CDTI-NEDO online Joint Workshop on Hydrogen Technology
- Green Hydrogen Production & Mobility -

Technologies, Standards and Regulations for Hydrogen Refueling Station in Japan

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HySUT

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Contents

1. Introduction About HySUT

HySUT
The Research Association of Hydrogen Supply/Utilization Technology

Established July 31, 2009
End of activity March 31, 2016

HySUT
The Association of Hydrogen Supply and Utilization Technology

Established Feb 2, 2016
Start of activity April 1, 2016

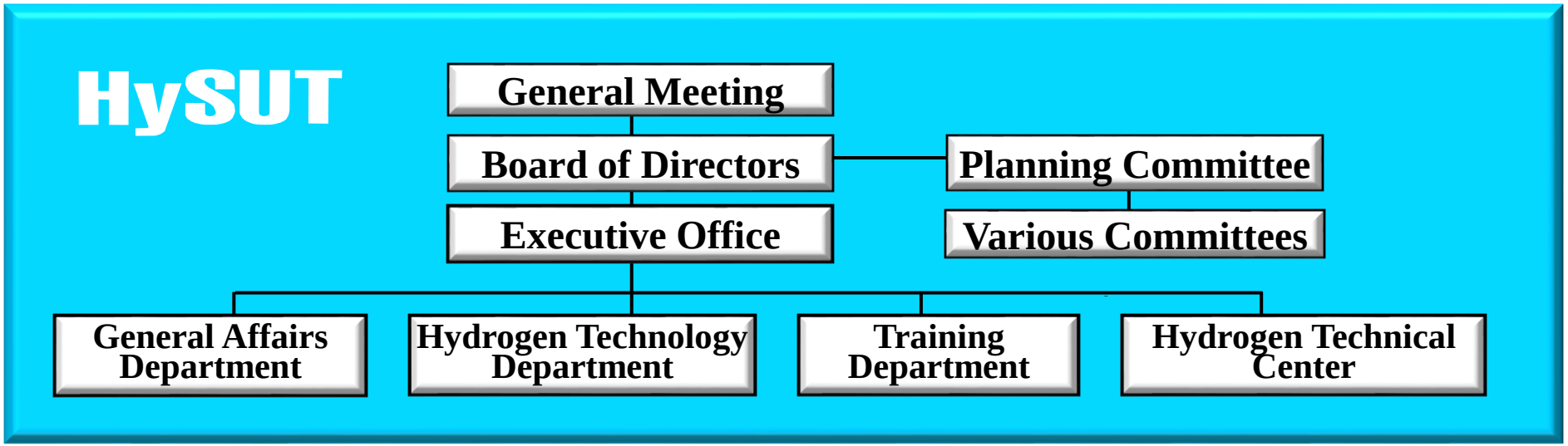
Chairman: Tomohide Miyata
Director, Senior Vice President, ENEOS Corporation
Location: 5-10 Akasaka Minato-ku, Tokyo 107-0052
Members: 46 companies and 2 organizations (as of November 2021)

Missions: We aim to ensure the stable supply and safe distribution of hydrogen, improve user satisfaction, and contribute to the development of the hydrogen energy industry by taking a comprehensive approach and engaging in such activities as technological development, surveys and research, education and outreach on the supply and the utilization of hydrogen energy.

Industry organization specializing in hydrogen fueling infrastructure for mobility such as fuel cell vehicles

