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REPORT



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Victoria Prussen Spears

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Jessica Carnevale, Esq. at (212) 229-4942

Email: jessica.carnevale@lexisnexis.com

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Editorial Office
230 Park Ave., 7th Floor, New York, NY 10169 (800) 543-6862
www.lexisnexis.com

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Hydrogen Regulations by Jurisdiction and Changing Transmission Systems—Part II

*By Simone Goligorsky, Simon Grieser, Colette D. Honorable, Eric Lin, Adela Mues, Debra A. Palmer, Hagen Rooke, Nicolas Walker, Karim Albassan, Albertine Aquenin, Nicole Cheung, Tufayel Hussain and Zahir Sabur**

In this two-part article, the authors examine the hydrogen regulations in some of the key jurisdictions globally, including the European Union, France, Germany, the United Kingdom, China, Singapore, the United Arab Emirates, and the United States. The first part of the article, which appeared in the February 2023 issue of Pratt's Energy Law Report, discussed the hydrogen regulatory regimes in the European Union, France, and Germany. This second part (and conclusion) of the article focuses on hydrogen regulation in the United Kingdom, China, Singapore, the United Arab Emirates and the United States.

UNITED KINGDOM

A Patchwork of Rules and Policies, Most from Before Hydrogen was Viable

The UK lacks a comprehensive regulatory framework for the production, transportation, and storage of hydrogen. Stakeholders face a patchwork of rules and policies, most enacted before hydrogen was considered a viable alternative fuel.

Licenses

Hydrogen is covered by the definition of “gas” under the Gas Act 1986. A license under the Gas Act is required to ship, transport or supply hydrogen. No license is needed purely to produce gas, but production must be “unbundled” from transportation and supply.

The licensing requirements for parties that trade gas depend on whether they are physical or non-physical traders. In 2012, the UK Office of Gas and Electricity Markets (Ofgem) removed the requirement for “gas traders” (i.e., parties that are purely engaging in trading activities but are not involved in the physical conveyance of gas from one point to another) to hold a gas shipper license. However, parties that intend to physically ship gas will be required to hold a gas shipper license.

* The authors, attorneys at Reed Smith, may be contacted at sgoligorsky@reedsmith.com, sgrieser@reedsmith.com, chonorable@reedsmith.com, elin@reedsmith.com, amues@reedsmith.com, dpalmer@reedsmith.com, hrooke@reedsmith.com, nwalker@reedsmith.com, kalbassan@reedsmith.com, aaquenin@reedsmith.com, ncheung@reedsmith.com, thussain@reedsmith.com and zsabur@reedsmith.com, respectively.

Production

Hydrogen production is subject to detailed health and safety rules, including:

- The Dangerous Substances and Explosives Atmospheres Regulations 2002, which requires employers to manage and control risks from the use or presence of dangerous substances in the workplace, which include flammable gases and liquids such as hydrogen.
- The Control of Major Accident Hazards Regulations 2015 (COMAH), which set out requirements in relation to the storage of dangerous substances (discussed in further detail below).

In addition, hydrogen production operations need to comply with environmental permit and planning conditions.

Storage

Hydrogen storage is regulated. The relevant rules depend on the quantities of hydrogen being stored.

A consent is required under the Planning (Hazardous Substances) Regulations 2015 (SI 2015/627) to store two or more tonnes of hydrogen.

Hydrogen is listed as a “dangerous substance” under the COMAH regime, and operators of an establishment where over 5 tonnes of hydrogen are present on site are under a duty to implement safety plans, emergency plans, and a “major accident prevention policy.”

Sites covered by the COMAH regime are further divided into “lower tier” and “upper tier” establishments. “Lower tier” duties will apply where between 5 and 50 tonnes of hydrogen are present at the site. “Upper tier” duties will apply if the amount of hydrogen present at the site equals or exceeds 50 tonnes. If other hazardous substances are present onsite, there are additional rules under COMAH regarding how operators calculate the overall trigger thresholds for lower and upper tier status.

