WHEC 2014 - Special Session

Hydrogen safety and international standardization with focus on Asia

Update on Regulation Review for HRS Construction and Operations in Japan

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This presentation material is provided by

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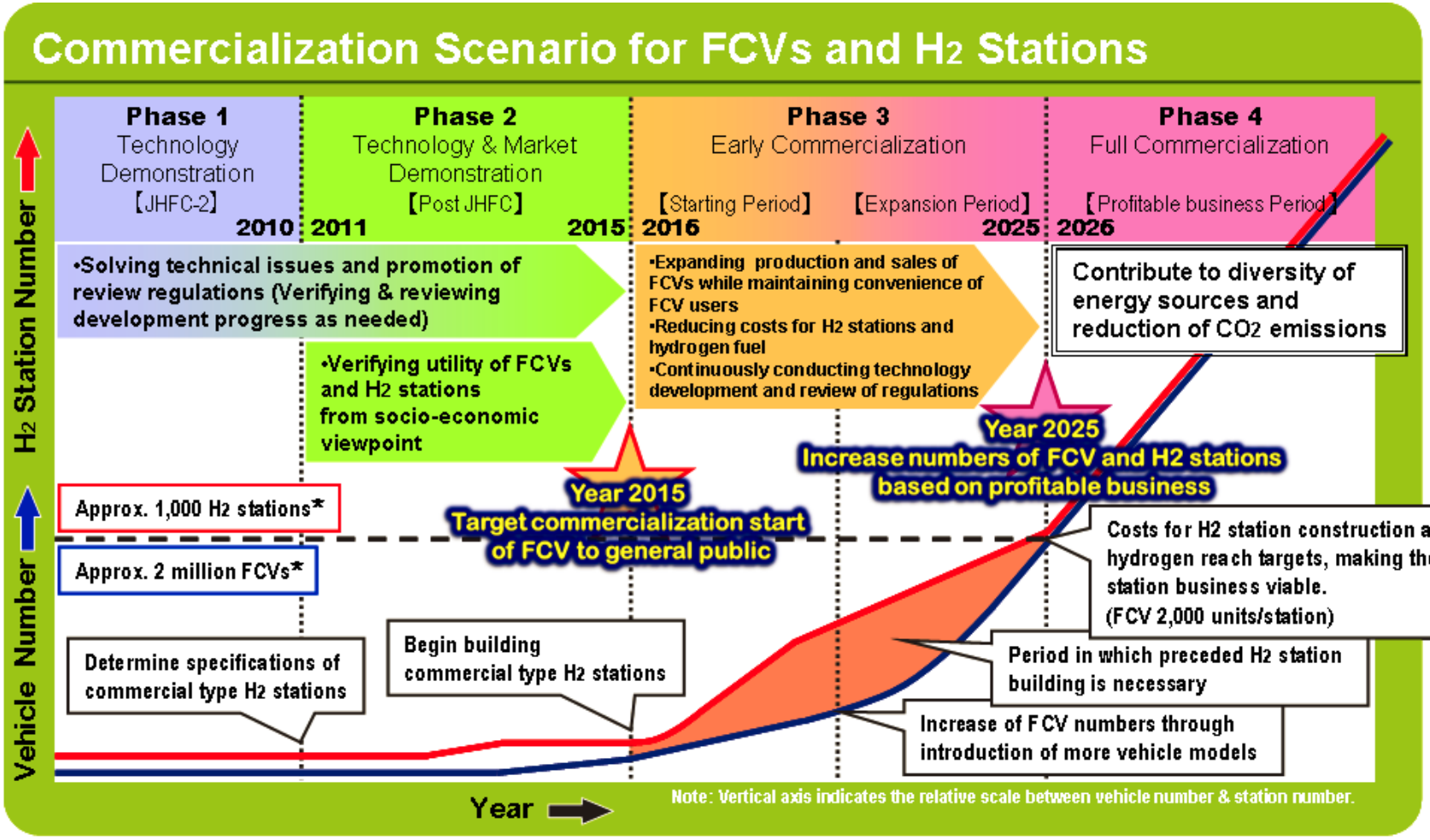
Contents

Commercialization Scenario for FCVs and HRSs in Japan

Fuel Cell Commercialization Conference of Japan (FCCJ)
Foundation: 2001/3/19
Objective: Making an important contribution to the commercialization and popularization of fuel cells in Japan
Members: 103 private companies and entities (at Oct. 28, 2013)



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

Reference : FCCJ March2010 http://fccj.jp/

Regulations regarding to HRS(Hydrogen Refueling Station) in Japan

- **High Pressure Gas Safety Act** (regulatory authorities : METI)
  - Regulates the production, storage, consumption, disposal, sale and transportation of high pressured gas.
  - HRS is under the regulation of HPGSA.
    (layout, materials, manufacturing, inspection, safety distances, etc.)
- **Building Standards Act** (regulatory authorities : MLIT)
  - Location of HRS is restricted depending on “use district”* determined by city planning.
  - The amount of hydrogen inventory at HRS is limited depending on “use district”.

