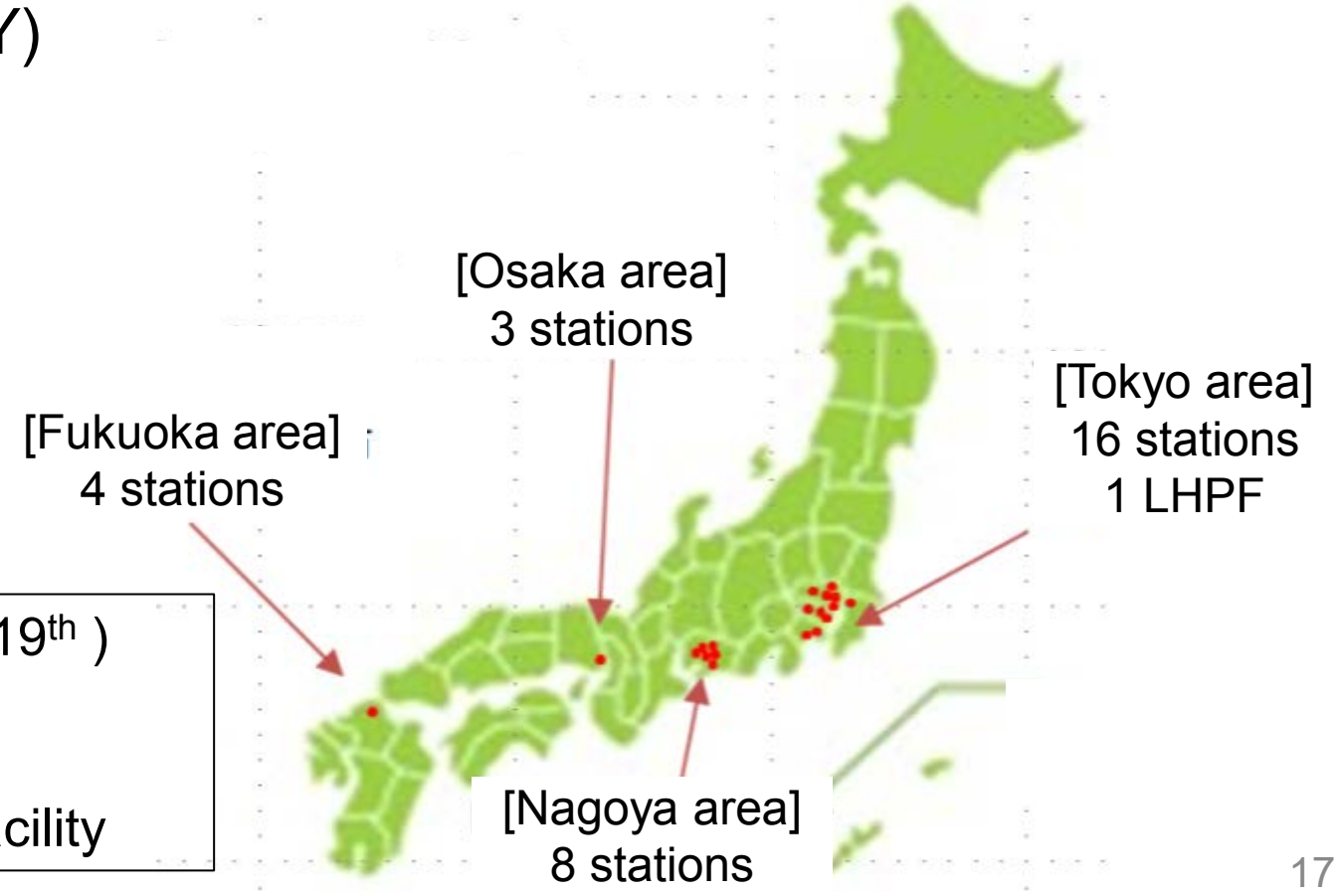


5. Promotion of HRS Installation

- **Prior to market introduction of FCEVs (2015), 100 HRSs will be installed in 4-major-populated-areas (Tokyo, Aichi, Osaka, Fukuoka)**
- **METI subsidizes about 50% of HRS installation cost**

(2014FY 7.2 billion JPY)

The third round for the application to hydrogen station installation in 2014 is now under process.