Operators of lower tier sites in the UK must notify the Competent Authority, prepare a major accident prevention policy, take “all measures necessary” to prevent a major accident, and report major accidents. Operators of upper tier sites, in addition to the duties placed on lower tier sites, must prepare a safety report and make arrangements for emergency planning.

The Competent Authority comprises the Health and Safety Executive (HSE), or the Office for Nuclear Regulation (ONR) for nuclear entities, acting together with the relevant environmental agency.

In England, the appropriate environmental agency is the Environment Agency (EA). In Wales, it is Natural Resources Wales (NRW), whereas, in

Scotland, it is the Scottish Environment Protection Agency (SEPA). In Northern Ireland, COMAH is enforced by the Competent Authority that comprises jointly the Health and Safety Executive Northern Ireland (HSENI) and the Northern Ireland Environment Agency (NIEA).

As the COMAH regime applies to establishments where sufficient quantities of dangerous substances are potentially present, it may apply to hydrogen production and dispensing sites as well.

Transportation

By Pipeline

A party will require a gas transporter license to transport hydrogen by pipeline. It must also adhere to the Pipeline Safety Regulations 1996, which set out requirements for the design, construction, installation, operation, maintenance, and decommissioning of pipelines.

At present, a dedicated hydrogen pipeline does not exist, so it may be necessary to transport hydrogen through the existing natural gas pipeline network by means of blending, followed by offtake. The concentration of hydrogen in gas pipelines is currently limited to 0.1 percent under the Gas Safety (Management) Regulations 1996 (GSMR). However, a blend of up to 20 percent hydrogen is currently being tested in the UK's HyDeploy project, and, if successful, may result in the GSMR being amended to allow up to 20 percent blending.

A gas shipper license is required in order to convey gas over a transporter's pipeline. Both gas shippers and gas transporters will also need to comply with industry codes, such as the Uniform Network Code, Retail Energy Code, and Smart Energy Code, as a condition of their license with Ofgem.

By Road

The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009 place duties on parties with a role in the carriage of dangerous goods (including hydrogen), which cover, inter alia, the classification, packing, carriage, loading, unloading and handling of goods, as well as construction and the approval of vehicles.

Hydrogen can be transported by road in cryogenic liquid tanker trucks or gaseous tube trailers. The design and manufacture of equipment for transporting, storing, and regasifying hydrogen is regulated by the Pressure Equipment (Safety) Regulations 2016/1105.

Pending Legislation

In its first-ever Hydrogen Strategy (August 2021), the UK government set out its use cases, and the steps for developing a full hydrogen value chain and

achieving a hydrogen economy. The government also published its proposed business model to incentivize low carbon hydrogen production, and is consulting on the design of the Net Zero Hydrogen Fund and a new low carbon hydrogen standard.

The Hydrogen Strategy is, however, light in detail with regard to regulation, policy, and legal issues. The government has committed therein to:

- Review the suitability of the Gas Act for hydrogen, to ensure appropriate powers and responsibilities are in place to facilitate a decarbonized gas future.
- Review gas quality standards with a view to enabling the existing gas network to have access to a wider range of gases.
- Launch a “call for evidence,” which will look at the current gas types and assess the potential role of hydrogen in the existing gas system.
- Set up a “hydrogen regulators forum” to assist with developing the area.

The government also is working with industry and regulators to consider the non-economic regulatory frameworks required to support the hydrogen value chain and has formalized this engagement through the Hydrogen Regulators Forum.

The Secretary of State for Business, Energy and Industrial Strategy plans to publish initial conclusions, proposals, and next steps on regulation in a hydrogen strategy update in early 2022.

In addition, a new Hydrogen Policy Commission, comprising senior politicians, experts from the UK’s private sector, and academics, was set up at the end of January 2022 to advise policymakers on the deployment of green and blue hydrogen across the UK economy. The Hydrogen Policy Commission will be conducting an assessment of the government’s Hydrogen Strategy. The Hydrogen Policy Commission will also be engaging with representatives from industry and academia, as well as senior officials from national and local government, to establish the steps needed to realize the opportunities presented by hydrogen.