    *use district : e.g. ‘residential district’, ‘commercial district’, ‘exclusive industrial district’
- **Fire Service Act** (regulatory authorities : FDMA)
  - Regulates “Hazardous Materials (Flammable Solids/ Liquids)”, in which H2 is not included.
  - Regulates HRS which is installed in petrol filling station.

METI : Ministry of Economy, Trade and Industry
MLIT : Ministry of Land, Infrastructure, Transport and Tourism
FDMA : Fire and Disaster Management Agency

History of Regulatory Revision related to HRS in Japan

- 2005
  - **HPGSA** : Regulation requirements for 35MPa HRS were established.
  - **FSA** : Installation of HRS in petroleum filling station was authorized.
  - **BSA** : Use district. It was authorized to build HRSs in Quasi-residential districts, Commercial districts, and Quasi-industrial districts.

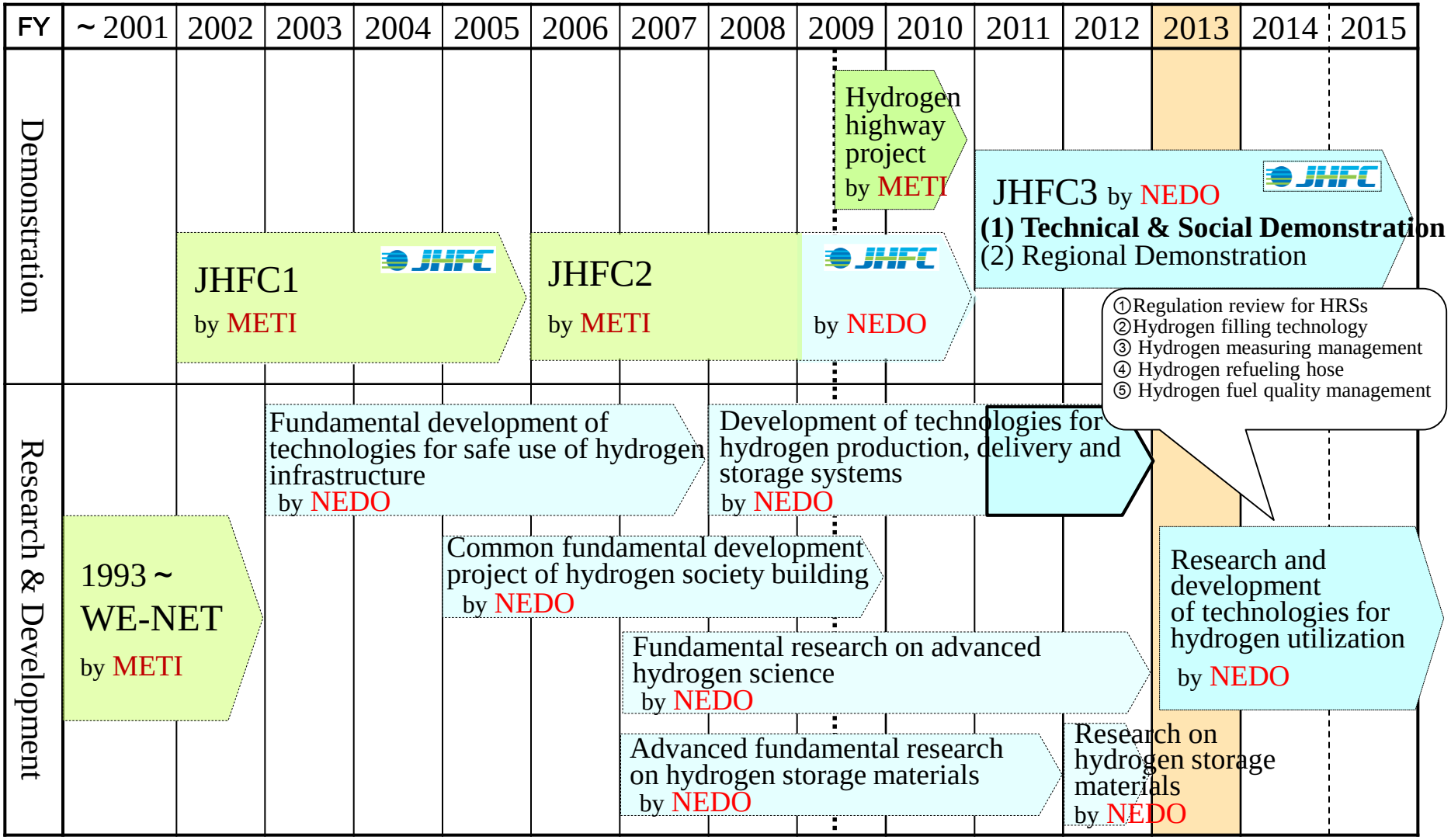
- 2010
  - **HPGSA** : Proposal for new regulations for 70MPa HRS was submitted to NISA (Nuclear and Industry Safety Agency).

- 2011

  HPGSA : Proposal for new regulation for 70MPa HRS to be assessed by NISA and KHK (The High Pressure Gas Safety Institute of Japan).