Status of HRSs (as of June 19th)
Budget secured:

- 31 stations
- 1 Large H_2 Production Facility

5. Promotion of HRS Installation
~ Summary of the approved HRSs by type~

Fueling ability	100-300 Nm^3/h (FY2013/FY2014)			300< Nm^3/h (FY2013/FY2014)	
	CHG	LH	Mobile	CHG	LH
on-site	0/1			2/1	
off-site	0/0	0/0	0/3	17/3	0/4

CHG: compressed hydrogen gas
LH: liquid hydrogen

3. Promotion of HRS Installation
Subsidy Scheme for HRS (2014FY)

Fueling ability (average) [Nm^3 / hr]	Types of HRS	Grant rate	Upper subsidy limit (million JPY)
more than 300	On-site (partial / full packaging)	Fixed	280
	On-site (Except above)	50%	280
	Off-site (partial / full packaging)	Fixed	220
	Off-site (Except above)	50%	220
	Movable	Fixed	250
100 to 300	On-site (partial / full packaging)	Fixed	180
	On-site (Except above)	50%	180
	Off-site (partial / full packaging)	Fixed	150
	Off-site (Except above)	50%	150
	Movable	Fixed	180
One Hydrogen production equipment for Hydrogen Shipping facility (10 equipment maximum at one site)		50%	60
Liquid hydrogen receiving and feeding equipment for HRS		50%	40

6 .NEDO's Program
~To solve issues for Hydrogen Infrastructure ~

Item 1: Streamlining Regulations

"Regulation Reform Plan" (Cabinet approved in June 2013)
- 24 items were identified as priority
  (e.g. location, distance, materials, etc.)

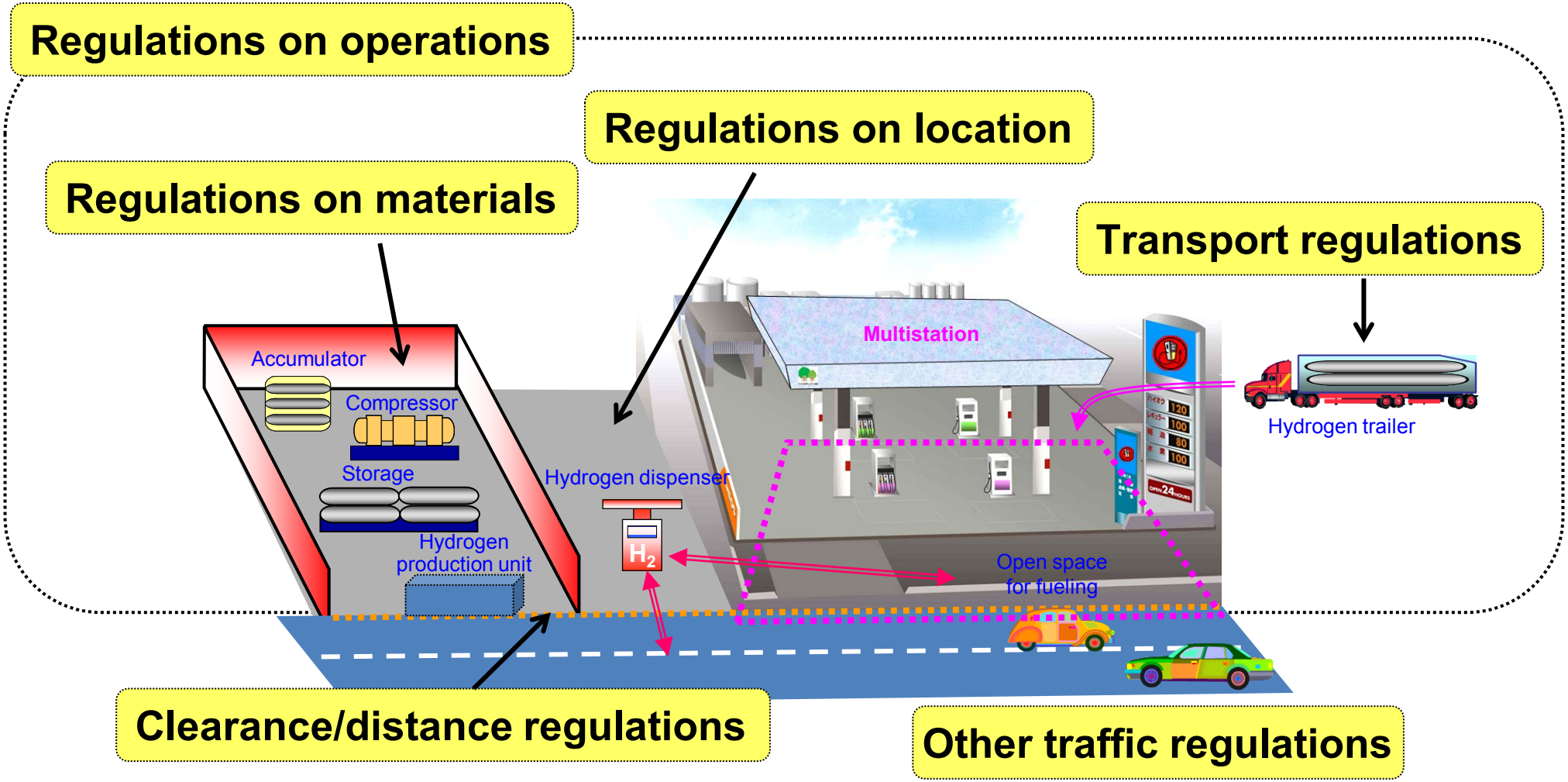
Item 2: R&D on low cost equipment for HRS

