



Consultation Paper

Proposed Amendments to the Gas Safety Ordinance (Cap. 51)



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Personal data collection statement



It is voluntary for any member of the public to supply his/her personal data upon providing views on the consultation document. Any personal data provided with a response form for consultation will only be used for this consultation exercise. The response forms and personal data collected may be transferred to the relevant Government bureaux, departments or agencies for purposes directly related to this consultation exercise. The relevant parties receiving the data are bound by such purposes in their subsequent use of such data.

The names and views of individuals and organisations which submit response forms in response to the consultation document (senders) may be published for public viewing after conclusion of the consultation exercise. Electrical and Mechanical Services Department (EMSD) may, either in discussion with others or in any subsequent report, whether privately or publicly, attribute comments submitted in response to the consultation document. EMSD will respect the wish of senders to remain anonymous and/or keep the views confidential in relation to all or part of a submission; but if no such wish is indicated, it will be assumed that the sender can be named and his/her views be published for public information.

Any sender providing personal data to EMSD in the submission will have the right of access and correction with respect to such personal data. Any request for data access or correction of personal data should be made in writing to the contact specified above.



Background

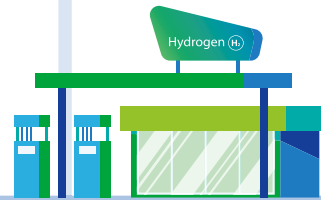


Achieving carbon neutrality is crucial to mitigate climate change and unlock economic opportunities for sustainable development. Hydrogen, particularly the green hydrogen, is considered to play an important role in achieving carbon neutrality worldwide because it can be produced from renewable energy, and used as a clean fuel with zero greenhouse gas emission. Its versatility allows it to be used in various sectors, including transportation, industry, and power generation.

China and other countries or regions like the United Kingdom, Europe, Japan, the United States, and South Korea have made significant advancements in hydrogen technology. They have established regulatory frameworks, integrated hydrogen transport into public life, adopted hydrogen in various sectors, and collaborated with car manufacturers to produce innovative hydrogen fuel cell vehicles, including for cargo and heavy-duty trucks.

China has made a commitment during the 75th session of the UN General Assembly to peak carbon dioxide emissions before 2030 and to achieve carbon neutrality before 2060. In March 2022, the National Development and Reform Commission and the National Energy Administration jointly issued the Medium and Long Term Plan for the Development of Hydrogen Energy Industry (2021-2035), which states that hydrogen would be an important component of the national energy system in the future. It is targeted to reach 50,000 hydrogen fuel cell vehicles on the road and to build a number of hydrogen filling stations in China by 2025. Besides transport, the plan envisages the use of clean hydrogen in other sectors, including energy storage, power generation and industrial applications.





In tandem with the national goals, Hong Kong has similarly pledged to achieve carbon neutrality before 2050. Trials on hydrogen fuel cell (“HFC”) double-deck buses and heavy-duty vehicles have commenced in 2023. It is expected that the trial results would facilitate

the formulation and implementation of a strategy for the application of hydrogen energy in Hong Kong.

Since June 2022, the Government has set up an Inter-departmental Working Group on Using Hydrogen as Fuel (“IWGUHF”) to explore the development and commercialization pathways of various hydrogen energy technologies and promote the hydrogen applications locally by processing the trial proposals. Hydrogen is currently classified as dangerous goods under the Dangerous Goods Ordinance (Cap. 295) which however does not govern its use as fuel. There is no comprehensive legislation in place to address the potential safety risks associated with the use of hydrogen as fuel, including personnel and emergency handling. There have been calls from local stakeholders to develop appropriate legislation to govern the safe use of hydrogen as fuel in Hong Kong.

Chapter 1 . Background

Moving forward, the Chief Executive has announced in the Policy Address 2023 to formulate the Strategy of Hydrogen Development in Hong Kong in the first half of 2024 and introduce the legislative amendments pertaining to the production, storage, transportation and application of hydrogen fuel with a view to introducing a bill into the LegCo in 2025. EMSD has conducted a literature review of national and international standards on hydrogen and prepared safety guidelines for the fuel systems of hydrogen fuel cell vehicles and hydrogen filling stations, with an aim to establish a regulatory framework for the safe use of hydrogen as fuel in Hong Kong.