CHINA

A Gradual Awakening to Hydrogen as a Primary Energy Source

China recognizes hydrogen as an important form of secondary energy that is critical to reach carbon peaking and carbon neutrality based on the Hydrogen Industry Development Plan—Mid-to-Long Term (2021 to 2035) (Hydrogen Industry Plan), issued by the National Development and Reform Commission and the State Energy Administration on March 23, 2022. In the absence of a

new nationwide regulatory framework, the production, transportation, storage, and usage of hydrogen are currently subject to the legal framework applicable to hazardous chemicals.

Production

Under the relevant laws and regulations on hazardous chemicals, the production of hydrogen in China requires two types of licenses:

- A safety production license for hazardous chemicals, obtained from the competent provincial-level production safety supervision and administration bureau; and
- A production license for industrial products, obtained from the competent provincial-level market supervision and administration bureau.

Storage

The storage of hydrogen requires an operation license for hazardous chemicals, obtained from the competent county-level production safety supervision and administration bureau. Hazardous chemicals should be stored in specified warehouses and managed by specially assigned personnel. The storage of gaseous hydrogen should comply with detailed rules and specifications relating to hydrogen safety, hydrogen containers, and markings.

The pressure vessels (including cylinders) for hydrogen storage are considered special equipment and so regulated by the safety supervision authorities. Entities that engage in hydrogen storage should comply with work safety measures and engage a qualified institution to conduct periodic safety inspections and assessments to ensure safe working conditions.

Transportation

By Pipeline

The planning, construction, and operation of pipelines for the transportation of hydrogen should comply with the Safety Management Regulations on the Pipeline Transportation of Hazardous Chemicals issued by the State Administration of Work Safety.

According to the China Hydrogen Energy and Fuel Cell Industry White Paper (2019) issued by the National Alliance of Hydrogen and Fuel Cells, as of 2019, there was only 100 km of pipeline dedicated to the transportation of hydrogen across the whole of China. Considering the huge costs of hydrogen pipeline construction, the suggested approach is to explore transportation via hydrogen-blended natural gas pipelines and making full use of the existing pipeline network in China.

By Road

Under the Administrative Provisions on Road Transport of Dangerous Goods issued by the Ministry of Transport, any entity that engages in the transportation of dangerous goods should obtain a dangerous goods road transportation license and set up a sound safety management system that meets the relevant technical standards and requirements.

“Dangerous goods” are defined as those listed on the List of Dangerous Goods (GB 12268-2). Frozen liquid hydrogen (No. 1966) and compressed hydrogen (No. 1049) are both on the list.

Use

Under the Hazardous Chemicals Safety Regulations, if a chemical company intends to use more than 160 tonnes of hydrogen a year, the company must obtain a usage safety license for hazardous chemicals from the competent local safety supervision and administration bureau.

Pending Legislation

The National Energy Administration issued a draft consultation on the Energy Law of the People’s Republic of China in April 2020 (Draft Energy Law) in order to promote the development of energy technology and improve energy efficiency.

A key development under the Draft Energy Law is that hydrogen is listed as a type of “energy” for the first time in government legislation, together with coal, oil, gas, and other types of renewable energy. This is regarded as a critical step for the development of the hydrogen industry in China as the draft legislation, once promulgated by the National People’s Congress, will recognize hydrogen as a type of energy, instead of a hazardous chemical as is the case under the current regulatory framework.

Key Policies and Guidance

In February 2021, the State Council issued the Guiding Opinions on Accelerating the Establishment and Improvement of Green and Low-Carbon Circular Development Economic System, which set out sustainable development objectives, such as increasing the share of energy consumption from renewable sources, vigorously promoting the development of renewable energies including hydrogen, and strengthening the construction of infrastructure for electric vehicle charging and hydrogen refuelling.

In March 2021, the National People’s Congress approved the Outline of the 14th Five-Year Plan for National Economic and Social Development, and the Long-Range Objectives through the Year 2035 for the PRC, which stated that China is to deploy a number of future industries in the fields of cutting-edge

technology and industrial transformation. Hydrogen energy and storage are both given as future industries that require forward-looking planning.

