



Research and Development for Safety Improvement of Hydrogen Refueling Stations in Japan

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**The Association of Hydrogen Supply and Utilization Technology
(HySUT)**

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1. Introduction 1-1 About HySUT



1. Technology Development

- ✓ Fueling, Quality, Metering etc.
- ✓ Guidelines
- ✓ ISO/TC197

2. Safety and Reliability

- ✓ Future Technology
- ✓ Training and Education
- ✓ Database, Safety Control

3. Support Program

- ✓ HRS Operation

4. Others

- ✓ Public Awareness
- ✓ International Collaboration

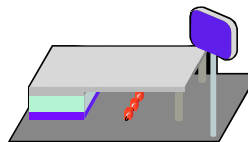
42 Member Companies and Organizations



Oil



City gas /
Industrial gas



Hydrogen
station

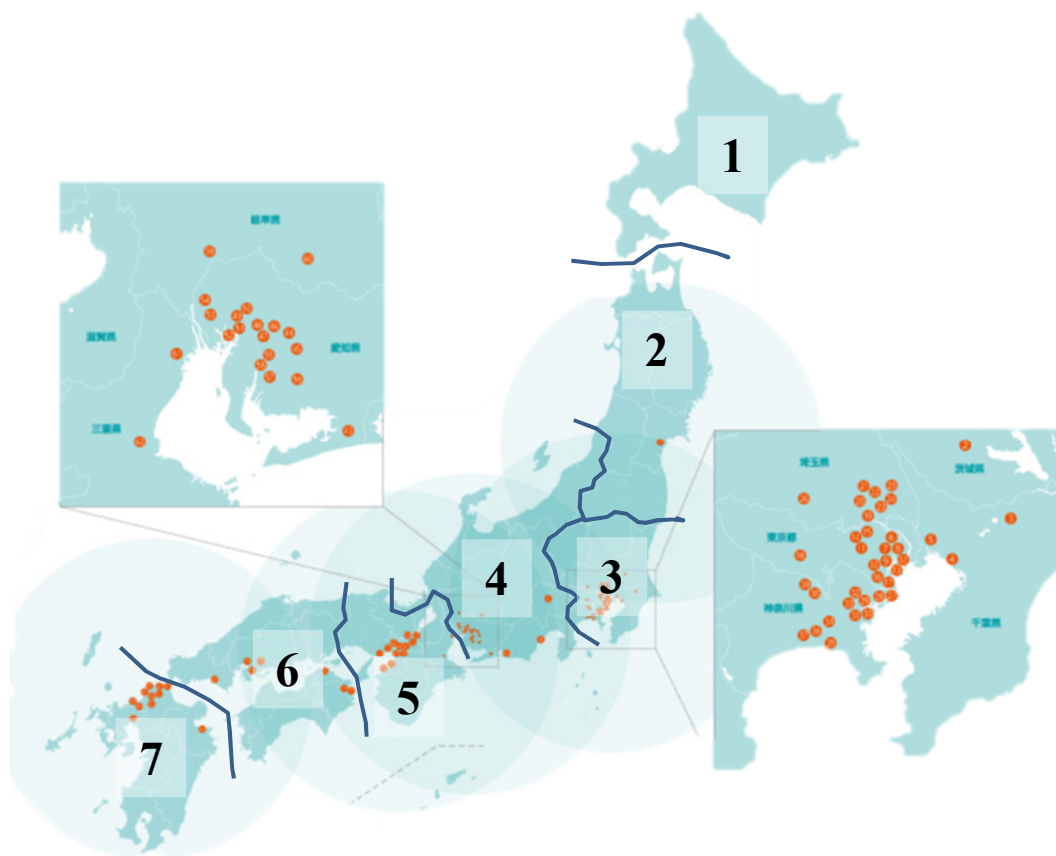


Engineering /
Machinery



Automotive

2. Deployment of Commercial HRSs(1)



Area	Number of HRSs	Number of FCVs
1. Hokkaido	0	5
2. Tohoku	1	11
3. Kanto	39	685
4. Chubu	22	748
5. Kansai	12	177
6. Chugoku/ Shikoku	6	68
7. Kyushu	12	105
Total	92	1,799

2. Deployment of Commercial HRSs(2)

Company	Number of HRSs
JXTG Nippon Energy	40
Iwatani	16.5
Air Liquide Japan	4
Tokyo Gas	3
Toho Gas	2.5
Osaka Gas	2
Nippon Mobile Hydrogen Station Services	5
Toyota Tsusho Air Liquide Hydrogen Energy	2
Idemitsu Kosan, Saibu Gas Chubu Gas, Seiryu Power Energy Mie Hydrogen Station Shikoku Taiyo Nippon Station Oita EBL Hydrogen Station Others	1 to 2

Type	Number of HRSs
On-site	15
Off-site	44
Mobile	33
Total	92

2. Deployment of Commercial HRSs(3)



Ebina-Chuo Station by JXTG
(Multi-Fuel)