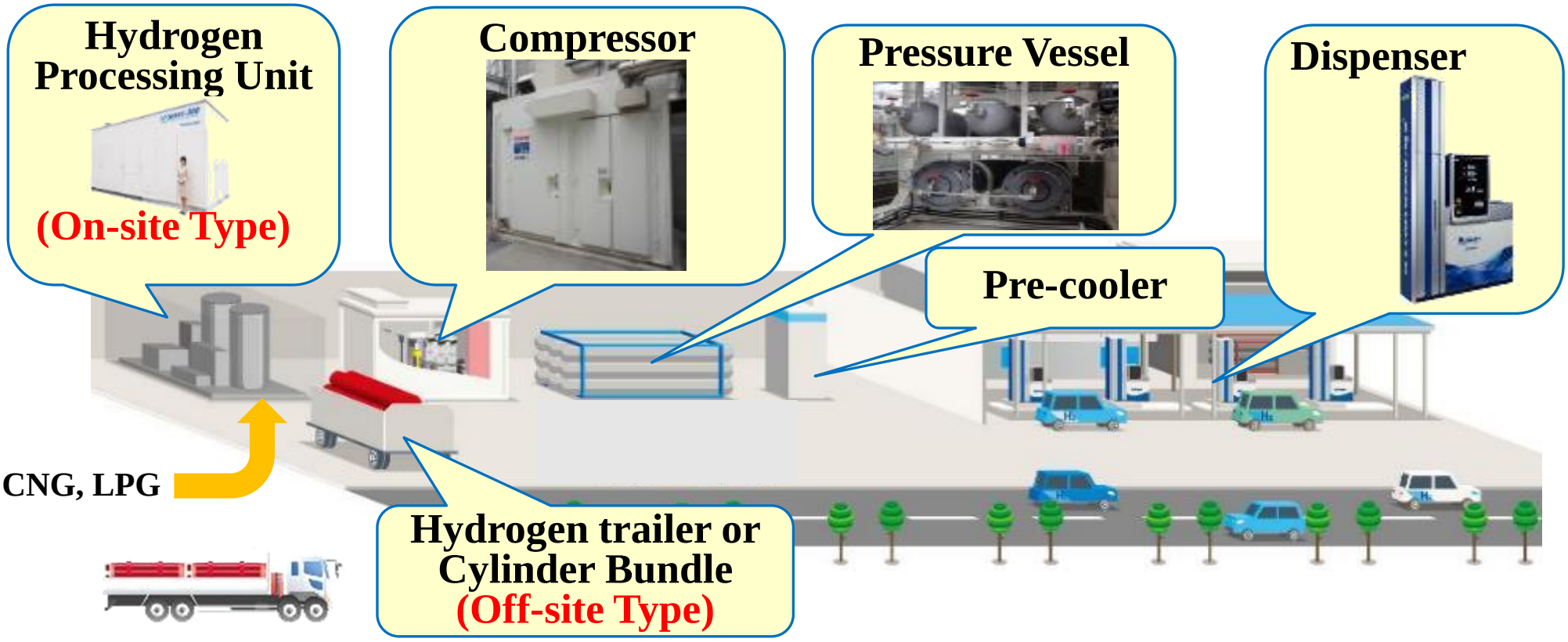
Activity Fields and Organization Chart of HySUT

1. Technology Research and Development / R&D for HRS (Hydrogen Refueling Stations) (NEDO's Program)
2. International Standard Harmonization / Activities as a country member body of ISO/TC197 (NEDO's Program)
3. Support and Reliability Improvement of HRS / Support Programs for Retail HRS, Safety and Security Activities, Education and training on HRS operation
4. Industrial Activities / Guidelines for HRS Technology, Regulations Review, Office of TF
5. Public Relations / Outreach activities including exhibitions and trade shows



2. Overview of HRS, Regulations and Standards
Typical Structure of Retail HRS

- Hydrogen is carried from outside or produced in the site
- Compressed to 82MPa and stored
- Pre-cooled and refueled to FCV (70MPa/15℃)



Regulations, Standards and Guidelines for HRS

Laws and Regulations

- High Pressure Gas Safety Act
  - Regulation on Safety of General High Pressure Gas
  - Regulation on Safety of Containers
  - Regulation on Designated Equipment Inspection
  - Regulation on Safety of Industrial Complexes
- Fire Service Act
- Building Standards Act
- Industrial Safety and Health Act
- Act on the Prevention of Disaster in Petroleum Industrial Complexes and Other Petroleum Facilities
- Road Transport Vehicle Act
- Road Traffic Act
- Act on Port Regulations

Technical Standards

- Exemplified Standard
- Japan Industrial Standard (JIS)
- International Standard (ISO/TC197)
- The High Pressure Gas Safety Institute of Japan (KHK-S)
- Japan Petroleum Energy Center (JPEC-S)
- Japan Industrial and Medical Gases Association (JIMGA-S)

Self-Guidelines

- HySUT
  - Quality Control (HySUT-G 0001)
  - Hydrogen Metering (HySUT-G 0002)
  - Fueling Performance Validation (HySUT-G 0003)
  - Inspection Apparatus (HySUT-G 0004)
  - HPIT* (HySUT-G 0005)

