



Understanding Gas Regulations for Hydrogen Production Using Non-Electric Applications Powered by Nuclear Energy

April 26, 2024



KGS and Presenter



Purpose of Establishment

Legal Basis : Article 28, High-Pressure Gas Safety Control Act

- » To prevent harm caused by gas, and to protect the lives and property of the citizens by advancing gas safety technology and promoting gas safety management projects systematically

Main Business

Inspection, Checkup,
Evaluation, etc.
entrusted by the
government

Safety Education
& Training, PR,
Research &
Investigation

Development and
Distribution of
Technology &
Device

Information Provision,
Certification,
International
Cooperation

History

- » 1974 01.11 Established as **High-Pressure Gas Safety Institute**(under MOTIE)
- » 1979 02.01 Reorganized into **Korea Gas Safety Corporation(KGS)**
- » 1995 08.07 Established the **Institute of Gas Safety R&D, KGS**
- » 2002 03.09 Established the **Institute of Gas Safety Technology Training, KGS**
- » 2020 07.01 Designated as a **Hydrogen Safety Agency** by MOTIE
(according to Article 35 of the Hydrogen Act)

※ According to Article 5, Paragraph 3, Item 2 of the Operation of Public Institutions Act, KGS falls under the category of Quasi-governmental Organization with Delegated Authority.

Mr.Young-jo Ryu

➤ Career Highlights

- **Jan. 2022 to Present:** Head of the Safety Standards Division, Secretary General of the Gas Technical Standards Committee
- **Jan. 2021:** Head of the Daejeon - Sejong Headquarters
- **Jan 2020:** Head of the Energy Safety Empirical Research Center
- **July 2017:** Head of Gyeonggi Eastern Branch Office
- **July 2016:** Head of Southern Seoul Branch Office
- **Feb.1994:** Joined KGS

➤ Education

- **PhD Completion in Safety Engineering**, Seoul National Univ. of Science and Technology

➤ Qualifications

- June 2007: **Professional Gas Engineer**
- Oct. 2014: CFEI
- May 2005: ISO 9001 Auditor

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I . Gas-related 4 Acts (1/2)

□ Purpose and Key Provisions

	HP Gas Act(HPGA)	Hydrogen Act(H2 Act)	Urban Gas Act(UGA)	LP Gas Act(LPGA)
Purpose	<ul style="list-style-type: none"> Preventing hazards caused by high-pressure gas Ensuring public safety 	<ul style="list-style-type: none"> Promotion of the transition to a hydrogen economy Ensuring public safety 	<ul style="list-style-type: none"> Development of urban gas business Ensuring public safety 	<ul style="list-style-type: none"> LPG safety management Safe supply and use of LPG
Key Provisions	<ul style="list-style-type: none"> Permit and Inspection of High-pressure Gas Production(Filling), Storage, Sale facilities Report and Inspection of Specified High-pressure Gas-Using facilities Manufacturing Registration and Inspection of the Container and Specific Equipment¹⁾ Safety Management Manual Writing and Assessment, Safety Training, Insurance Enrollment 	<ul style="list-style-type: none"> Installation for hydrogen fuel supply facilities Hydrogen products²⁾ Manufacturing permit and Inspection Inspection of hydrogen fuel use facilities (same as the left) 	<ul style="list-style-type: none"> Urban gas business permit Approval/Report and Construction Supervision for Construction Plan of Gas Supply Facilities Inspection of Specific Gas-using Facilities Urban gas Quality Inspection (same as the left) 	<ul style="list-style-type: none"> Permit and Inspection of LPG Filling, Storage, Collective Supply, Sale facilities Inspection for LPG specific use facilities Gas Appliances³⁾ Manufacturing Permit and Inspection LPG Quality Control (same as the left)