e.g. Compressor, Pre-cooler, Reformer, etc.

Item 3: Code and Standard

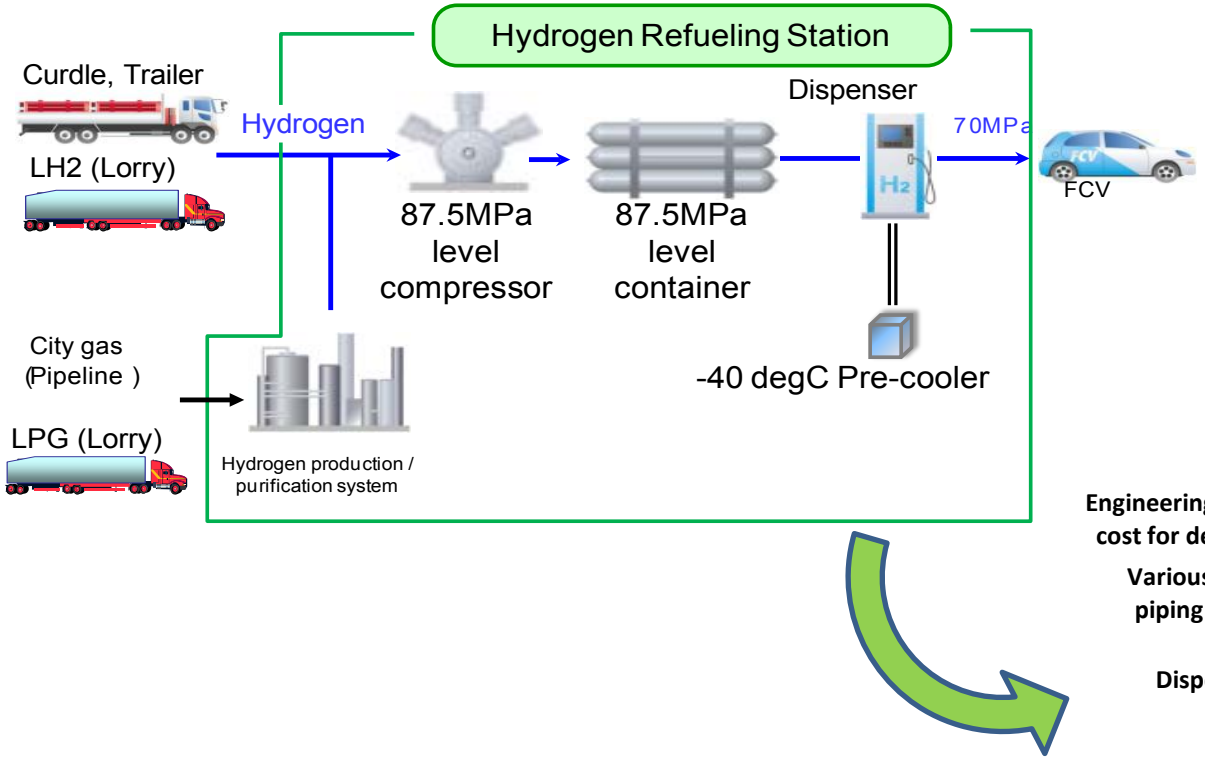
e.g. quality, metering, filling, inspection, etc.