- 2012
  - **HPGSA** : Regulation requirements for 70MPa HRS were revised.
  - **FSA** : Installation of 70MPa HRS adjacent to petroleum filling station was authorized.

FCV/Hydrogen Infrastructure Project in Japan



METI : supported by Ministry of Economy , Trade and Industry
NEDO: supported by 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

Timetable of regulatory review(FY2010-FY2012)

		- FY2010	2011	2012	2013	2014	2015	
HPGSA	35MPa HRSs Regulation	★ Revised in 2005						
HPGSA	70MPa HRSs Regulation			★ Revised in 2012				
HPGSA	Increasing steel grade options							
HPGSA	Design Factor							
HPGSA	CRPV for HRSs					NEDO Project from FY2010		
HPGSA	CRPV for hydrogen transport trailer							
HPGSA/ FSA	Revision of Safety Distances CNG station-HRS H2 dispenser - public roads H2 dispenser – petrol dispenser							
HPGSA	Safety inspection standards							
HPGSA	Full-Filling HRSs							
BSA	H2 inventory at HRSs							
HPGSA	Safety valve for CRPV					NEDO Project from FY2011		
	Explosion-proof zone around H2 dispenser							
HPGSA	Self-service hydrogen refueling							
HPGSA	Refueling H2 to FCVs on public roads							
HPGSA	Safety distance for refrigerating unit							
HPGSA	Safety measures for composite Hydrogen vessels							

Contents

Outline for study on HRS standards(Leading 4 items)

Conduct a study on materials that may contribute to prepare technical standards concerning the following 4 items, which may affect the costs, from the point of view of promoting the hydrogen infrastructure

(1) Increasing steel grade options

→ Options for steel grade having high strength other than SUS316L for piping material, etc.

(SUS316Ni≧12%・Cold working, SUH660, etc.)

（2）Design factors

→Thin walled pipes by reducing the design factor for piping = 4, etc.

(Application of “Standard for Ultra high pressure gas facility for hydrogen, etc.)

（3）CRPV(Composite Reinforced Pressure Vessels) for HRSs

→Study on new technical standards for CRPV other than steel vessels.

（4）CRPV for hydrogen transport trailer

→Current exemplified standard, and elevation of maximum filling pressure (35MPa→45MPa)

(1) Increasing steel grade options

《 Issues 》

SUS316L (stainless steel) is available for piping material with 35MPa HRS, but the piping and valves are made too thick with the 70MPa HRS due to its low strength.

《 Direction in regulation review 》

To explore more high-strength metal materials and expand permissible types of steel.

	Steel grade	Candidate application
High	①SUS316（Ni 12% or over) Cold working = 0 %	・Piping ・Valve body ・Flowmeter body
	②SUS316L（Ni 12% or over) Cold working	
Priority	③SUH660	・Flow tube for flowmeter ・Filling nozzle ・Emergency release coupler
	④A6061-T6	・Liner for compound vessel
Low	⑤SUS310S	・Flowmeter body ・Valve body

《 Results 》

・ December, 2013: the exemplified standard was revised and use of SUS316 was enabled.

FY2014: Standardization of extended SUH660 and other type of steel is in progress now.

（2）Design Factor

《 Issues 》

In Japan, higher design factors are adopted in comparison with Europe and North America, making piping and valves too thick.

《 Direction in regulation review 》

To establish a technical standard to build the HRS using design factors comparable to those in Europe and North America.

Comparison of design factors between Japan and other countries

Example of national standard (High Pressure Gas Safety Act)	Example of foreign country's standard (ASME)
Piping Exemplified standard ・Tensile force: 4 times ・Yield strength: 1.5 times	Piping ASME B31.3 ・Tensile force: 3 times ・Yield strength: 1.5 times
Pressure vessel Class 1 specified facility ・Tensile force: 4 times ・Yield strength: 1.5 times	Pressure vessel ASME Sec. VIII Div2 ・Tensile force: 2.4 times ・Yield strength: 1.5 times

《 Results 》

- February, 2013：it was confirmed that a design factor 2.4 was applicable for vessels by "KHKS0220," the standard for high pressure gas facility.
- Special permit review and documentation with the standard are in progress.

（3）CRPV(Composite Reinforced Pressure Vessels) for HRSs

《 Issues 》

As the material of the pressure-vessel is currently limited to steel, it becomes heavy and costly at 70MPa HRS.

《 Direction in regulation review 》

Establishment of a technical standard of CRPV, to use light weight vessels to achieve a lower cost than a steel pressure vessel

	Steel vessel Type1			CRPV Type3
Material	SNCM439（Retempered)			CFRP+A6061
Designed pressure	90MPa			105MPa
Inner volume	60L	100L	255L	300L
Vessel weight	835kg	1,370kg	3,800kg	500～2,000kg（Estimates)

《 Results 》

February 2013: Prepared the “Technical guidelines for CRPVs and inspection procedures ".

・ Standardization for special approval is in progress now.