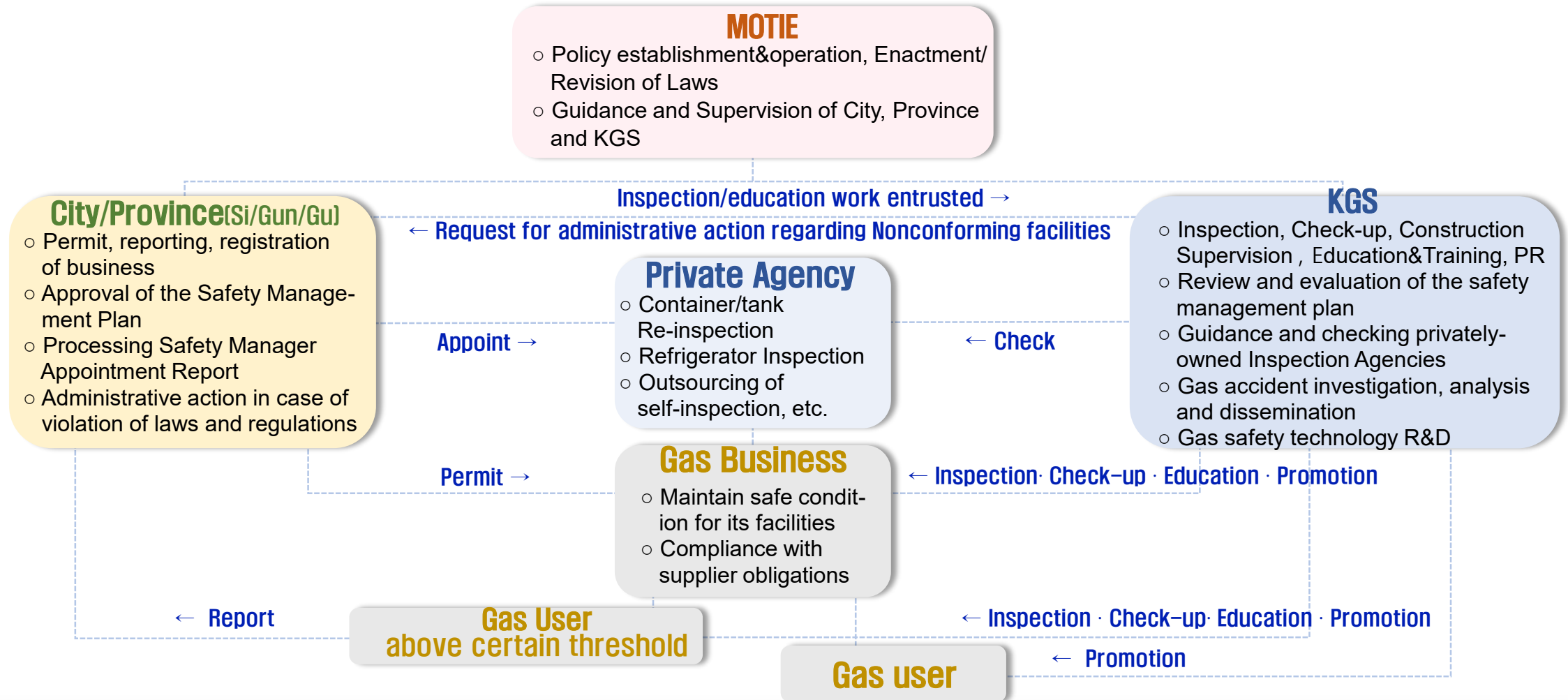
1) High-pressure gas-related facilities such as storage tanks, tanks fixed to vehicles(tank lorry), safety valves, pressure vessels, emergency shutoff devices, and vaporization devices.

2) Stationary fuel cell(fuel consumption 232.6kW or less , excluding fuel cells mounted on automobiles), portable fuel cells , water electrolysis facilities, hydrogen generators

3) Burning Appliances for using LP gas or city gas such as forced mixing type gas burners, etc.

I . Gas-related 4 Acts (1/2)

- The Korean Gas Safety Management System is led by a collaboration among :
Ministry of Trade, Industry and Energy(MOTIE) + **Local Governments** + **KGS**



II . High-Pressure Gas Safety Control Act (1/5)

□ Definition of High-pressure Gas (Article 2 of the Enforcement Decree of the HP Gas Act)

① Compressed Gas (over 1MPa)

- ◆ Compressed gas with pressure(gauge pressure) of at least 1MPa **at a normal working temperature actually measured as having pressure of at least 1MPa**
 - ※ Normal working temperature: The temperature at which gas facilities are typically operated or handled under normal conditions (excluding abnormal conditions)
- ◆ Compressed gas(excluding acetylene gas) **with pressure of at least 1 MPa at 35 °C**
- ◆ Acetylene gas with pressure exceeding 0 Pa at 15 °C

- Case 1. When the working temperature is below 35°C
 - ☞ Calculate the pressure at 35°C by applying Boyle Charle's Law
- Case 2. When working temperature exceeds 35°C
 - ☞ Determine the actual pressure at that temperature

Ⅱ . High-Pressure Gas Safety Control Act (2/5)