6. NEDO's Program
~ Streamlining Regulations for HRS ~



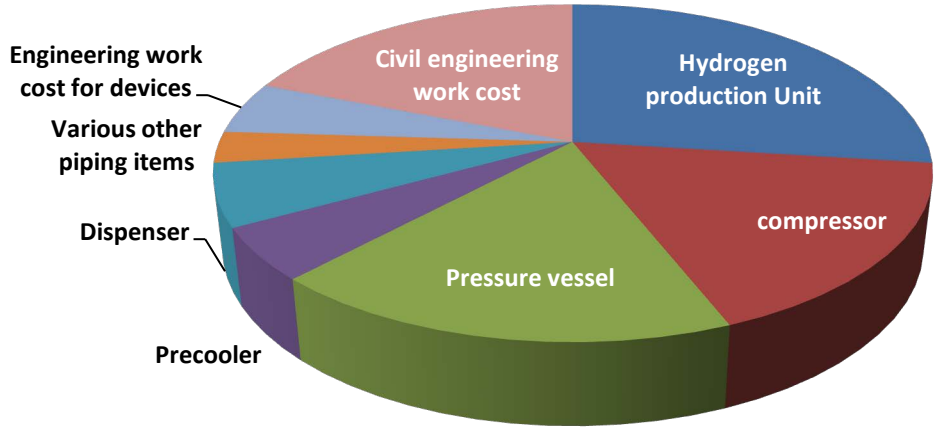
6. NEDO's Program
~ R&D on low cost equipment for HRS ~

-The present cost of supply equipment is 500 to 600 million yen, which is a major problem.
-The goal is to lower the cost of H_2 refueling stations.
-Cost reduction can be achieved by deregulation, mass production and simplification of system components.



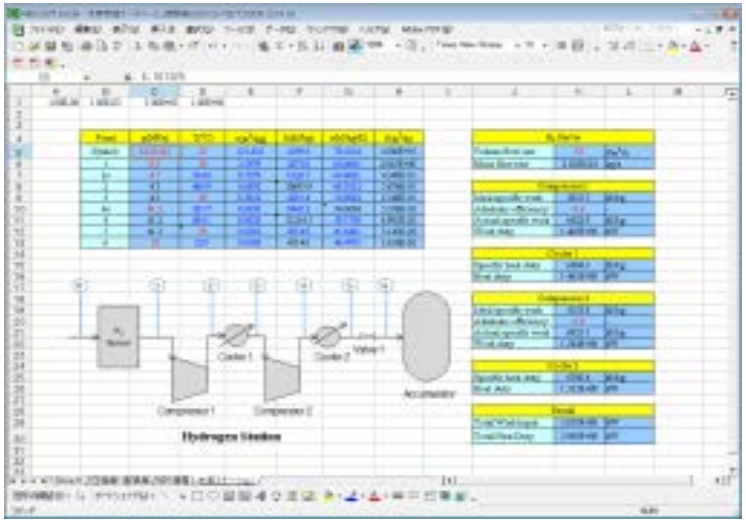
Cost breakdown for hydrogen refueling station