* Hydrogen Powered Industrial Truck

Safety of HRS

Reliability of Retail HRS

3. Market Data of FCVs and HRS
Number of registered FCVs in Japan

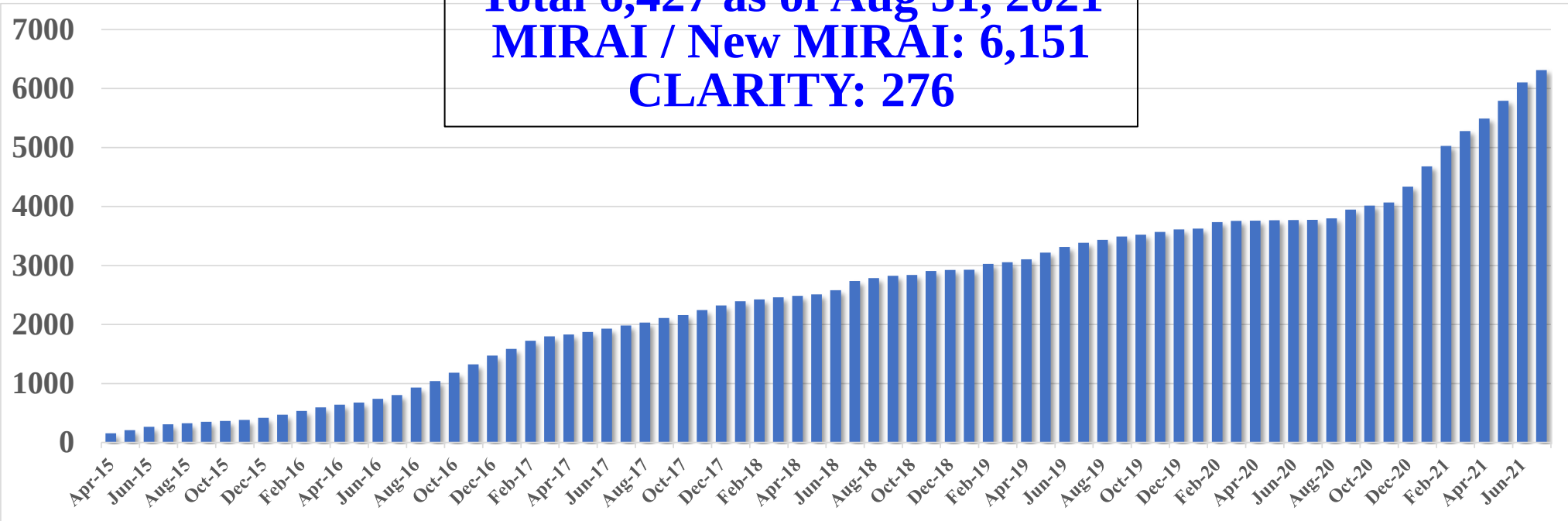
TOYOTA MIRAI
(Dec 2014)

New TOYOTA MIRAI
(Dec 2020)

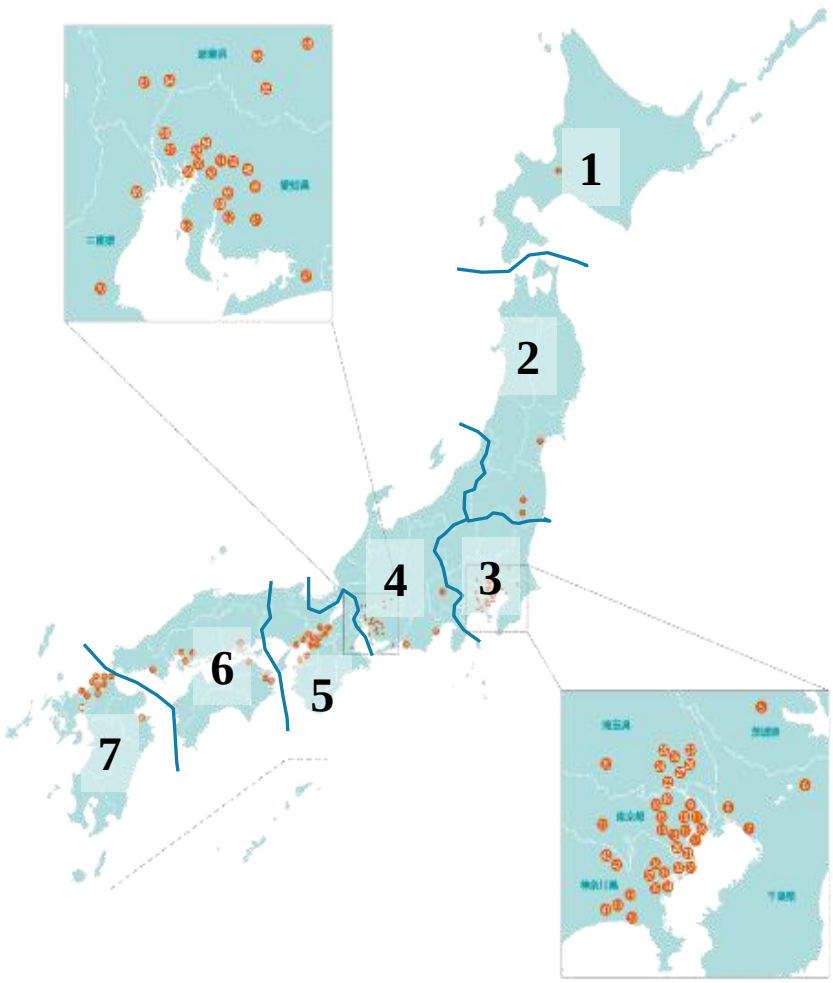
HONDA CLARITY FUEL CELL
(Mar 2016)