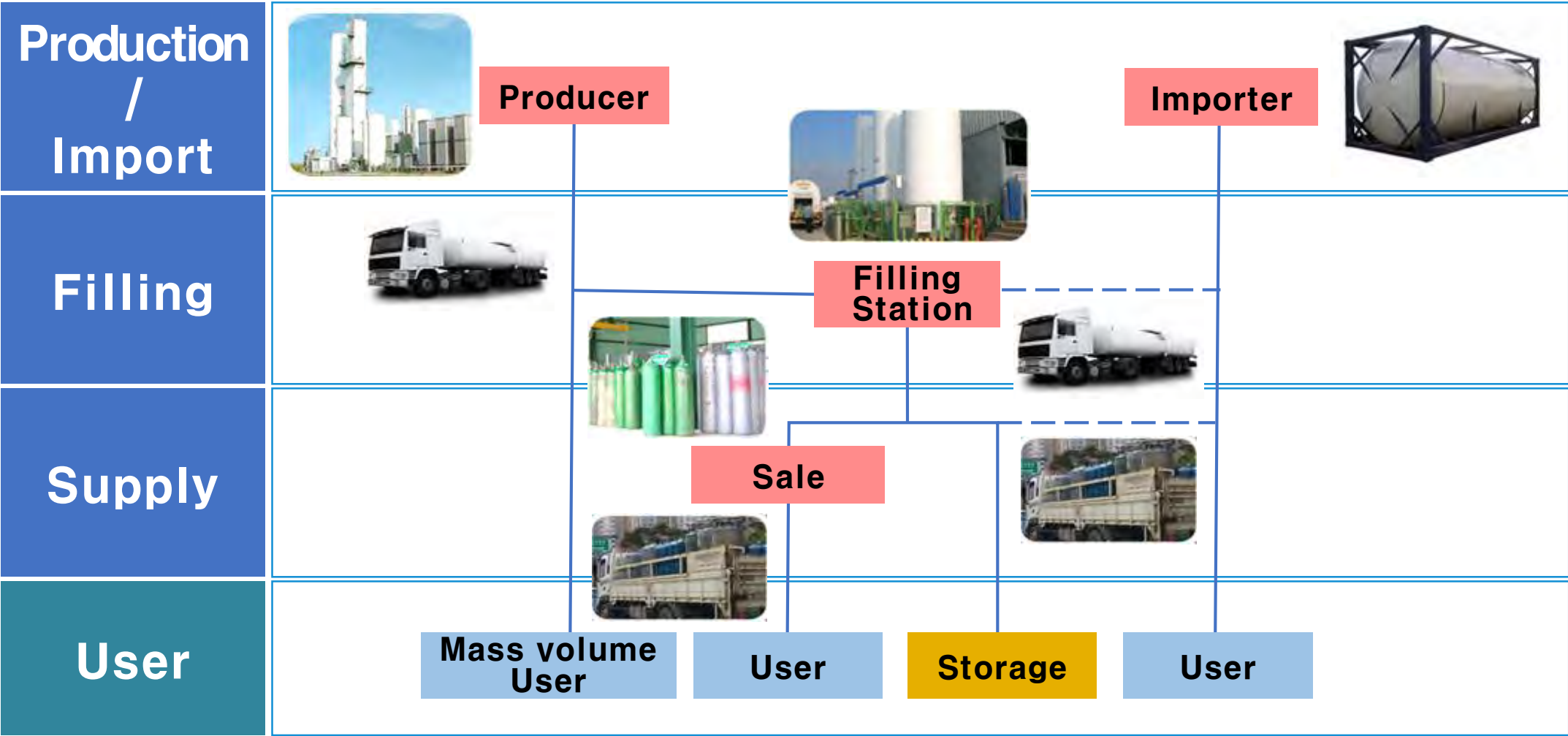
□ Definition of High-pressure Gas (Article 2 of the Enforcement Decree of the HP Gas Act)

② Liquefied Gas (over 0.2 MPa)

- ◆ Liquefied gas with pressure of at least 0.2 MPa **at a normal working temperature actually measured at a pressure of at least 0.2 MPa**
- ◆ Liquefied gas having a temperature of **up to 35 °C when the pressure is 0.2 MPa**
 - ※ Liquefied Gas : It is in a liquid state by methods such as pressurization or cooling, with a boiling point under 40°C or at or below normal working temperature at atmospheric pressure.
- ◆ **Liquefied hydrogen cyanide, liquefied methyl bromide, and liquefied ethylene oxide gas**, as liquefied gas with pressure exceeding 0 Pa at 35 °C