This paper outlines the legislative proposals on the regulatory framework for the safe use of hydrogen as fuel in Hong Kong and seeks views from interested parties and the stakeholders, so that EMSD would take into account the views and concerns of the trade and community in formulating the legislative amendment proposals.

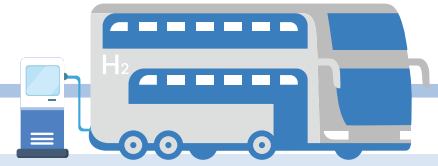


Chapter 2

The Gas Safety Ordinance (Cap. 51)

The Gas Safety Ordinance (“Cap. 51”), together with the subsidiary regulations from Cap. 51A to Cap. 51G enforced by the Gas Authority (“the GA”), was enacted in 1991 for the regulation of liquefied petroleum gas (“LPG”), town gas, and natural gas. It regulates the entire gas supply chain, including the importation, manufacture, storage, transport, supply and use of gas in the safety aspect. The Director of Electrical and Mechanical Services was appointed as the GA for the purposes of Cap. 51. The gas safety regulatory framework is based on Cap. 51 and requires a joint effort of all stakeholders to abide by the law. In collaboration with a wide range of stakeholders, the GA strives to facilitate compliance with the law by all parties concerned, ensure effective enforcement and initiate prosecution as appropriate. The regulatory approach for Cap. 51 enactment includes risk-based inspection, investigation, approval, risk assessment, promotion and education. Enforcement of Cap. 51 entails the systematic audit inspection of gas installations and facilities as well as registration, enlistment and performance monitoring of the entire gas trade.

Gas supply companies, being the top tier of the end-to-end value chain, are of particular importance within the gas industry. Considering the broad scope and large scale of their businesses among the gas industry, it is essential for the gas supply companies to conduct their operations in a safe manner so that members of the public are not exposed to undue risks from gas. In view of this, it is stated in Cap. 51 that only registered gas supply companies may carry on business of imports, manufactures and supplies of any gas. The gas supply companies shall fulfil certain requirements as stipulated in Cap. 51 in order to be qualified for the registration.



Cap. 51 has been provided with comprehensive provisions including the creation of regulations in relation to any matters relevant to the importation, manufacture, storage, transport, supply and use of gas and the empowerment of the GA on the approval and issue of Codes of Practice (“CoP”) for the purpose of providing practical guidance in respect of any requirements under Cap. 51 and the appointment of inspectors. Formation of appeal board panel and the handling of appeal against a decision or action taken by the GA are also specified in Cap. 51.

Below is the current list of subsidiary legislations under Cap. 51:

Gas Safety (Gas Quality) Regulations (Cap. 51A) >

Gas Safety (Gas Supply) Regulations (Cap. 51B) >

Gas Safety (Installation and Use) Regulations (Cap. 51C) >

Gas Safety (Registration of Gas Installers and Gas Contractors) Regulations (Cap. 51D) >

Gas Safety (Registration of Gas Supply Companies) Regulations (Cap. 51E) >

Gas Safety (Miscellaneous) Regulations (Cap. 51F) >

Gas Safety (Gasholders Examination) Regulation (Cap. 51G) >

Chapter 3

Proposed Amendments to the Gas Safety Ordinance (Cap. 51)

3.1. Purpose

Cap. 51 has been successfully applied to regulate the entire gas supply chain, including importation, manufacturing,

storage, transport, supply and use of LPG, towngas, and natural gas in the safety aspect. There are also comprehensive provisions in Cap. 51 for making regulations, empowering the GA to approve and issue CoP, as well as outlining the appeal systems. It has also been successfully applied to the LPG vehicle scheme, governing LPG suppliers, fuel systems on LPG vehicles and their maintenance, as well as LPG filling stations and their operations. CoP has been gazetted under the provisions in Cap. 51 to provide practical guidance on the safety of LPG vehicles.