Number of FCVs

Total 6,427 as of Aug 31, 2021
MIRAI / New MIRAI: 6,151
CLARITY: 276



Number of Retail HRS and FCVs (as of Aug 31, 2021)



Area	Number of Retail HRS	Number of FCVs
1. Hokkaido	2	28
2. Tohoku	5	209
3. Kanto	58	3,119
4. Chubu	48	1,955
5. Kansai	18	626
6. Chugoku/ Shikoku	9	179
7. Kyushu	14	311
Total	154	6,427

4. Regulations Review

<Current Situation>
Based on the regulatory reform implementation plan, 27 out of 37 items have been implemented in the 2017 plan for reviewing regulations related to hydrogen stations and fuel cell vehicles toward the realization of a hydrogen society. In addition, four new items have been added to the Reiwa 2-year (2020) plan.

<Recent efforts>
- ✓ Unmanned operation of hydrogen stations by remote monitoring
- ✓ Allowing concurrent posts as a security supervisor

Source: High Pressure Gas Subcommittee, November, 2020

Results of major regulatory reviews to date

High Pressure Gas Safety Act [Ministry of Economy, Trade and Industry]

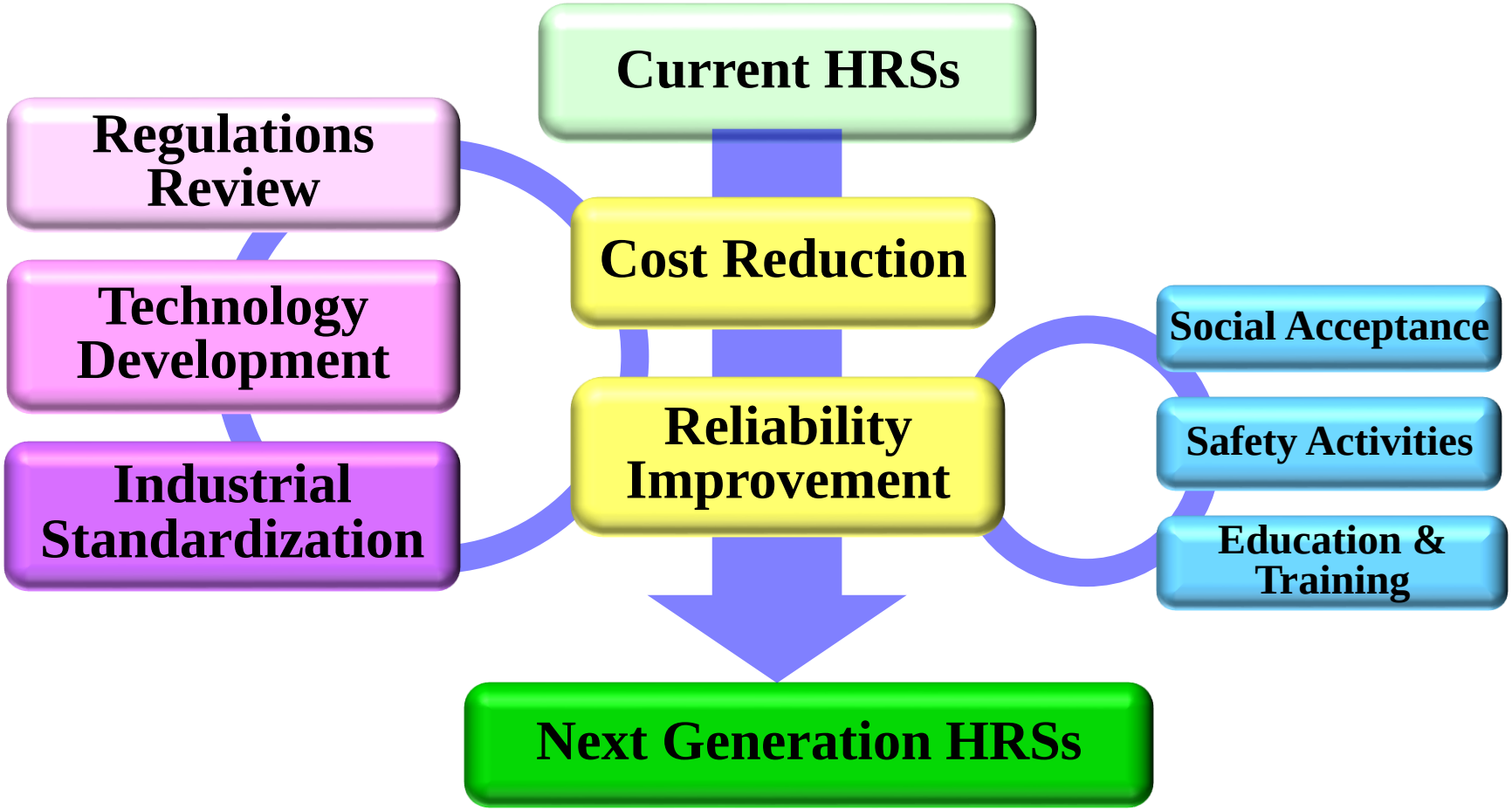
- ✓ Development of technical standards for 82MPa hydrogen station
- ✓ Expansion of steel grades that can be used for piping, etc.
- ✓ Development of technical standards related to design coefficients
- ✓ Development of technical standards for mobile hydrogen stations and small-scale hydrogen stations
- ✓ Performance standards of the separation distance between public roads and dispensers, etc.

Fire Service Act [Ministry of Internal Affairs and Communications]	Building Standards Act [Ministry of Land, Infrastructure, Transport and Tourism]
Regulatory review that allows gas stations and hydrogen stations to be installed side by side	Elimination of the upper limit on hydrogen storage amount in urban areas