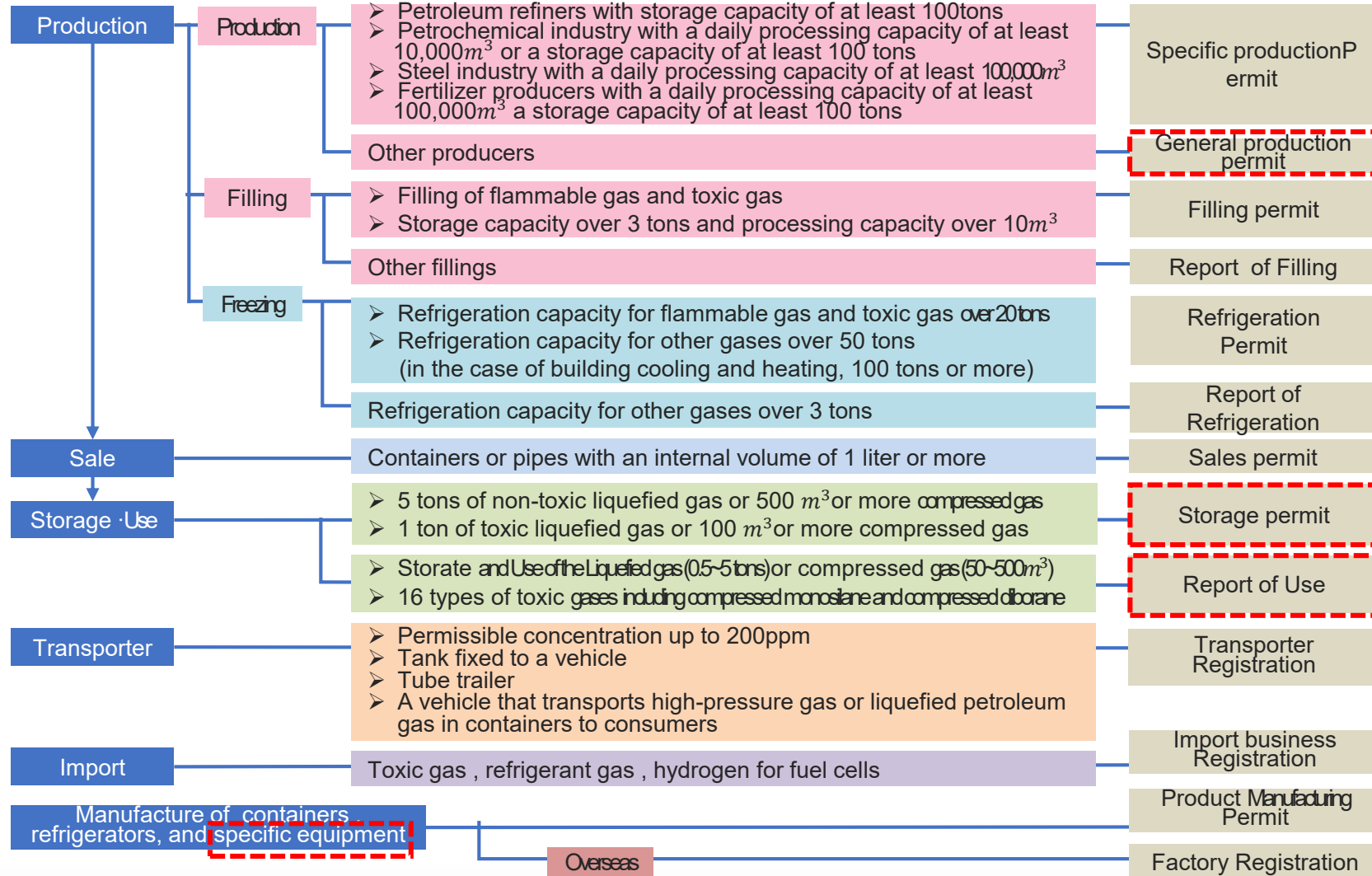
II . High-Pressure Gas Safety Control Act (3/5)

□ Distribution Structure



II . High-Pressure Gas Safety Control Act (4/5)

□ Permit / Registration / and Reporting System



Pressure vessel (stack)