（4）CRPV for hydrogen transport trailer

《 Issues 》

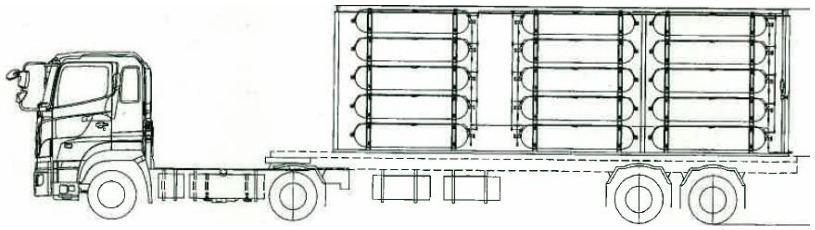
Hydrogen transportation efficiency can not be improved further, as the use upper pressure limit of the vessels on hydrogen transport trailer is regulated up to 35MPa by the current law.

《 Direction in regulation review 》

Summarize technical standard (proposal) of CRPV of the upper limit of 45MPa, based on (JIGA-TS/12/04 *).

* 「 Japan Industrial Gases Association 」 - technical standard

(Ex.) CRPV for transportation
(35MPa, 205L)



(Ex.) Loading of CRPV for transportation

《 Results 》

September 2012: established "technical standard of CRPV for compressed hydrogen transport trailer (JPEC-S 0005 (2013))" the criteria specified in 45MPa the maximum available.

- proceeding of notification is in progress.

Contents

Regulation review items for HRSs(Supplemental 12items)

（1） *Safety distance between CNG station and HRS

（2） Safety inspection standard for 35MPa HRSs

（3） Safety valve for CRPV installed in hydrogen transport trailer

（4）*Gasoline stations with hydrogen refueling facilities

（5） *Safety distance between H2 dispenser and public roads

（6） Self service hydrogen refueling

（7） ∗Explosion-proof zone around H2 dispenser

（8） Refueling hydrogen to FCVs on public roads

（9） ∗Full-filling HRSs

（10） Hydrogen inventory at HRSs

（11）∗Safety distance required for a refrigerating unit of pre-cooling system

（12） Safety measures required for installation of CRPV at HRSs

（1） *Safety Distance between CNG station and HRS

《Regulations》

☆Article 7-1. Paragraph 7 in General provisions in the High Pressure Gas Safety Act

Over 6m of distance from CNG refueling facility (compressor, cylinder) and hydrogen filling facility is required. (Distance between facilities)

《Issues 》

When an HRS is adjacent to a CNG station, an excessive area is needed under the current regulations.

《Direction in regulation review》

・**Shortening the distance between facilities**

・ Revision of General provisions of the High Pressure Gas Safety Act and the exemplified standards

《Effects to be expected 》

Effective use of the site of CNG station is ensured, and sharing of existing facilities such as office buildings is allowed, so that cost reduction is achieved.

《 Results 》

・ February, 2013 : The mitigating measures using the wall were drafted.

CNG – Wall : 1.5m, Hydrogen – Wall : 1.8m ＝＞ Distance : 6m→ 3.3m

(2) Safety inspection standard for 35MPa HRSs

《Regulations》

Annual safety inspection is mandatory for hydrogen stations, and for pressure resistance and strength of cylinders, visual inspection and non-destructive inspection are specified;). At the present time, visual inspection is conducted for the inner surface of cylinders after emptying once per 2-3 years, because of the lack of provisions.

《Issues 》

Visual inspection should be conducted on inner surface of cylinders after emptying once per 2-3 years, the current procedure, which result in hydrogen station closure for consecutive 10 days and impose a substantial burden on hydrogen station management.

《Direction in regulation review》

- Development of an appropriate inspection method, which can be replaced with the visual inspection on the inner surface of cylinders.
- Establishment of safety inspection standard of the High Pressure Gas Safety Act and periodic self-inspection guidelines

《Effects to be expected》

Hydrogen station closure for consecutive 10 days for the inspection is not required, so that user convenience will be improved and maintenance costs will be reduced as well.

Shut down inspection is conducted using an endoscope passing through the mouthpiece

Cylinders at hydrogen station

《 Results 》

- March, 2012 : Ultrasonic testing (UT) for in-service-inspection (pressurized) was adopted.
  Safety inspection standard plan, periodic self-inspection guidelines plan were drafted.

(3) Safety valve for CRPV installed in hydrogen transport trailer

《Regulations》

For CRPV for compressed hydrogen transport trailer, installation of safety valves is mandatory, assuming the overheating of cylinders in the event of fire based on the cylinder safety regulations in the High Pressure Gas Safety Act; however, fusible plug type safety valves are only assigned in the exemplified standard, so that the use of other types of safety valves is not allowed.

《Issues 》

Though thermally actuated safety valves (glass bulb type) that are compact, highly reliable and practical are used overseas, they cannot be used in Japan.

《Direction in regulation review》

- **The use of thermally actuated safety valves (glass bulb type) should be allowed.**
- Revision of the exemplified standard of the cylinder safety regulations in the High Pressure Gas Safety Act

《Effects to be expected》

Thermally actuated safety valves (glass bulb type) that are compact and highly reliable can be used, which leads to further improvement in safety and cost reduction.