Cap. 51 has demonstrated its efficacy in regulating the safety of LPG, natural gas and towngas. Indeed, the composition of towngas comprises about 50% of hydrogen. Hydrogen is similar to the aforesaid fuel gases but has wide flammability range, low ignition energy, rapid flame speed and very high operating pressure. It is lighter than air and can be quickly dispersed without accumulation when leaked. On the other hand, it is easy to be ignited and can affect a certain distance due to the high operating pressure. Therefore, the design, operation and maintenance of hydrogen facilities need to be governed and the personnel handling those facilities should be properly trained to ensure the safe use of hydrogen as fuel.



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Given the similarities in regulating the entire end-to-end value chain of hydrogen fuel with the gases regulated under Cap. 51 and the proven track record of gas safety in Hong Kong, it is considered that Cap. 51 provides the most suitable legislative framework to regulate comprehensively and effectively the safe use of hydrogen as fuel in Hong Kong.

Benchmarking study on the regulatory framework on overall value chain of using hydrogen as fuel for other countries or regions like China, the United Kingdom, Japan, the United States, and South Korea has also been conducted. It is learnt that the United Kingdom has no comprehensive regulations on using hydrogen as fuel and oversight is scattered across various authority bodies. In China and the United States, numerous technical standards are served as the base of the regulatory regime without solid and comprehensive regulatory framework and oversight is carried out at city or state level. Regulations for hydrogen as fuel in Japan and South Korea are newly developed in recent years and the overall regulatory regime is still quite adolescent. In this connection, by adopting the well-developed Cap. 51 regulatory approach on regulating hydrogen as fuel in Hong Kong, we can establish a more comprehensive and effective gas legislation and regulatory framework to govern the safe use of hydrogen as fuel in comparison with other pioneers and leading countries in the hydrogen industry.

The amendment to Cap. 51 is to provide the appropriate regulatory environment to enable and facilitate the healthy development of hydrogen as fuel in Hong Kong. Other matters such as supply and certification of green hydrogen and other non-safety related items are distant from the remit of Cap. 51 and will be addressed separately in the context of the hydrogen strategy to be published by Environment and Ecology Bureau later this year.

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To provide a clear picture for the potential investors on hydrogen installations or hydrogen fuel cell vehicles, instead of amending different clauses in the existing subsidiary legislation under Cap. 51A to 51G, it is recommended to introduce a new subsidiary legislation under the Cap. 51, namely Gas Safety (Hydrogen) Regulations (Cap. 51H) which will encompass a thorough regulatory framework for hydrogen, addressing importation, manufacture, storage, transport, supply, and use of hydrogen. By creating a dedicated subsidiary legislation, all regulations governing using hydrogen as fuel can be easily referenced and streamlined, providing a clear framework for its safe implementation.

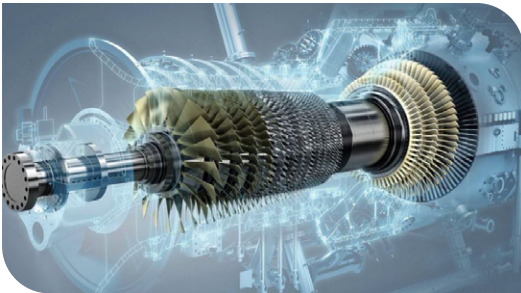
As hydrogen development is fast booming, it is recommended to issue CoP by gazette under Cap. 51 which can be updated from time to time to provide the safety requirements for new types of hydrogen applications to catch the development needs dynamically.

It is proposed to amend the definition of gas under the Gas Safety Ordinance (Cap. 51) to include hydrogen similar to LPG, town gas and natural gas. While the use of hydrogen (for non-fuel purposes) is currently regulated under the Dangerous Goods Ordinance (Cap. 295), the proposed regulatory framework specifically focuses on regulating hydrogen as fuel, i.e., when hydrogen is used/intended to be used as fuel for:



- Fuel cell or other hydrogen fuelled vehicles or trains as green transport;
- Green machineries at construction sites, port terminals, airport or other appropriate venues; and/or
- Power generation at remote areas or other appropriate venues.