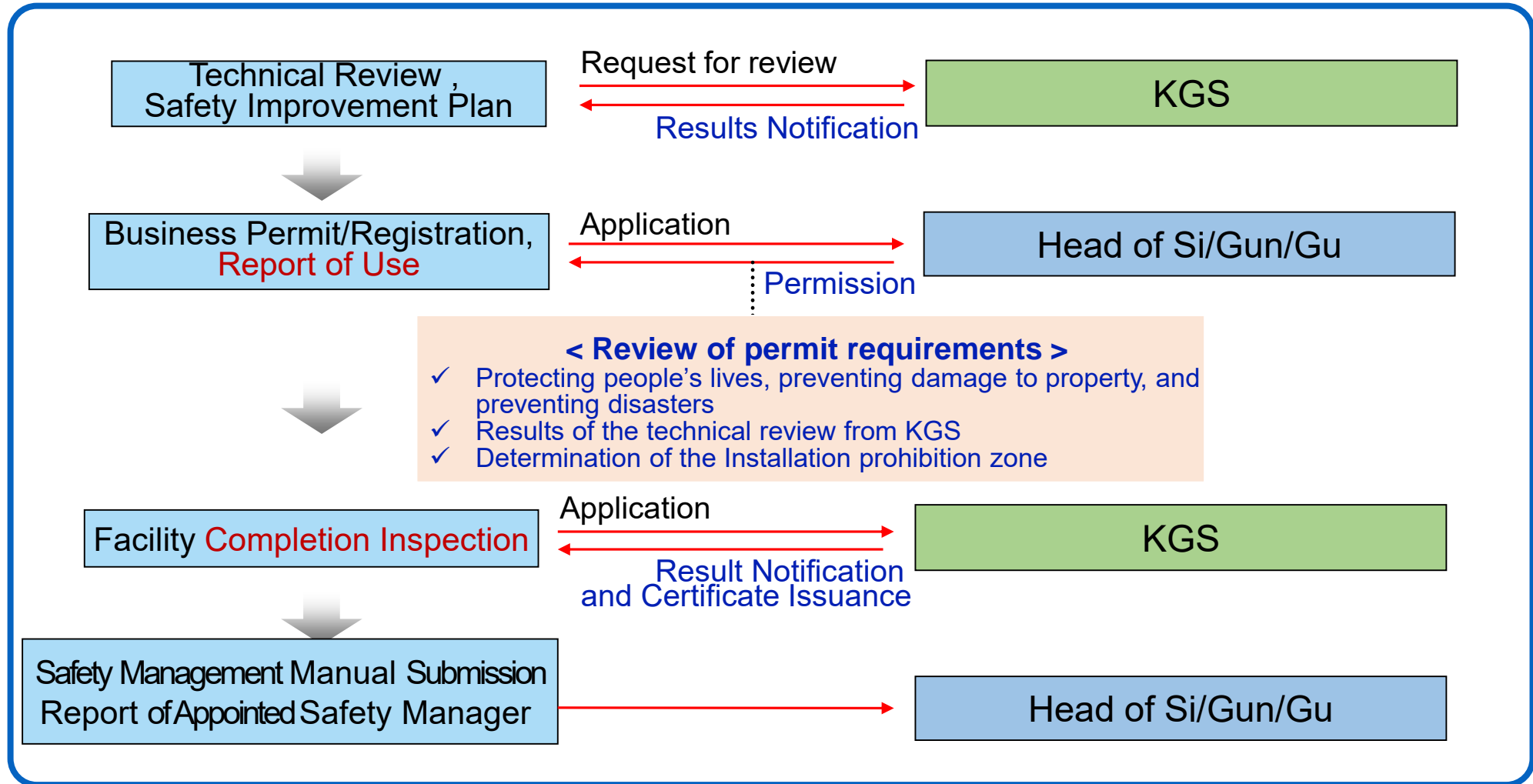
Pressure vessel
(PSA; Pressure Swing Adsorption)



Safety valve

II . High-Pressure Gas Safety Control Act (5/5)

□ HP Gas (Production, Storage, and Use) Safety Management System



III . Hydrogen Safety Control Act (1/2)