《 Results 》

- March, 2012 : Technical standard plan of safety valve including the regulations of the glass bulb type was drafted, but will be reexamined in reference to an overseas standard in 2013-2014.

(4)-1 *Gasoline station with hydrogen refueling facilities(1/2)

《Regulations》

- Hydrogen stations attached to gasoline stations are defined as refueling stations in the Fire Service Act, consequently, an open space of over 6 m depth and over 10 m wide is required to be provided in the refueling facility (gasoline dispenser).
- **Installation of hydrogen dispensers in the open space is prohibited.**

《Issues 》

Side-by-side installation of gasoline and hydrogen dispensers is not allowed in the hydrogen stations attached to gasoline stations, so that effective use of the limited site becomes difficult.

《Direction in regulation review》

- **Side-by-side installation of gasoline and hydrogen dispensers should be allowed in an open space.**
- Revision of the Rules for the Control of Dangerous Goods, Fire Service Act

《Effects to be expected》

Effective use of limited sites will be achieved, so that installation of hydrogen stations will become easier especially in urban areas, and construction costs will be drastically reduced.

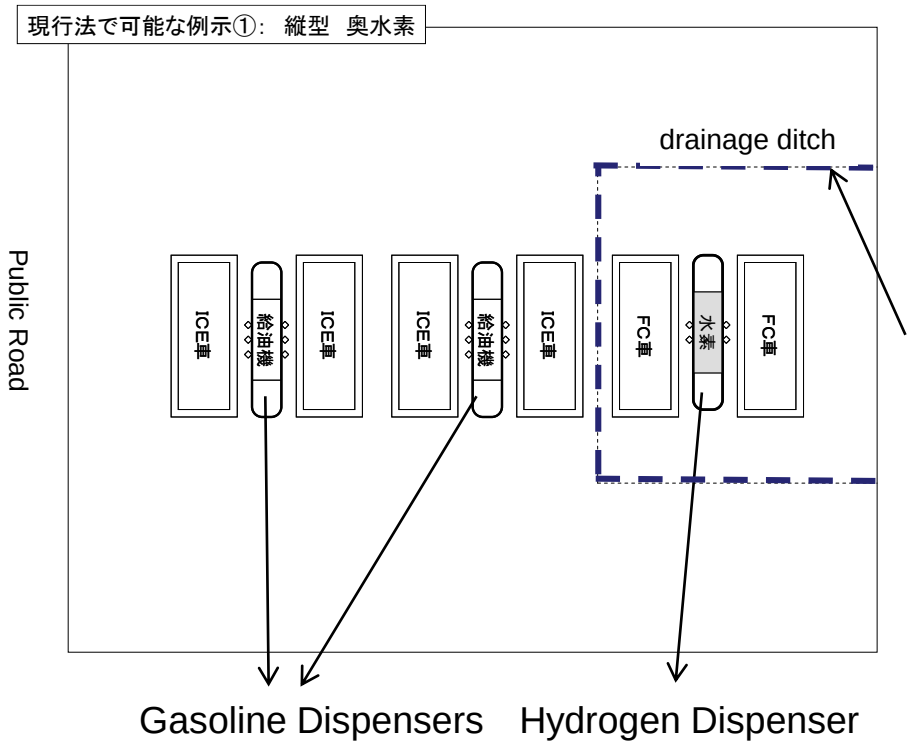
《 Results 》

- March, 2012 : From the Fire Defense Agency, the layout allowing parallel installation under the current rule is released.

Hydrogen station in the U.S.

(4)-1 *Gasoline station with hydrogen refueling facilities(2/2)

FDMA (Fire and Disaster Management Agency) stipulated the examples of hydrogen dispenser installation layout which can be accepted by the current Fire Services Act.



- Construct a drainage ditch between a hydrogen dispenser and a gasoline dispenser to prevent spilled gasoline from reaching FCV.

Approval requirement for installation of hydrogen dispenser adjacent to gasoline dispenser was clarified.

It clears a path for oil companies to utilize their facilities for hydrogen stations.

(4)−2 *Gasoline station with hydrogen refueling facilities

《Regulations》

For operation of reformers (hydrogen generators) using petroleum-based feedstocks, attendance of a dangerous object handler is needed, so that unattended warm-up operation is not allowed.

At the present time, LPG for which unattended warm-up operation is allowed is used for this purpose, adding to facility costs and the area of site.

《Issues 》

- Increase in facility costs and the area of site required
- In cases where LPG is not used, warm-up operation of reformer cannot be performed during nighttime or other cases when nobody is left in the site, and then, hydrogen production (heating up to about 800˚C is required) could not restart quickly the next morning, which impedes the operation of hydrogen stations.

《Direction in regulation review》

- For reformers using petroleum-based feedstocks, unattended warm-up operation should be allowed.
- Revision of ministerial ordinances and notices

《Effects to be expected》

- Operating costs will be reduced and user convenience will be ensured.
- Promotion of off-site type hydrogen stations using petroleum-based feedstocks will be accelerated in areas where city gas is not available such as mountain areas.