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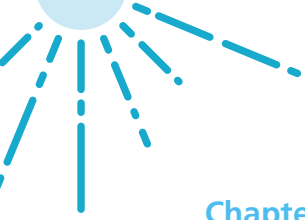
Hydrogen is currently categorized as a Class 2 dangerous goods and is governed under Dangerous Goods Ordinance (Cap. 295) among other compress gases, but the use of hydrogen as fuel is not governed. Existing provisions under Cap. 295 shall continue to apply to hydrogen used for non-fuel applications such as laboratory uses or cooling agent for power plant equipment. The regulatory power under Cap. 295 and Cap. 51 on using hydrogen for non-fuel and fuel purposes would be demarcated clearly and consequential amendment to Cap. 295 will be arranged where necessary.

3.2. Regulatory Areas

The proposed regulatory framework will include (i) amendments to relevant clauses in the main legislation of Cap. 51 for the introduction of hydrogen; and (ii) introduce Proposed Cap.51H to govern the use of hydrogen as fuel.

As the definition of "gas" is expanded to include hydrogen, it is necessary to refine certain clauses in the main ordinance that impose requirements only applicable on the original gas matter. This is done to ensure consistency with the meaning, requirements, and execution power of other existing subsidiary regulations. On the other hand, existing regulations related to those gases currently governed by Cap. 51 should not be affected by the introduction of hydrogen as one of the gases in Cap. 51.



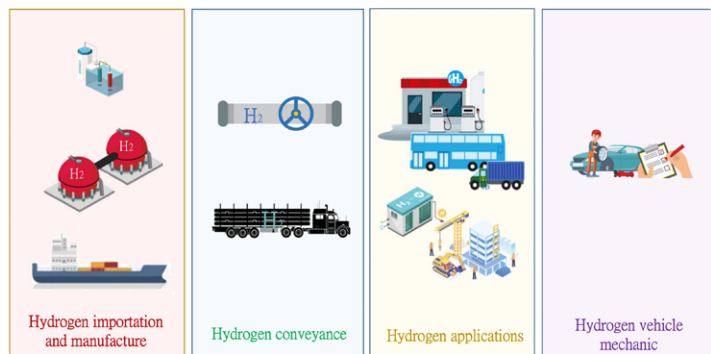


The key regulatory areas of the Proposed Cap.51H include:

- Hydrogen Quality¹;
- Registration of Hydrogen Supply Company;
- Construction and Use of Hydrogen Installation;
- Type Approval of Hydrogen Container;
- Use of Hydrogen System;
- Commissioning, Recommissioning and Decommissioning of Hydrogen Installations, Hydrogen Containers and Hydrogen Systems
- Permit for Hydrogen Conveyance Vehicle; and
- Registration of Hydrogen Vehicle Mechanics.

The use of hydrogen fuel is an emerging technology, and hence the safety requirement would have to be regularly updated in tandem with technologic developments. While the Proposed Cap. 51H would provide the legislative framework for regulating hydrogen facilities, practical guidance in respect to the safety requirements of hydrogen as fuel shall be laid down in the CoP to be published by gazette by the GA based on the existing provisions in Cap. 51. This approach provides the flexibility for the GA to update the regulatory requirements in response to new developments in technologies and the hydrogen market.

An overview of the key changes under Cap.51 and key regulatory requirements of the Proposed Cap. 51H is set out in the ensuing sections.



Hydrogen quality refers to the requirement of the purity level of hydrogen and the maximum levels of other likely trace components so as not to affect the end users, such as contamination of the hydrogen fuel cells.

3.3. Hydrogen Quality

With a view to control the quality of hydrogen supplied or used, it is proposed to include regulations on the hydrogen quality, similar to that of Cap. 51A governing the gas quality of LPG, town gas and natural gas. The quality of hydrogen supplied and intended for use as fuel shall meet the statutory requirement on the



purity level of hydrogen and the maximum levels of other likely trace components so as not to affect the end users, such as contamination of the hydrogen fuel cells. It shall meet the international or national standards with laboratory test or quality assurance requirements as stipulated in the CoP.