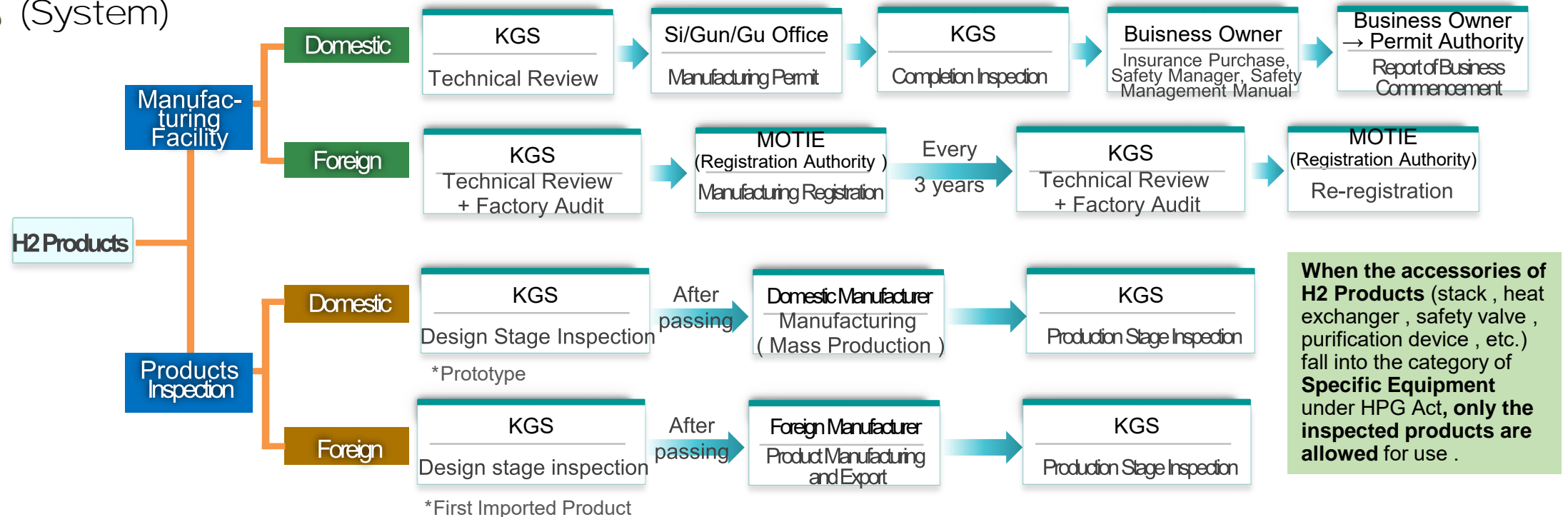
□ Hydrogen Products Safety Management System

- (H2 Products) Gas Fuel Cells, Mobile Gas Fuel Cells, Water Electrolysis H2 Generator, H2 Generator

※ Hydrogen Act Enforcement Rules Article 2 , Paragraph 3

- Fuel consumption of 232.6 kW or less
- Fuel cells installed in automobiles under Article 2, Paragraph 1 of the Automobile Management Act are excluded from the scope of hydrogen products.

- (System)



III . Hydrogen Safety Control Act (2/2)

□ Hydrogen Fuel Use Facilities (Hydrogen Act Enforcement Rules Article 2 , Paragraph 4)

- ① A facility where fuel cells are fixedly installed and hydrogen is supplied via low-pressure (less than 1 Mpa) pipes from the third parties.
- ② A facility where fuel cells are fixedly installed and hydrogen is supplied at low pressure from hydrogen production and storage facilities installed by the fuel cell user.
- ③ A facility to supply hydrogen from a hydrogen production facility or a hydrogen storage facility to the facility in ① through low-pressure pipes.

(Exclusions) Facilities within power plants being operated or constructed by power generators under Article 2, Paragraph 4 of the Electric Utility Act (excluding only facilities beyond the gas shut-off valve installed at the front of the fuel cell)

□ Inspection System of Hydrogen Fuel Use Facility

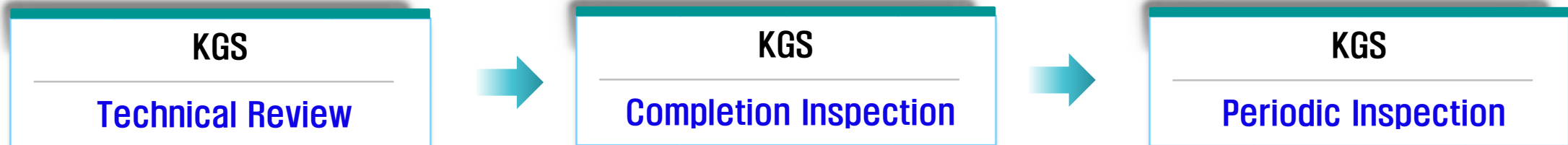


IV . Urban Gas Business Act

□ Specific Gas Use Facilities (Urban Gas Act Enforcement Rules Article 20-2)