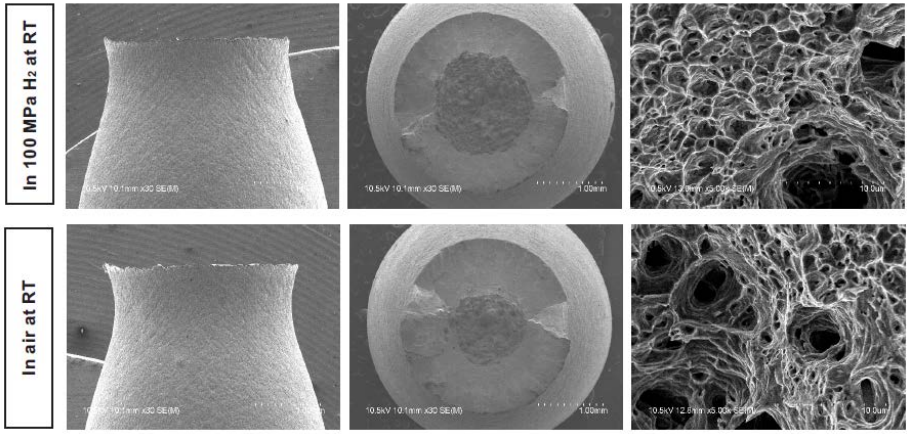
Example of medium-scale on-site costs



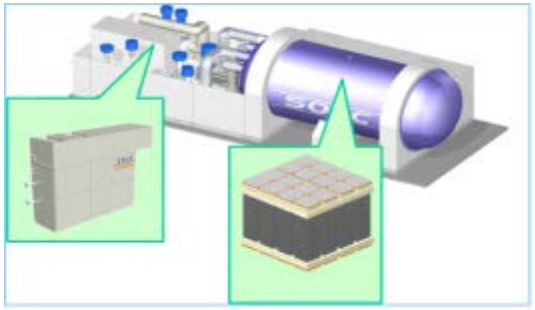
6 .NEDO's Program
~ Research for Codes and Standards ~