3.4. Registration of Hydrogen Supply Company

Under the Cap. 51E regulatory framework, the duty rests on every registered gas supply company to ensure, in carrying on its business as a gas supply company, the health and safety at work of all its employees and to conduct its operations in a safe manner so that members of the public are not exposed to undue risks from gas. Similar approach is adopted in developing the general self-regulating duty on the

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top-tier hydrogen supply company under the proposed Cap.51H.

Under the Proposed Cap.51H, any company (i.e. “hydrogen supply company”) involved in the importation, manufacturing and supply of hydrogen as fuel, is required to fulfil the following responsibilities:

- **Registration:**

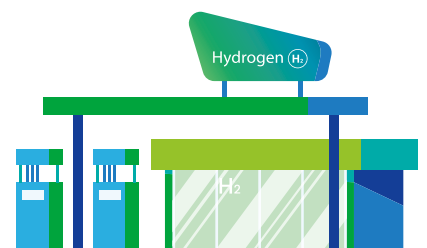
Companies eligible to be registered as registered hydrogen supply companies (“RHSCs”) must possess adequate resources and manpower to carry out their business operations and assume the associated liabilities. They need to apply for registration by providing the necessary information, which include but is not limited to a written statement on health and safety arrangement, safety case, safety management system and emergency handling plan, in the application form.

- **Report and Handling of hydrogen fuel incidents:**

If there is a major incident associated with hydrogen as fuel, the RHSC concerned shall report the incident to the GA within a prescribed timeframe, provide the GA with information and details about the incident and submit a written report to the GA, stating the cause of the incident and mitigating actions to prevent the recurrence.

- **Interruption of hydrogen fuel supply:**

A RHSC must have arrangements in place to manage supply interruptions, ensuring the safe and timely restoration of the hydrogen fuel supply system.



3.5. Construction and Use of Hydrogen Installation

Adopting similar approach to Cap. 51B, the construction (if applicable) and the use of hydrogen installations require approval from the GA under the proposed Cap.51H. Below set out requirements for the construction and use of hydrogen installations.

Hydrogen installations (“HIs”) refer to fixed installations that contain liquid or gaseous hydrogen, which include but are not limited to the receiving terminals of hydrogen fuel, the systems that manufacture hydrogen fuel, the hydrogen filling stations, the hydrogen fuel stores, the hydrogen fuel facilities, the hydrogen vehicle maintenance workshops, etc., where the associated hydrogen fuel pipes, pressure-regulating installations, safety devices, etc. are included in the HIs. Similar to the existing practices for notifiable gas installations, all HIs require approval from the GA for their construction and use, and the process includes:



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- **Application for construction and use approval of HI:**

A person intending to construct or carry out major modification of a HI must apply to the GA for construction approval by submission of the design, construction plan, schematic diagrams, equipment details and a Quantitative Risk Assessment (QRA) report, as well as relevant documents as requested by the GA. The GA shall evaluate the submissions and satisfy that the installation will not pose unacceptable risks to nearby individuals' health and safety, before granting the construction approval. Upon completion of the construction in accordance with the approved construction plan, the person shall apply for the use approval with submission of testing and commissioning reports and the safe operation and maintenance plan. GA will examine the submissions and inspect the installation with satisfaction results before granting the use approval.



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- **Safe operation and maintenance of HI:**

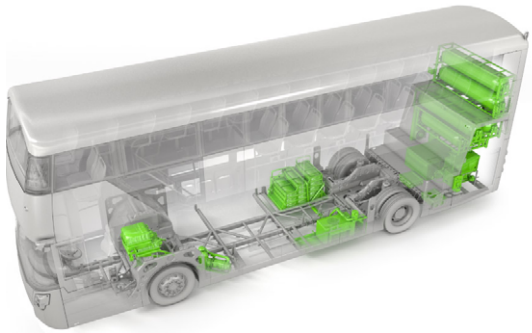
HI owners are responsible for safe operation and maintenance of the HIs to ensure that no undue risks will be posed to the public. The GA has the power to issue CoPs specifying the safety requirements on HIs, testing requirements of the facilities in the HIs, inspection intervals by a competent person, record-keeping of documentations, and the required submissions to the GA. Owners of HIs are obligated to comply with the requirements stipulated in relevant CoPs.