《 Results 》

- May, 2012 : From the Fire Defense Agency, safety measures were notified of, and unmanned warm-up operation was enabled.

Reformers at off-site type hydrogen station

（5） * Safety distance between H2 dispenser and public roads

《Regulations》

Although some provisions have been reviewed, including shortened safety distance for hydrogen station, by revision of ministerial ordinance related to the High Pressure Gas Safety Act, the separation distance between hydrogen dispensers and public roads is currently 6m/8m, which is longer than that for gasoline dispensers (4～5m).

《Issues 》

The area of hydrogen station site cannot be reduced, so that cost reduction resulted from reduced land cost, site selection and side-by-side installation of hydrogen station to gasoline station cannot be easily achieved.

《Direction in regulation review》

・Distance requirement between hydrogen dispensers and public roads should be shortened from 6m/8m (current requirements) to 4～5m (equivalent to the distance for gasoline dispensers).

・Revision of general provisions and exemplified standards of the High Pressure Gas Safety Act

《Effects to be expected》

Effective use of limited sites will be facilitated, so that development of hydrogen stations in urban areas will be promoted.

《 Results 》

・ March, 2012 : The distance shortening plan that set up the wall between a public road and dispensers was presented. But, as the wall causes a problem in the road safety, the standardization was interrupted.

・ From 2013 : A policy of distance shortening is being examined again

(6) Self-service hydrogen refueling

《Regulations》

- At domestic self-service gasoline stations, refueling by ordinary drivers is allowed under supervision, which contributes to reducing operating costs of gasoline stations.
- Meanwhile, at hydrogen stations, refueling by ordinary drivers is not allowed even under supervision.

《Issues 》

Operating costs of hydrogen stations are difficult to be reduced to the level of gasoline stations.

《Direction in regulation review》

- Requirements for allowing self-refueling will be organized, and eventually, refueling by ordinary drivers should be allowed even in hydrogen stations under supervision.
- Revision of general provisions and exemplified standards of the High Pressure Gas Safety Act
- Revision of government ordinances and rules regarding the Rules for the Control of Dangerous Goods, Fire Service Act

《Effects to be expected》

A significant reduction in the operating costs of hydrogen stations is expected.

Hydrogen station
(Hydrogen station attendant)

Gasoline station
(Ordinary driver)

《 Results 》

- Feb, 2013 : Report “Technical Guidance for self-hydrogen-fueling station" was drafted covering necessary requirements of the self-fueling realization.

（7） * Explosion-proof area around H2 dispenser(1/2)

《Regulations》

Under the High Pressure Gas Safety Act, electrical equipment is regarded as potential fire hazard, therefore, 6m/8m of fire safety distance from the hydrogen dispenser should be set, and explosion-proof electrical equipment should be installed within the area.

《Issues 》

All of the electrical equipment near the hydrogen dispenser must be explosion-proof, so that gasoline dispensers, touch panels and credit card terminals which are used in existing gasoline stations cannot be installed, leading to increased cost.

《Direction in regulation review》

- Explosion-proof zone for each part of hydrogen dispenser as in the case of existing gasoline dispenser should be clarified, which enables to select proper explosion-proof electrical equipment in the designated zone.
- Consolidation and streamlining of general provisions and exemplified standards in HPGSA.

《Effects to be expected》

installation of the hydrogen dispenser adjacent to gasoline dispensers, and installation of POS system and surveillance cameras will become easier, and cost reduction and improved user convenience will be achieved.

Example of installation of touch panel (Germany)

《 Results 》

- Sep. 2012 : “Explosion-proof standard around the dispenser” JPEC industry standard was established, and Mar. 2013 : The standard was publicized to the prefectures by METI

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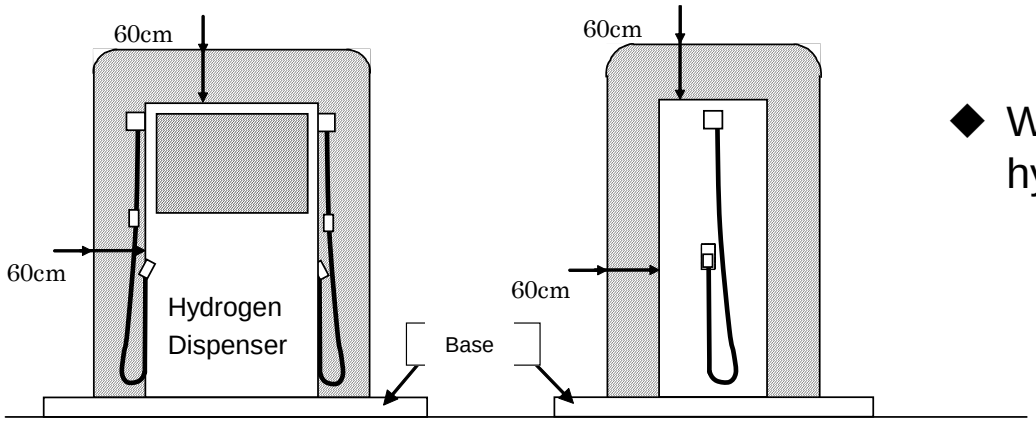
（7） * Explosion-proof area around H2 dispenser(2/2)

JPEC-S 0004 “Standard for Hazardous Area Classification for Electrical Apparatus around Hydrogen Dispenser” was established in 2012 by JPEC.