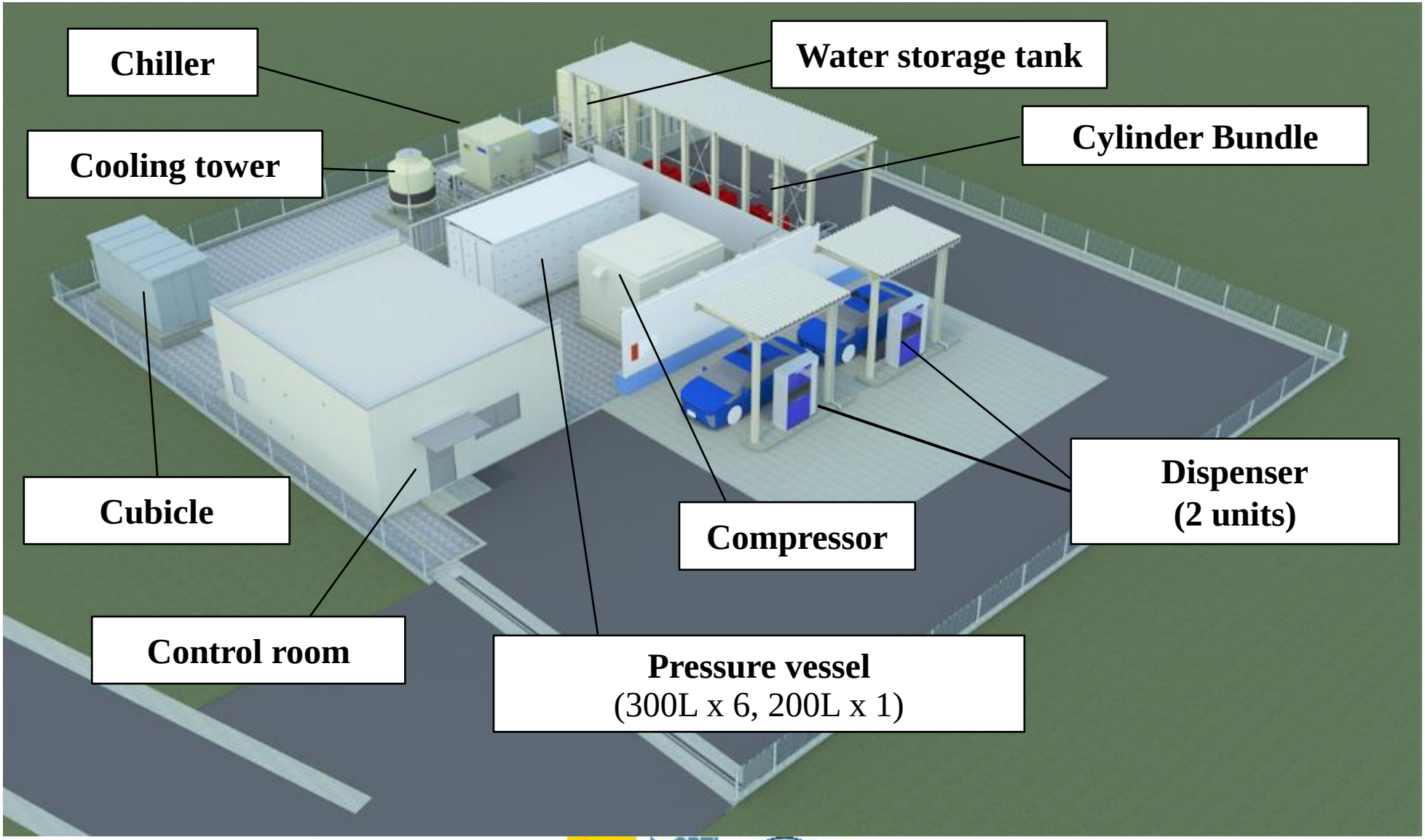
Source: Regulatory Reform Promotion Conference, WG for Investment etc. May, 2020