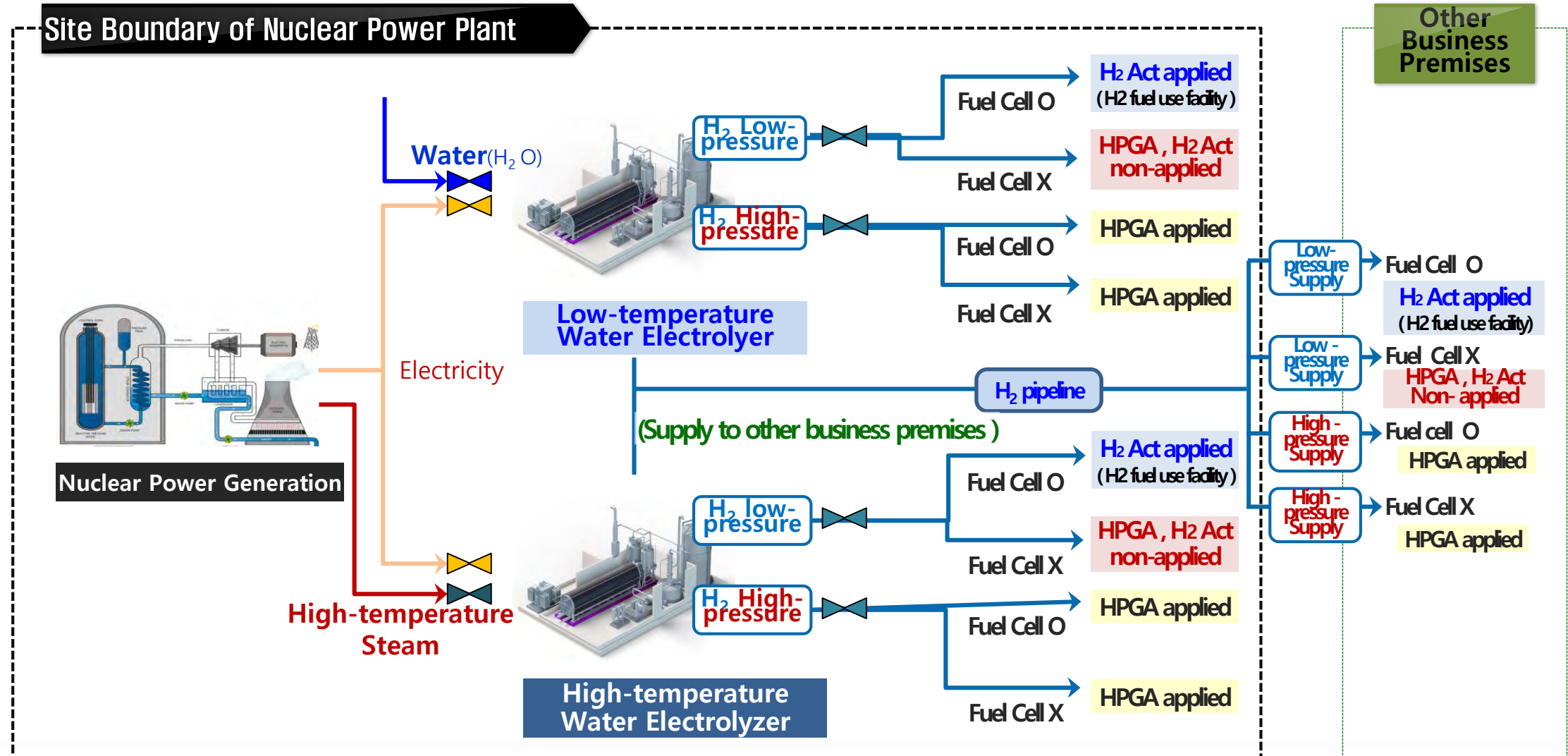
- ① **Gas-using facilities with monthly projected gas usage more than 2,000 m³ (1,000 m³ in case when installed within a Class I protected facility)**
 (Exclusions) · Gas-using facilities within power generation facilities that generate electricity using city gas among the electrical facilities specified by Electric Utility Act (Excluding only equipment after the gas-shutoff valve installed in front of gas turbines, gas engines, gas boilers, and fuel cells)
 · Gas-using facilities that are subject to inspection under the Energy Use Rationalization Act
- ② **Following gas-using facilities with monthly projected gas usage less than 2,000 m³ (1,000 m³ in case when installed within a Class I protected facility)**
 - The inner building and its attached facilities Gas-using facilities embedded or buried in
 - Gas facilities used by many people and designated by city/provincial governors as necessary for safety management
- ③ **Natural Gas-using facilities from the installed Liquefied Natural Gas(LNG) storage tank**
- ④ **Gas facilities for automobiles that use city gas as fuel**