Applied methodology was based on JIS C 60079-10 (equivalent to IEC 60079-10-1).



- Within 60cm from the surface of hydrogen dispenser casing :
  - Zone 2

Installation of non-explosion-proof equipment such as POS(Point of sale system) set around hydrogen dispenser has become possible by following JPEC-S 0004.

(8) Refueling H2 into FCVs on public roads

《Regulations》

In cases where hydrogen is refueled to FCVs in places other than hydrogen stations, mobile (high pressure gas) production equipment may be preferable; however, hydrogen refueling cannot be performed on public roads because of the following provisions.

- Safety distance between Class 1 security properties (railroad stations, schools, etc.) and hydrogen filling facility is 15 m or over, that between Class 2 security properties (houses, etc.) is 10 m or over.
- Hydrogen refueling can be performed only in Class 1 high pressure gas manufacturing sites or in places where notification is given to the prefectural governor.

《Issues 》

For FCVs, running out of fuel is assumed to occur on the road at the same ratio* as current gasoline vehicles; however, the reality is that hydrogen refueling cannot be performed on public roads, so that long distance towing may be required compared to gasoline vehicles, and increasing inconvenience.

*Running out of fuel accounts for 20% of the emergency road services by Japan Automobile Federation (JAF)

《Direction in regulation review》

- After requirements are clarified, and eventually, refueling hydrogen to FCVs should be allowed on public roads.
- Consolidation and streamlining of general provisions and exemplified standards, in HPGSA.

《Effects to be expected》

Convenience of FCV users will be improved, and traffic congestion and risks due to running out of fuel will be avoidable as well.

《 Results 》

- Feb, 2012 : “Report to be applied to public road fuelling realization“ was summarized.

(9)

* Full-filling HRSs

《Regulations》

In order to make full use of the performance of hydrogen canister of FCVs (about 150L of hydrogen can be stored at 70MPa @ 35˚C), hydrogen should be filled at pressures higher than the maximum filling pressure for the hydrogen canisters (70MPa) taking account of the temperature rise during hydrogen filling; however, under the current regulations the pressure shall be below the maximum filling pressure for the hydrogen canisters (70MPa).

《Issues 》

- Pressure in the hydrogen cylinder decreases with decreasing temperature of hydrogen gas after filling, so that the amount of hydrogen filled shows about 15% less in theory compared to the capacity of hydrogen cylinder, and then, the driving range will be shortened.
- Construction of hydrogen stations having full-scale filling (filling hydrogen at pressures higher than the maximum filling pressure of the hydrogen canister) facilities are not allowed.

《Direction in regulation review》

- Establishment of technical standards and other regulations that may allow constructing hydrogen stations with full-scale filling facilities that can fill hydrogen at pressures higher than 70MPa
- Consolidation and streamlining of general provisions and Cylinder safety regulations, High Pressure Gas Safety Act

《Effects to be expected》

The amount of hydrogen filled will be increased to the same level as that in other countries, so that mileage of FCVs will be increased and user convenience will be improved as well.

《 Results 》

The technical standard plan that the communication fuelling technique of the SAE TIR J2601 standard was drafted. From 2013, Technical standard plan based on SAE J2601 (after taking effect) is being drafted.

（10） Hydrogen inventory at HRSs

《Regulations》

Under the Building Standard Law, the maximum amount of hydrogen stored is set for each land use zone (light-industrial zone, commercial zone and semi-residential zone), which is, however, not sufficient for commercialization.

Semi-residential zone:	350 Nm3	(equal to about 5 FCVs)
Commercial zone:	700 Nm3	(equal to about 10 FCVs)
Light-industrial zone:	3,500 Nm3	(equal to about 50 FVCs)

HRS with GS in Germany

《Issues 》

In urban areas, which are assumed to become major hydrogen station sites at the start of promotion of FCVs, sufficient amount of hydrogen stored cannot be secured, so that establishment of hydrogen supply business becomes impossible, and impeding the development of hydrogen infrastructure.

《Direction in regulation review》

- Building up the track records of the amount of hydrogen stored which may exceed the upper limits by obtaining permissions on a case-by-case basis, and eventually the upper limits should be eliminated.
- Revision of the Building Standard Law Enforcement Order, etc.

《Effects to be expected》

Construction of commercial hydrogen stations will be allowed in urban areas, so that construction of hydrogen stations will be promoted.

《 Results 》

- Mar. 2011 : Technical advice (permission regulation) was released to affect permission individual than Ministry of Land, Infrastructure and Transport city area building section
- Feb. 2013 : "Compiled technical data making for the individual permission acquisition of the Building Standard Act about quantity of hydrogen possession of the hydrogen station" was summarized.
- Some companies are working to get for "the individual permission " .