Designated competent person for HIs shall be assigned to ensure the safe operation and maintenance of HIs. The competent person, who is competent by virtue of his training, qualification and substantial practical experience, shall be recognized by the GA.

The owner of the HI shall ensure that no person shall carry out any operation or maintenance work in relation to the HI, unless the person carrying out the work is competent by virtue of training and practical experience. The training shall include, but not limited to, training in the properties of hydrogen, the use of safety devices and emergency handling of the HI. The owner of the hydrogen installation has the responsibility to ensure safe operation and maintenance of such installation.





3.6. Type Approval of Hydrogen Container

Hydrogen container is the pressure receptacle that is intended or designed to use in containing hydrogen or connecting to a facility for the withdrawal of hydrogen through hydrogen pipes. This covers the buffer tanks of the hydrogen filling facilities, the hydrogen fuel tanks on vehicles, etc. Similar to LPG containers as stipulated under Cap. 51B, hydrogen containers must receive written approval from the GA, or be of types approved by the GA before being used for the transfer or storage of hydrogen as fuel. The owner of the hydrogen container has the responsibility to ensure the safe use and maintenance of such container.

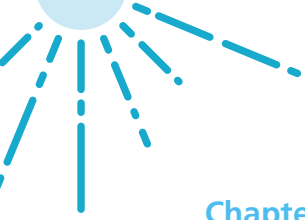


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Regular examinations and inspections of hydrogen containers, as specified in the GA's CoP, are required to ensure their safety for hydrogen fuel use. The containers must also be tested and examined at a time interval specified by the manufacturer or according to the approval conditions. The owner must maintain written records of these tests and examinations until the container is no longer in use. If the container is found to be unsafe, its use must be immediately discontinued until rectification work is completed to ensure its safety.

The owner of the hydrogen container shall ensure that no person shall carry out any operation or maintenance work in relation to the hydrogen container, unless the person carrying out the work is competent by virtue of, training and practical experience. The training shall include, but not limited to, training in the properties of hydrogen, the use of safety devices and emergency handling of the hydrogen container. The owner of the hydrogen container has the responsibility to ensure safe operation and maintenance of such container.





3.7. Use of Hydrogen System

Hydrogen systems – namely an assembly of hydrogen components and fuel systems that include hydrogen containers and hydrogen fuel cell or other hydrogen fuelled system on a vehicle or for movable power generation facilities at a construction site, etc. – must receive approval from the GA before being used for the transfer or consumption of hydrogen as fuel. The owner of the hydrogen system has the responsibility to make the application and ensure the safe use and maintenance of such system.



Regular examinations and inspections of hydrogen system, as specified in the GA's CoP, are required to ensure their safety for hydrogen fuel use. The systems must also be tested and examined at a time interval specified by the manufacturer or according to the approval conditions. The owner must maintain written records of these tests and examinations until the system is no longer in use. If the system is found to be unsafe, its use must be immediately discontinued until rectification work is completed to ensure its safety.



The owner of the hydrogen system shall ensure that no person shall carry out any operation or maintenance work in relation to the hydrogen system, unless the person carrying out the work is competent by virtue of, training and practical experience. The training shall include, but not limited to, training in the properties of hydrogen, the use of safety devices and emergency handling of the hydrogen system. The owner of the hydrogen system has the responsibility to ensure safe operation and maintenance of such system.

3.8. Commissioning, Recommissioning and Decommissioning of Hydrogen Installations, Hydrogen Containers and Hydrogen Systems

Hydrogen installations, hydrogen containers, hydrogen systems, and associated hydrogen fuel pipes and facilities need to be properly purged with inert gas to ensure that they are gas freed for commissioning, recommissioning and decommissioning.