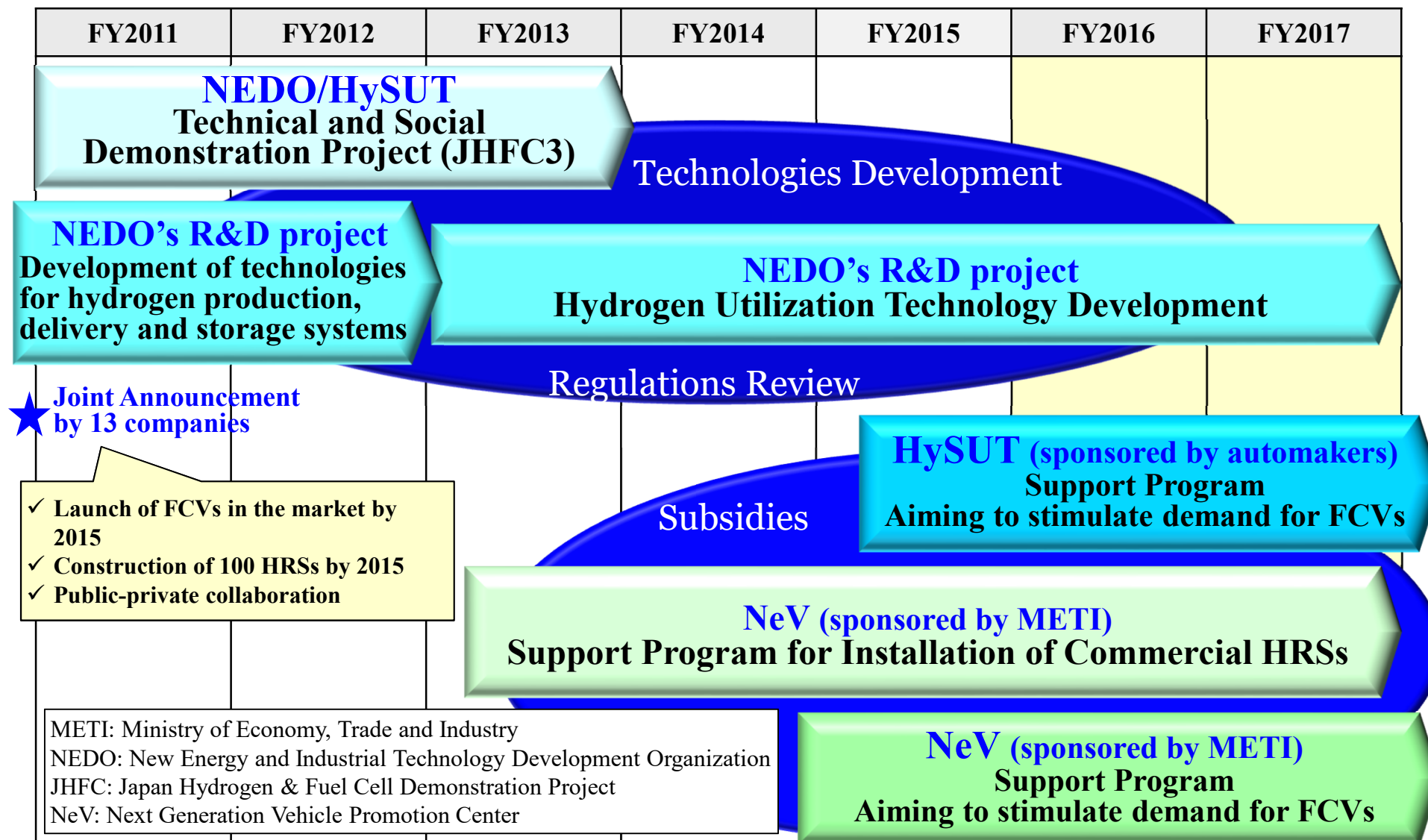


Narita Station by Idemitsu Kosan
(Narita Airport)

Features	Station
Multi-Fuel (Integrated gas station)	✓18 HRSs by JXTG
Multi-Fuel (Hydrogen, Gasoline, CNG,LPG)	✓Nissin HRS by Toho Gas
Multi-Fuel (Hydrogen, CNG)	✓2 HRSs by Tokyo Gas
Multi-Fuel (Hydrogen, LPG)	✓Otsu HRS by Iwatani
Station with convenience store	✓2 HRSs by Iwatani
Near the highway	✓4 HRSs by JXTG ✓1 HRS by Toyota Tsusho
Airport	✓Narita HRS by Idemitsu Kosan ✓Kansai Airport HRS by Iwatani