5. Challenges for Dissemination of HRS

➢ **Challenge for Dissemination** ⇨ **Cost Reduction & Reliability Improvement**

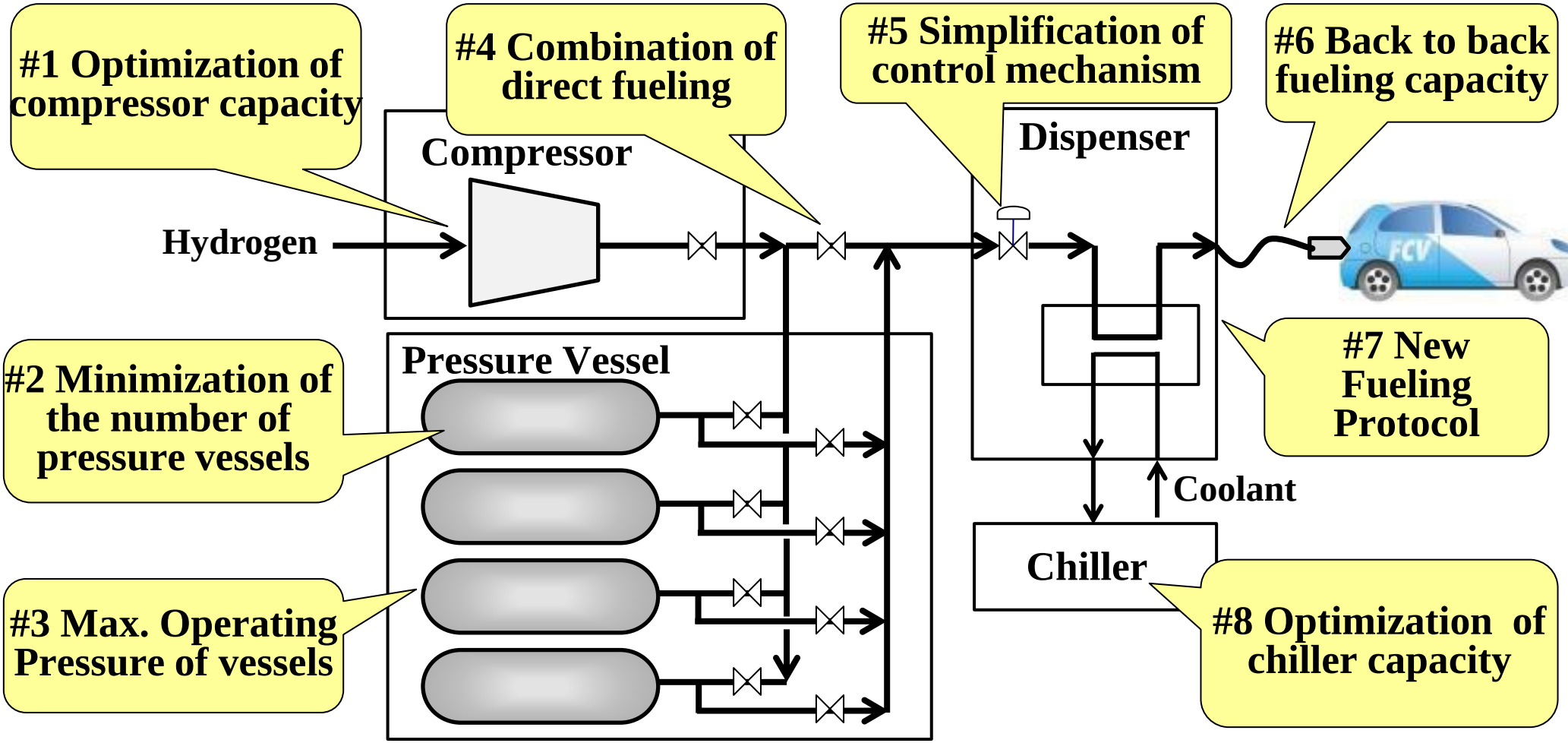


Hydrogen Technical Center (HTC) (Start operation Dec 2017)



Study on Technologies for Cost Reduction of HRS system at HTC

- **Review of station equipment specification based on actual use condition at the spreading stage**



Development on Long Life, High Pressure Hydrogen Seals, Fittings and Equipment for Safety

- Clarification of faults on the seals and the mechanical fittings
- Development of reliable and long-life devices for cost reduction of HRS operation


Hydrogen Generator


Compressor


Storage


Dispenser


FCV

Mechanical Joints

Gaskets, O-rings

Packings, Dynamic Seals

Leak by reduction of surface pressure

Leak by wear of seal devices

Leak by fracture of seal devices

New Strategic Roadmap for Hydrogen and Fuel Cells by METI (March 2019)

The Strategic Road Map for Hydrogen and Fuel Cells ～Industry-academia-government action plan to realize "Hydrogen Society"～ (overall)

- In order to achieve goals set in the Basic Hydrogen Strategy,

① **Set of new targets to achieve (Specs for basic technologies and cost breakdown goals), establish approach to achieving target**

② **Establish expert committee to evaluate and conduct follow-up for each field.**