3.9. Permit for Hydrogen Conveyance Vehicle

The regulatory requirements for hydrogen conveyance vehicles, which transport hydrogen as fuel on road (such as hydrogen tube trailers), are developed with reference to the existing provisions governing LPG road tankers or cylinder wagons under Cap. 51B. Specific provisions on hydrogen conveyance vehicles include:



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- **Permit requirement for carrying hydrogen as fuel:**

Only hydrogen conveyance vehicle (“HCV”) with a valid permit specifically issued for that vehicle is allowed to transport hydrogen as fuel on a road. In addition, only hydrogen containers that have been approved by the GA are allowed to carry hydrogen as fuel on an HCV. The application for a permit to carry hydrogen as fuel on an HCV, along with supporting documents shall be submitted to the GA for compliance assessment with regulatory requirements. The GA has the power to invalidate a permit if the vehicle fails to meet specified conditions.

- **Competency requirements for operation and maintenance:**

Only competent persons with sufficient practical experience or under the supervision of a competent person are allowed to engage in activities related to operating, maintaining, or loading/unloading of hydrogen fuel on an HCV. Competency training should be offered by the RHSC to cover hydrogen properties, fire-fighting, and emergency response. The owner of an HCV must ensure the presence of sufficient competent persons when carrying or handling hydrogen fuel.



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- **Safety measures during hydrogen fuel discharge:**

During hydrogen fuel discharge from an HCV, a prominently displayed sign must be present near the vehicle. All employed competent persons should have immediate access to the vehicle and remain within a prescribed distance during fuel loading or discharge. Discharging hydrogen as fuel from an HCV into a HI or hydrogen system is permitted only if a compliant safety device is fitted to both the vehicle and the installation. The safety device must be maintained in a good working order, and capable of automatically activated upon detection of leakage of hydrogen as fuel.

The owner of the hydrogen conveyance vehicle shall ensure that no person shall carry out any operation and maintenance in relation to the hydrogen conveyance vehicle, unless the person carrying out the work is competent by virtue of training and practical experience. The training shall include, but not limited to, training in the properties of hydrogen, the use of safety devices and emergency handling of the hydrogen conveyance vehicle. The owner of the hydrogen conveyance vehicle has the responsibility to ensure safe operation and maintenance of such vehicle.

3.10. Registration of Hydrogen Vehicle Mechanics

For LPG vehicle, the LPG fuel system shall be handled by a competent person enlisted by the GA with recognised training and experience. Similarly, under the Proposed Cap.51H, individuals responsible for tasks related to fabrication, connection, disconnection, testing, commissioning, decommissioning, maintenance, repair, or replacement of any components of hydrogen systems specifically on hydrogen vehicle will also be regulated. These individuals are expected to fulfil the following responsibilities:



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- **Duty of the registered mechanic:**

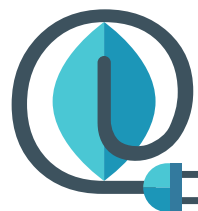
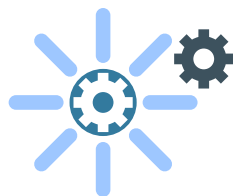
Only registered hydrogen vehicle mechanics (“HVM”) or individuals undergoing training to become registered HVM are allowed to carry out installation and maintenance work on hydrogen system components of hydrogen vehicles. The registered HVM shall comply with the regulations outlined in the Proposed Cap. 51H.



- **Registration and qualification requirements for HVM:**

To become a registered HVM, an individual must meet the prescribed qualifications or possess equivalent qualifications and practical experience recognized by the GA. Registration is granted if the applicant meets the specified qualifications and can fulfil the obligations regarding public safety. The GA has the authority to cancel


or suspend the registration of an HVM under certain circumstances, such as obtaining registration through fraud, conviction of an offense related to Proposed Cap. 51H, or failure to comply with its requirements.




Chapter 4

Collection of views

It is believed that the aforesaid proposed amendments to the Gas Safety Ordinance can govern the whole supply chain for using hydrogen as fuel in Hong Kong and can provide clear guidelines to facilitate the investors to develop the hydrogen energy industry. EMSD welcomes views from interested parties and the general public on the proposed amendments to the Gas Safety Ordinance (Cap. 51). Please let us have your views on or before **19 March 2024** using the Response Form in Appendix A of this paper, through either one of the following channels:

 **Mail** Gas Standards Office
Electrical and Mechanical Services Department
3 Kai Shing Street
Kowloon

 **E-mail** gsdb@emsd.gov.hk

 **Fax** (852) 2576 5945