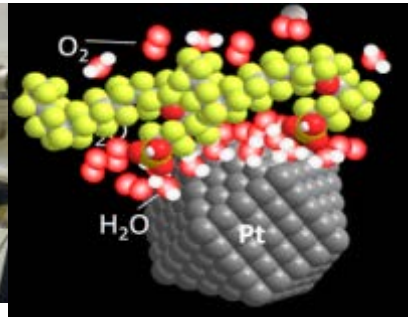
Kyushu Univ. as COE of Hydrogen

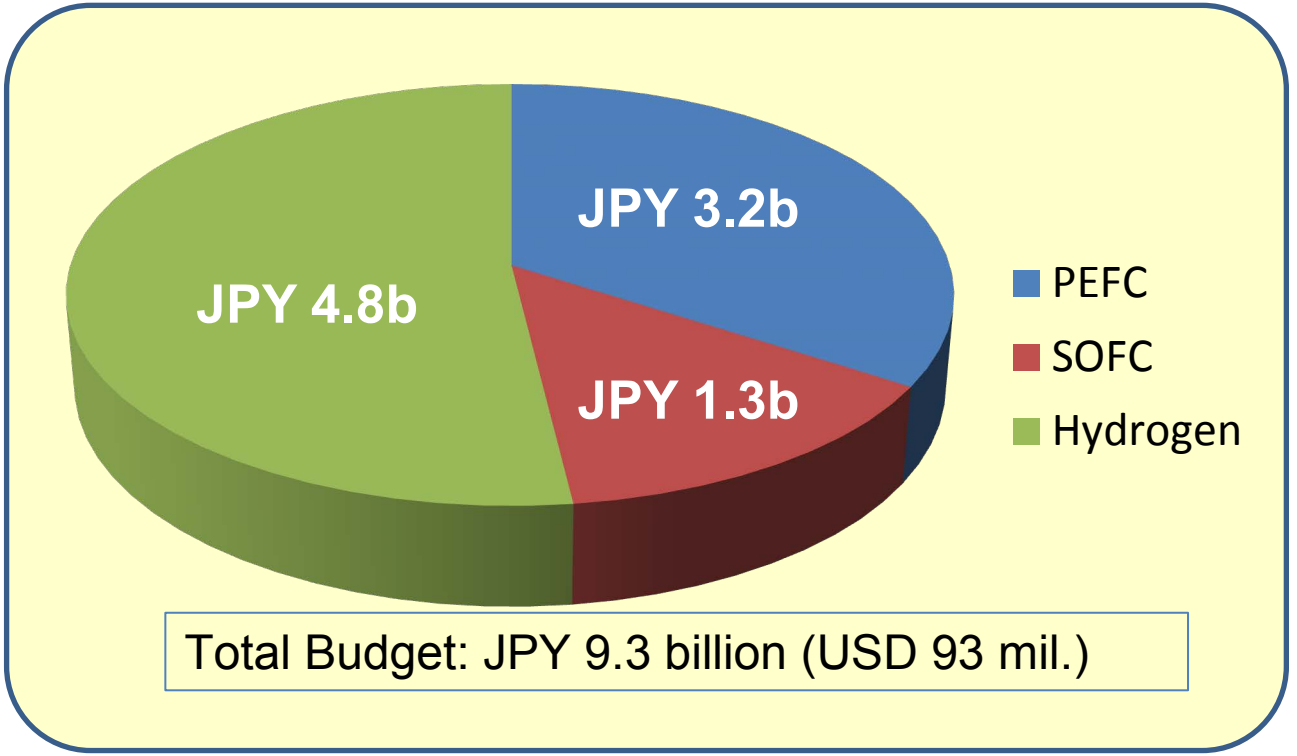




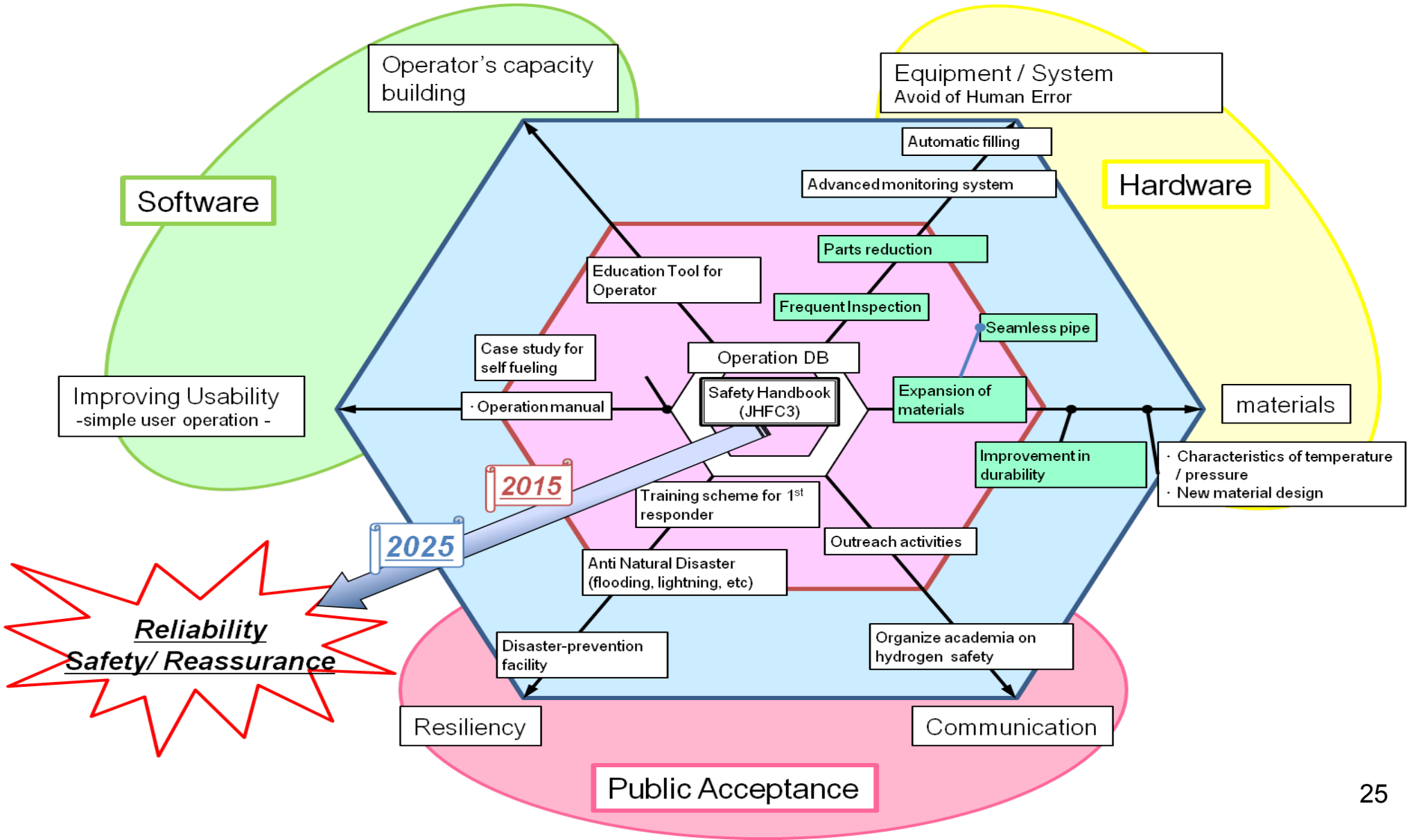
6. NEDO's Program
~Budgets for H_2 & FC in 2014 ~







6. NEDO's Program
~ HRS Reliability Project ~



Thank you
for your attention!