（11） *Safety distance required for a refrigerating unit of pre-cooling system

《Regulations 》

・Safety distance required for installing a refrigerating facility (hydrogen pre-cooling system) on 70MPa hydrogen refueling station expected to be regulated as class 1(more than 11m)・ class 2(more than 7m) by the revised Ministerial Ordinance under HPGSA

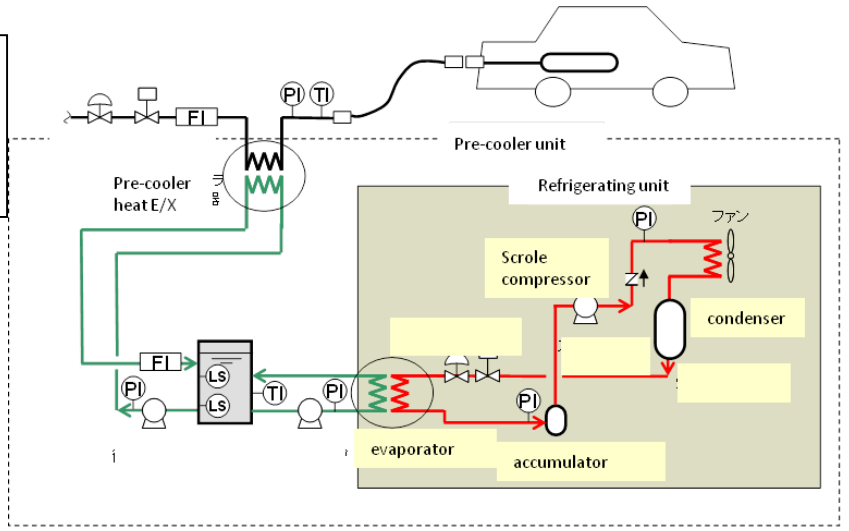
Similar to refrigerating units for air conditioning systems hydrogen pre-cooling system is regarded one of the components of high pressure equipment even though it is operated with inert gas as refrigerant.

《 Issues 》

Difficulty in securing land for hydrogen refueling station.

《 Direction in regulation review 》

- **Shortening or abolition of required** Safety distance.
- Revise General High-Pressure Gas Safety Regulations of HPGSA .(Ministerial Ordinance) of HPGSA and related Exemplified Standards



《 Effects to be expected 》

Contributes to securing of the land for hydrogen refueling station.

Especially facilitates construction in urban area.

《 Results 》

・The technical standard plan in which safety distance is negligible was drafted.
・Above is now under examination by regulation enforcement authorities.

(12) Safety measures required for installation of CRPV at HRSs

《 Regulations 》

Under the existing technical standards **(**Designated Equipment Inspection Regulations of HPGSA) use of CRPV is not authorized at HRS as existing standards aim to use steel /nonferrous metal vessels only.

《 Issues 》

Compared with metal pressure vessel, CRPV offers light weight and low-price. Existing standards impeded efforts to reduce the total cost of HRSs.

《 Direction in regulation review 》

- Authorize to install CRPV in HRSs
- Revise General High-Pressure Gas Safety Regulations of HPGSA (Ministerial Ordinance) and Exemplified Standards.

《 Effects to be expected 》

Installation of CRPV in HRSs can bring total cost reduction of the station .

《 Results 》

- Arranged safety measures for CRPV installation.

  →Placing the screen to prevent vessel deterioration from ultra- violet, damage from scattering things, and radiation heat.

- Above is now under examination by regulatory enforcement authorities.

《Metal vessels 》

Contents

Items of regulation review

(FY2013-FY2017 : Research & Development of technologies for hydrogen utilization by NEDO)

1. Safety inspection standard for 70MPa HRSs

* **2.The pressure relief devices(PRD) for composite vessel installed in hydrogen trailer**

* **3.Safety distance between hydrogen dispenser and public road**

* **4.Refueling H2 to FCVs on public roads**

5.Same as the above (Refueling H2 to FCVs at dealer)

⇒A work method and legal issues are extracted through the social demonstration using the small equipment for hydrogen refueling

6.Mitigation of the maximum temperature for the container on hydrogen transport trailers

7.Technical standard for Liquefied HRSs

⇒The technical standard plan which enables installation with a gas station in a city area is drafted.

8.Technical standard for small hydrogen supply equipment

⇒The technical standard plan is drafted , after safety is studied based on the specification of small-scale hydrogen supply equipment (the capacity: less than 30m3).

9.Emergency guideline at HRSs

* **10.Prevention of hydrogen filling exceeding SOC100%**

* **11.Increasing options for Metal materials at HRSs**

* 12.**Review the technical standards for CRPV**(Composite Reinforced Pressure Vessels) **at HRSs**

Notes : The mark(∗) is a continuous theme from 2010 and 2011.
A bold letter is a JPEC activity.

Finally

This project was made possible by government assistance, and we hereby express our great appreciation to NEDO (New Energy and Industrial Technology Development Organization) .

Thank you and feel free to contact:

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