3. Current Activities Overview

3-1 Support Programs for Commercialization

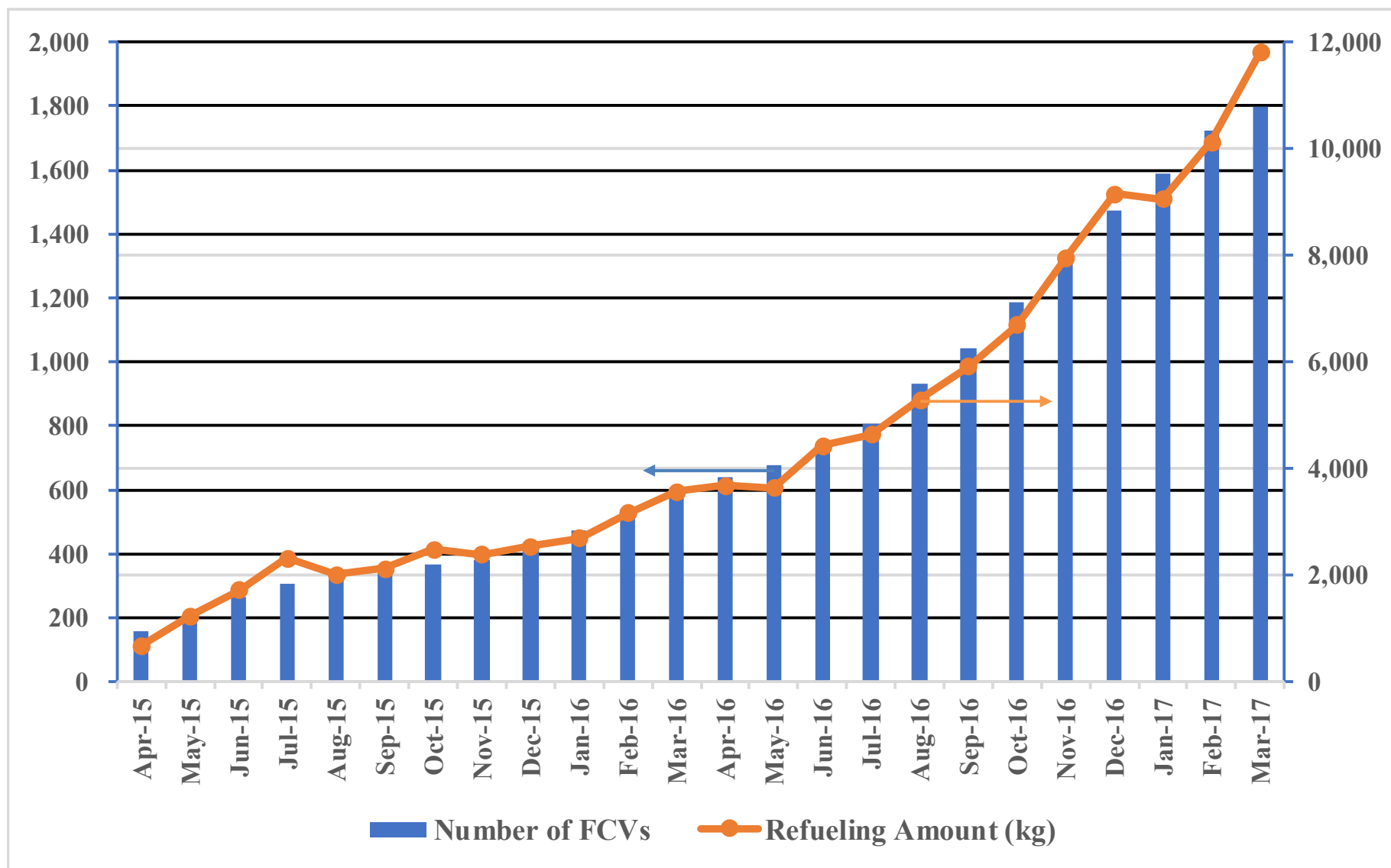


3-2 Support Program for Commercial HRSs

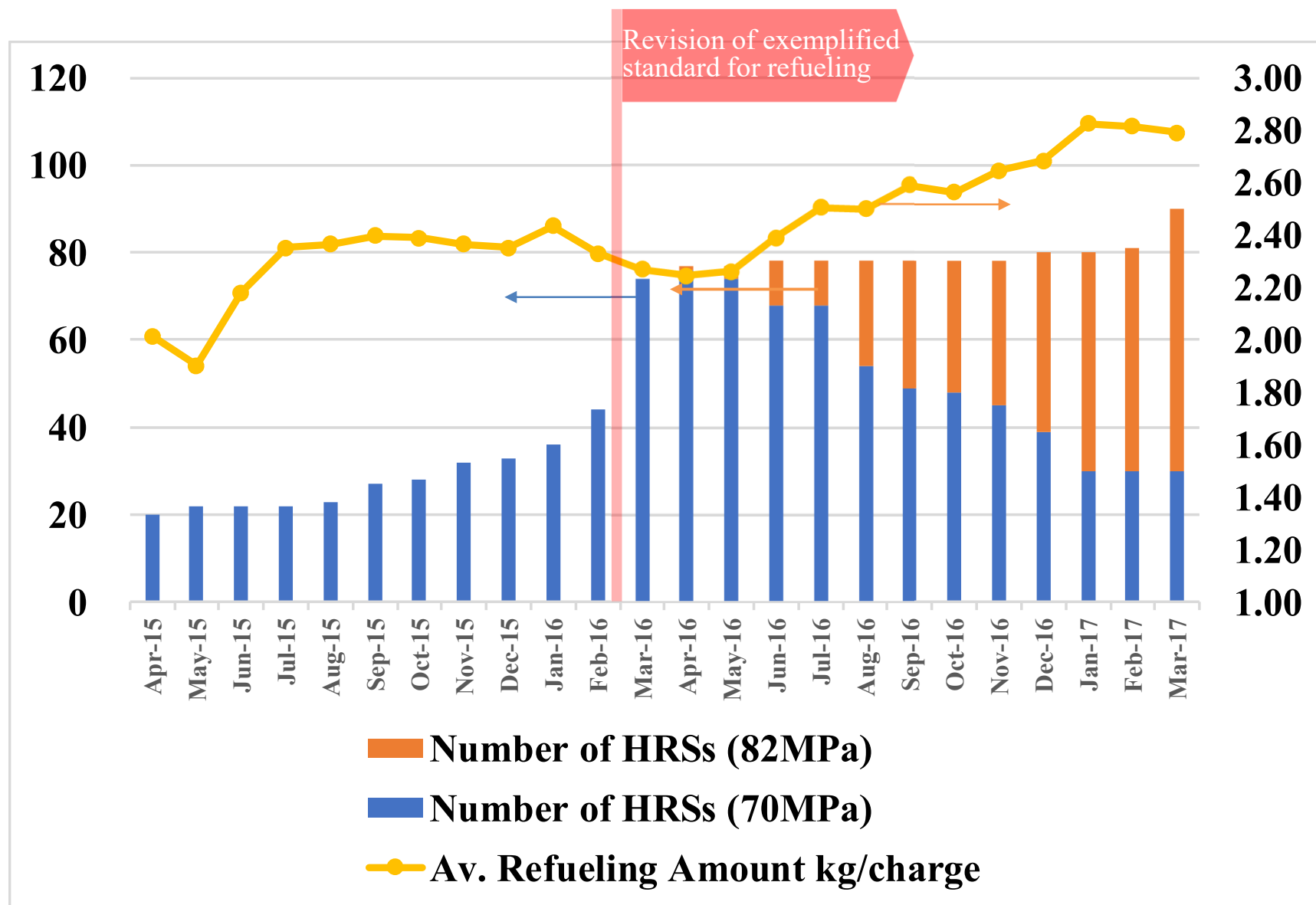
Program	Support	
Installation of Commercial HRSs by NeV (Sponsored by METI)	✓ Bus refueling Support rate: 1/2 Max. amount: 3.9 million US\$ ✓ Others Support rate: 1/2 to 2/3 Max. amount: 1.8 to 2.9 million US\$	Construction
Aiming to stimulate demand for FCVs by NeV (Sponsored by METI)	Max. support amount per HRS : 0.22 million US\$	Operation
Aiming to stimulate demand for FCVs by HySUT (Sponsored by automakers)	Max. support amount per HRS : 0.11 million US\$	