		Goals in the Basic Hydrogen Strategy		Set of targets to achieve	Approach to achieving target
Use	Mobility	FCV 200k by 2025 800k by 2030	2025	• **Price difference between FCV and HV** (¥3m → ¥0.7m) • **Cost of main FCV system** (FC ¥20k/kW → ¥5k/kW; Hydrogen Storage ¥0.7m → ¥0.3m)	• Regulatory reform and developing technology
		HRS 320 by 2025 900 by 2030	2025	• **Construction and operating costs** (Construction cost ¥350m → ¥200m; Operating cost ¥34m → ¥15m) • **Costs of components for HRS** (Compressor ¥90m → ¥50m; Accumulator ¥50m → ¥10m)	• Consideration for creating nation wide network of HRS • Extending hours of operation
		Bus 1,200 by 2030	Early 2020s	• Vehicle cost of FC bus (¥105m → ¥52.5m)	• Increasing HRS for FC bus
		※In addition, promote development of guidelines and technology development for expansion of hydrogen use in the field of FC trucks, ships and trains.			
	Power	Commercialize by 2030	2020	• Efficiency of hydrogen power generation (26%→27%) ※1MW scale	• Developing of high efficiency combustor etc.
	FC	Early realization of grid parity	2025	• Realization of grid parity in commercial and industrial use	• Developing FC cell/stack technology

(Source: METI's website.)

Thank you very much for your attention!
Muchas gracias por su atención!

This report contains the results of the programs supported by the New Energy and Industrial Technology Development Organization (NEDO).