□ Inspection System of Specific Gas Use Facility



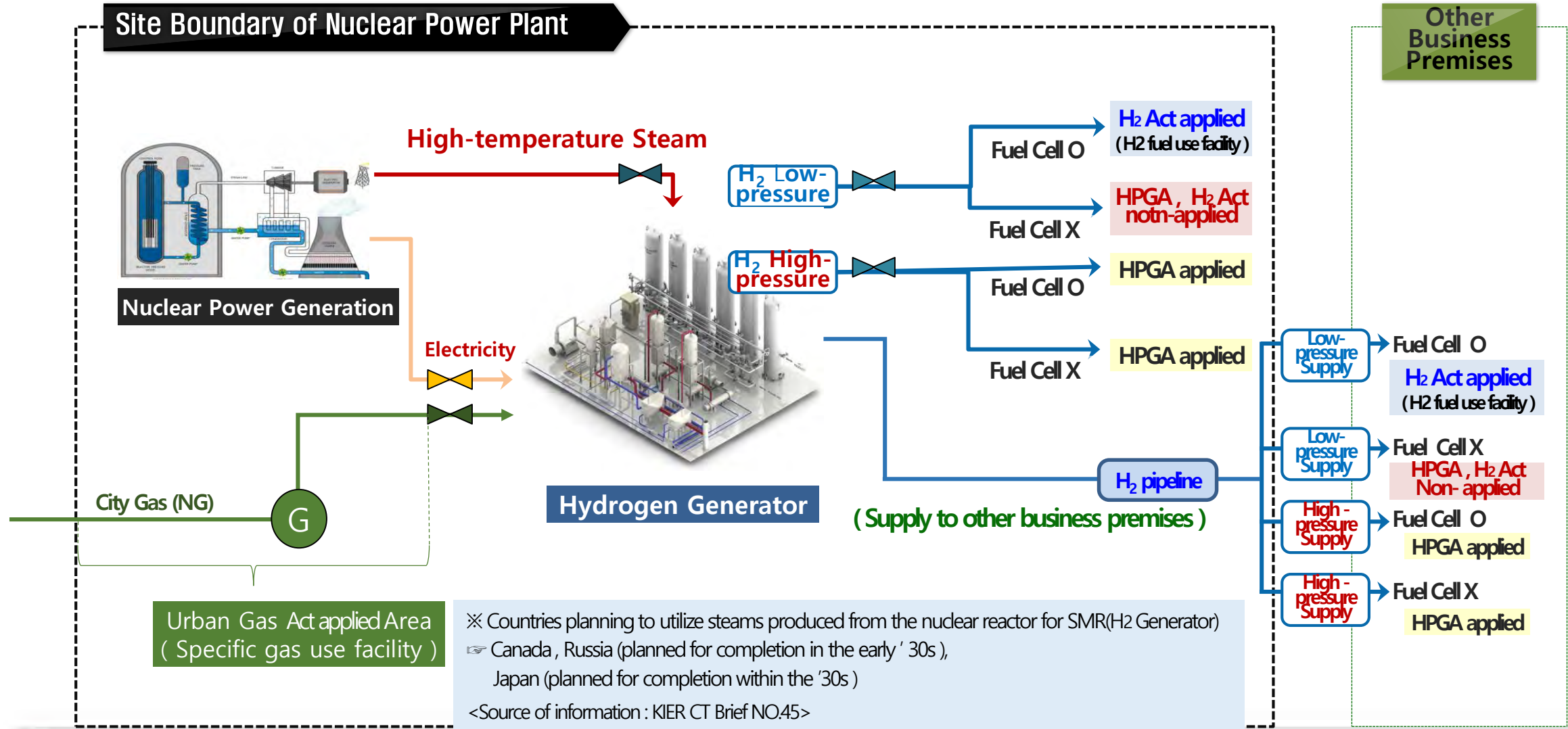
V. Nuclear H2 Production-related Gas Acts^(1/2)

□ Water Electrolysis H2 Generator



V. Nuclear H2 Production-related Gas Acts^(2/2)

□ Hydrogen Generator



가장 안전한 국민행복 실현

Thank you

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