METI: Ministry of Economy, Trade and Industry
 NeV: Next Generation Vehicle Promotion Center

3-3 Number of FCVs and Refueling Data at Commercial HRSs



3-4 Refueling Data at Commercial HRSs

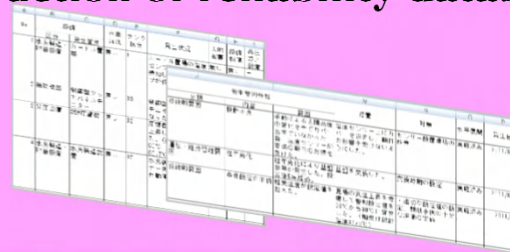


4. Safety and Reliability Technology for HRS

4-1. Basic concept for the infrastructure safety program

- ✓ Collection of Incident/trouble data and construction of a reliability database
- ✓ Preparation of a guidance document for Education and training for HRS operators
- ✓ Development of safety and reliability enhancing technology required in the future
- ✓ Further improvement of social acceptance

Construction of reliability database



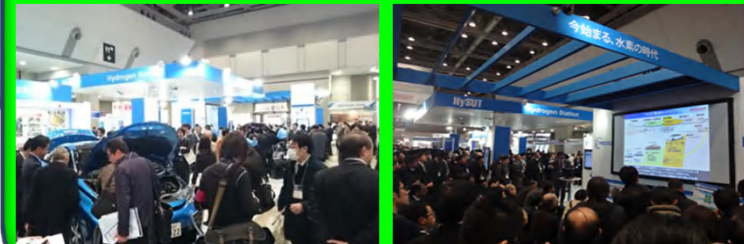
No.	項目	内容	発生年月	発生場所	発生状況	原因	対策	備考
1	設備故障	高圧配管の漏れ	2015.03	東京都港区	運転中、高圧配管からガスが漏れ、運転が中断した。	配管の劣化による亀裂	配管の交換	
2	運転ミス	高圧ガスの誤操作	2015.05	東京都港区	運転中に高圧ガスの弁を誤って開閉した。	運転者の不注意	運転者の教育・訓練	
3	設備故障	高圧配管の漏れ	2015.07	東京都港区	運転中、高圧配管からガスが漏れ、運転が中断した。	配管の劣化による亀裂	配管の交換	
4	運転ミス	高圧ガスの誤操作	2015.09	東京都港区	運転中に高圧ガスの弁を誤って開閉した。	運転者の不注意	運転者の教育・訓練	
5	設備故障	高圧配管の漏れ	2015.11	東京都港区	運転中、高圧配管からガスが漏れ、運転が中断した。	配管の劣化による亀裂	配管の交換	

Hydrogen Refueling Station

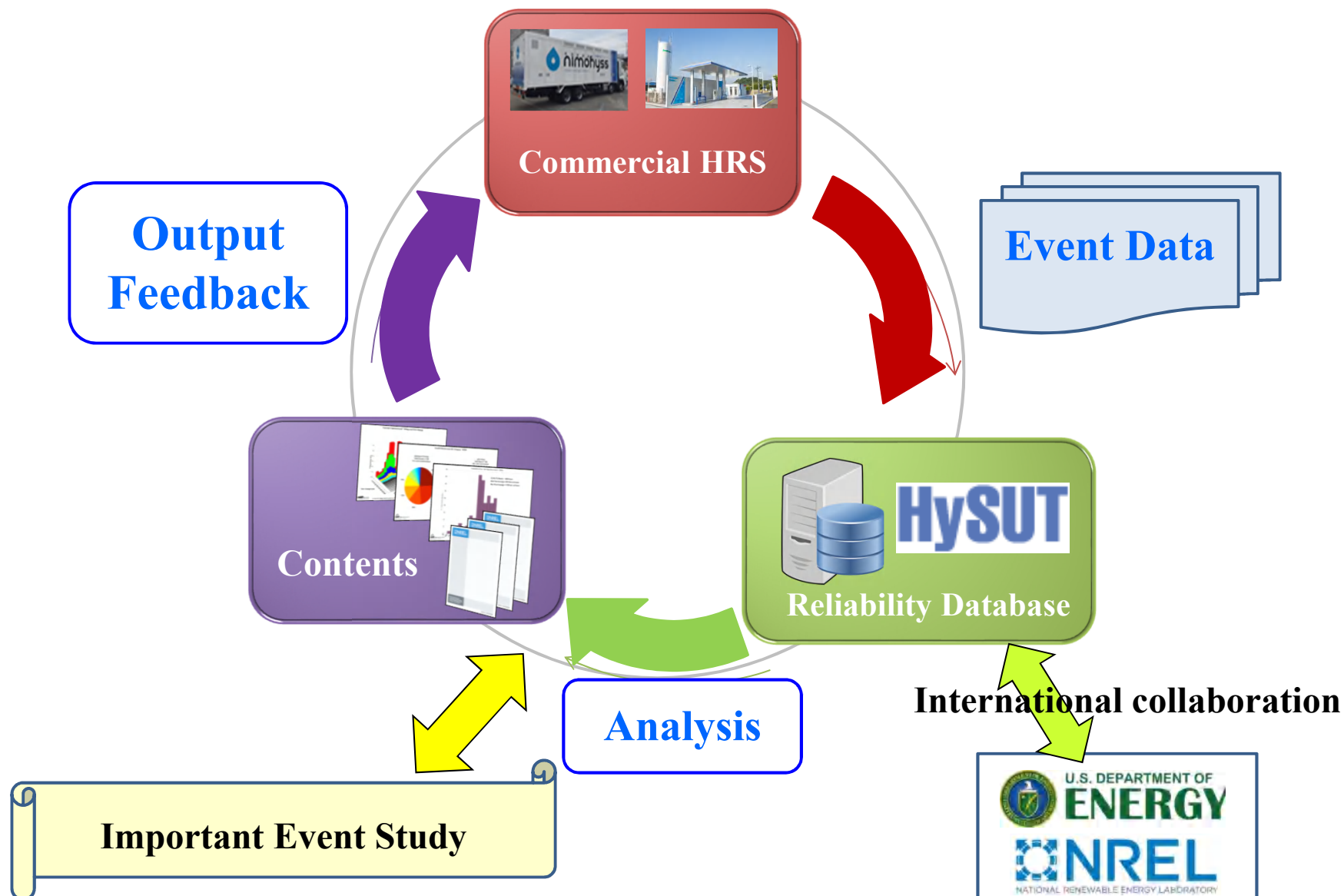
Education & training



Enhancement of social acceptance

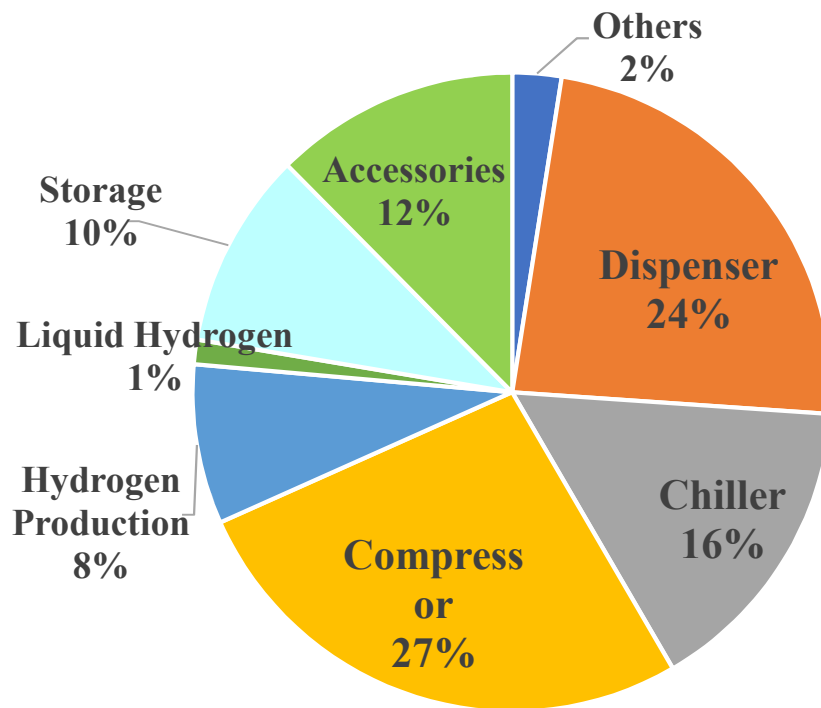


4-2. HRS Reliability Database System

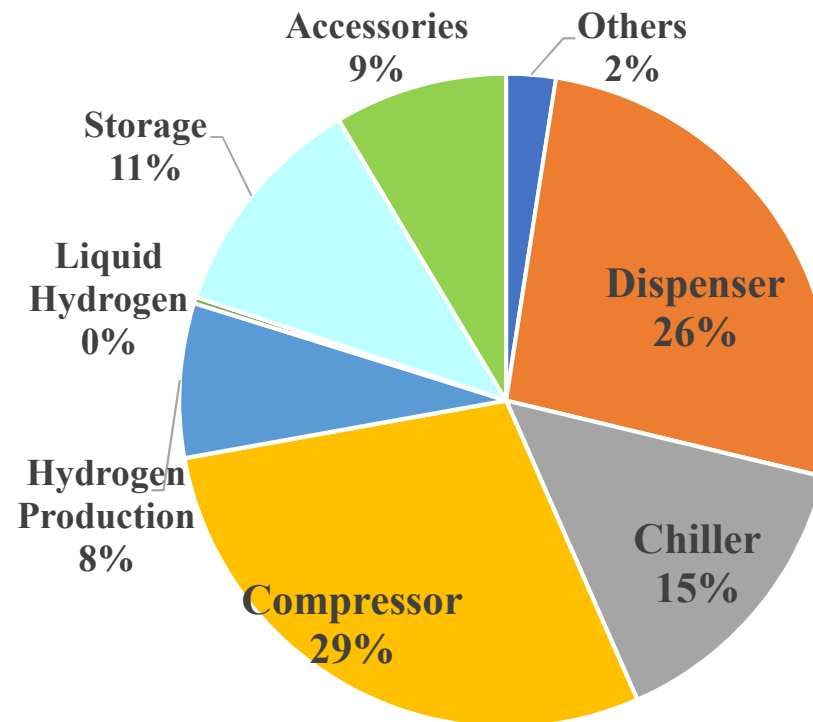


HRS Reliability Database Analysis

Equipment Category of Events



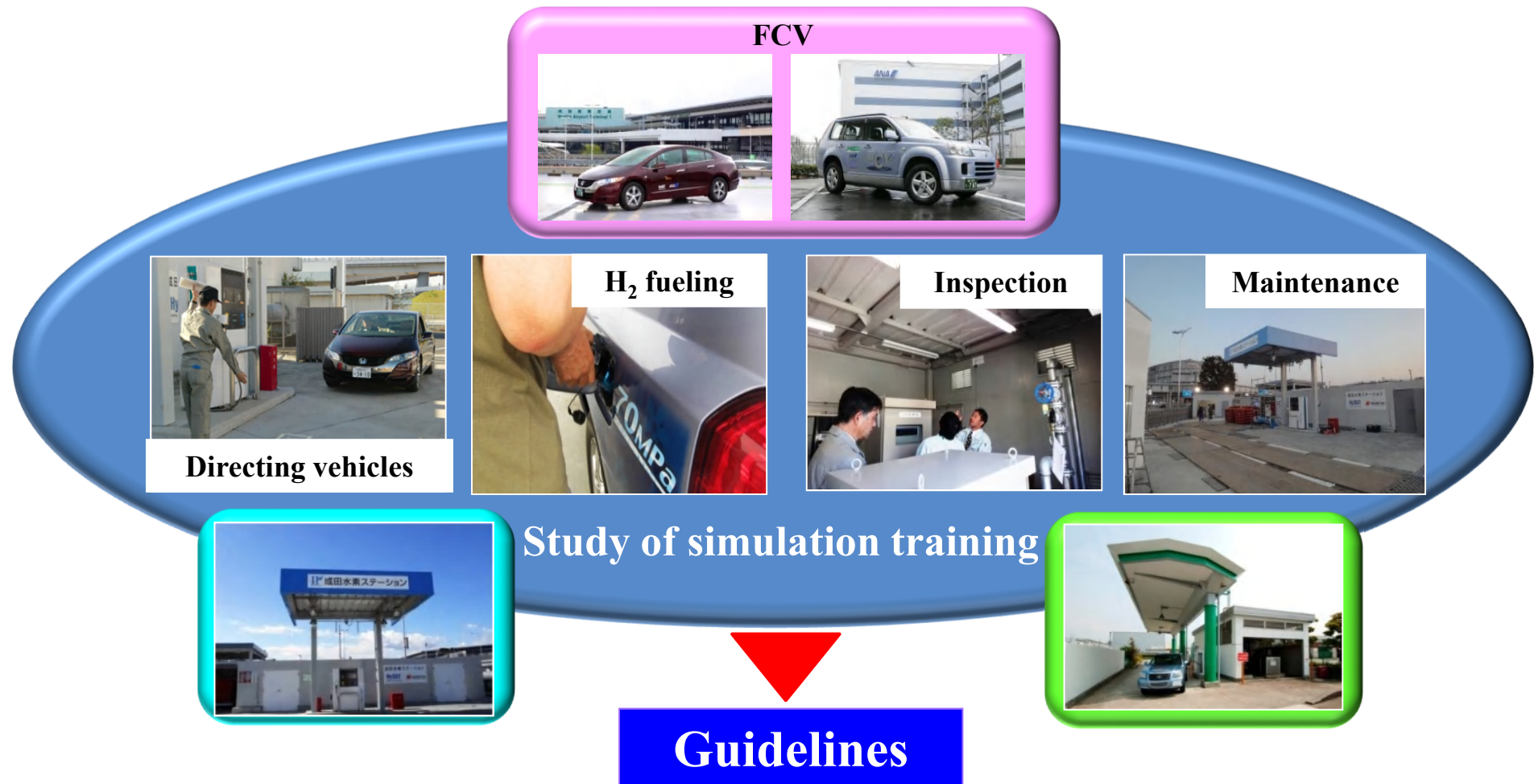
FY 2015



FY 2016

4-3. Education & Training

Education & training for HRS operators



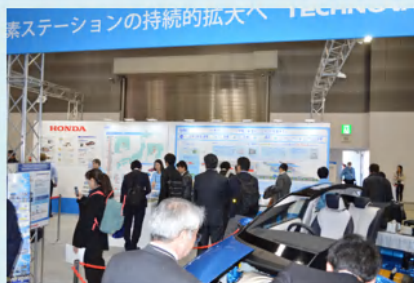
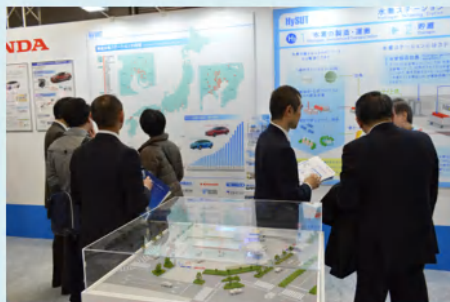


Guidelines for HRS Education and Training Programs

Contents

- 1. Purpose and definitions**
- 2. Physical properties and characteristics of hydrogen**
- 3. Basic knowledge of high-pressure gas - Standards related to compressed H₂ stations**
- 4. Hazard prevention - Explanation of hazard prevention requirements**
- 5. Safety manuals - Equipment and task-oriented manuals**
- 6. Fuel cell vehicles - What every H₂ station operator should know about FCVs**
- 7. Simulation training for HRS - Hydrogen compression, pressure accumulation, guiding and fueling FCVs, routine inspections**
- 8. Emergency training - What to do in combustion, fire fighting, or gas leaks**
- 9. Case study of incidents - From hydrogen stations in and out of Japan**
(Reliability database and others)

4-4 Social Acceptance Activity HySUT Exhibition in FC EXPO 2017



28,000 Visitors

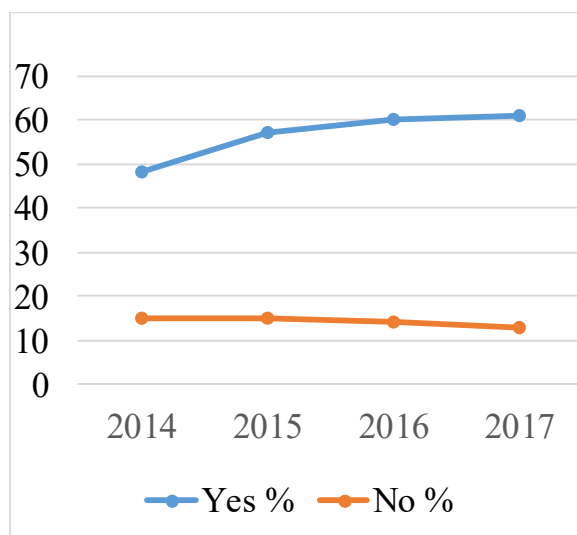


Ride & Drive

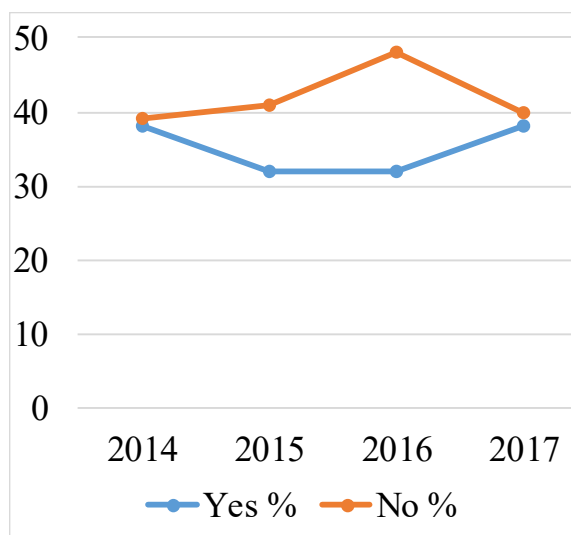
Survey data on FCV and Hydrogen Infrastructure

Date	Survey respondents	Number of respondents
2/27-28/2014	FC Expo visitors	208 (Male: 194 / Female: 14)
2/25-26/2015	FC Expo visitors	327 (Male: 246 / Female: 81)
3/3-4/2016	FC Expo visitors	329 (Male: 246 / Female: 83)
3/2-3/2017	FC Expo visitors	332 (Male: 289 / Female: 43)

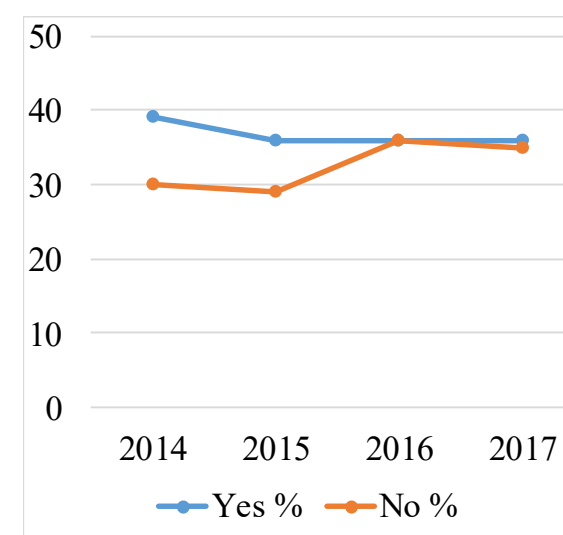
Do you recognize that "FCV" is as safe as a gasoline-powered car?



Do you think "Hydrogen" is dangerous?



Do you think "HRS" is dangerous?



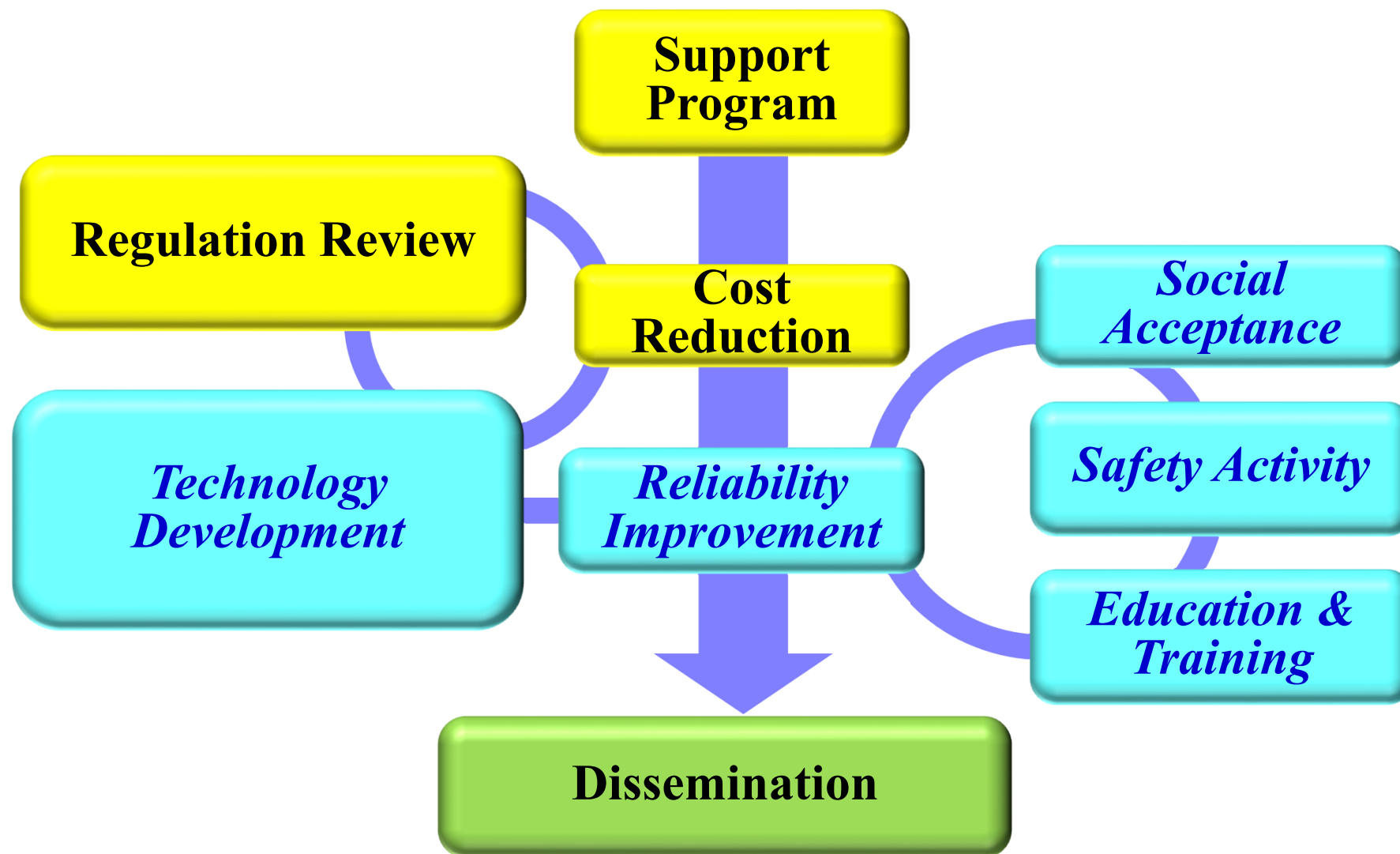
Example of activities for better social acceptance

One-stop portal site of “hydrogen energy”



<http://hydrogen-navi.jp/>

Summary





Thank you very much for your attention!



This program has been supported by New Energy and Industrial
Technology Development Organization (NEDO).