The Hydrogen Industry Plan sets out some ambitious targets for the development of hydrogen in China, including achieving annual production of 100,000 to 200,000 tonnes of hydrogen by 2025 through the use of renewable energy.

SINGAPORE

Updated Fuel Safety Rules in 2020; Plans to Decarbonize Maritime Industries

Singapore has no hydrogen-specific legislation in place at this time. The import, storage, sale, and transportation of hydrogen are governed by broader legislation covering flammable materials generally and workplace health and safety laws.

Licenses

Hydrogen is a “flammable material” under the Fourth Schedule to the Fire Safety (Petroleum and Flammable Materials) Regulations 2020 (P&FM regulations). As such:

- A P&FM storage license is required to store any quantity of hydrogen.
- A P&FM transportation license is needed to transport (by road) more than 130 kg (gross weight) of hydrogen gas in not more than two cylinders or more than 20 liters of liquefied hydrogen. This license is specific to each vehicle used in such transportation; that means transporters will need as many licenses as they have vehicles.
- A P&FM import license is needed to import more than 130 kg (gross weight) of hydrogen gas in not more than two cylinders or more than 20 litres of liquefied hydrogen. The importer must have at least one P&FM storage license to apply for a P&FM import license.
- A P&FM pipeline license is needed to transport any amount of hydrogen through a pipeline. Pipeline owners are responsible for obtaining this license.

The Singapore Civil Defence Force (SCDF) issues each license above.

Production and Storage

Hydrogen production and storage are subject to detailed health and safety requirements, including:

- The Workplace Safety and Health Act 2006, which requires hydrogen manufacturers and suppliers to register factories and ensure informa-

tion on precautions, health hazards, and test results is available to everyone who uses hydrogen at work.

- The Workplace Safety and Health (Major Hazard Installations) Regulations 2017, which require occupiers of facilities where hydrogen is processed, manufactured, or stored in bulk to register the facilities, prepare and maintain a safety case, notify and report incidents, and share information with regulators from time to time.
- The Fire Safety Act (FSA), under which storage facilities must comply with fire safety requirements for the storage of flammable materials in premises. All storage must also be indicated in building plans submitted to the SCDF for approval. There is no quantity-based exemption for this obligation.
- The Fire Safety (Building and Pipeline Fire Safety) Regulations and an accepted code of practice, which require that the storage licensee for any licensed premises must ensure that the premises' ventilation, fire escapes, structural fire precautions, and fire prevention and extinguishing systems.

In addition, hydrogen production operations will need to comply with the usual environmental permit and planning conditions.

Transportation

By Pipeline

As noted above, pipeline owners must have a license to transport hydrogen by their pipelines. Under the P&FM regulations, they must also conduct safety checks and regular maintenance, adopt an accepted code of practice, and have a compliant in-house company emergency response team of six people (larger teams are advisable, though not required, for larger premises), unless otherwise directed. In addition, pipeline users must help the licensee carry out its duties, including by preventing leaks or spills from sections of pipeline under the user's control.

By Road

In addition to the licensing requirements set out above, hydrogen must be transported only during pre-approved hours and on pre-approved routes; under the FSA and the Environmental Pollution Control Act, drivers transporting hydrogen by road must hold a driver permit for hazardous materials transportation; and transportation vehicles must satisfy the inspection checklist set out by the SCDF.

Collection Points

Importers (or their authorized agents) must take delivery of hydrogen at: (i) a wharf, if imported by water; (ii) an air cargo terminal, if imported by air; or (iii) the Tuas Checkpoint, if imported by road. Import by rail is not allowed.

Sale and Purchase

Any storage licensee operating a dispensing station or pump must comply with the detailed safety measures set out in the P&FM regulations and must not sell or supply hydrogen to anyone unless the licensee is satisfied that the recipient holds a license to store or transport hydrogen. Additionally, all sales must be recorded and records maintained.

Spot and Derivative Trading

Carrying on spot trading of hydrogen is licensable under the Commodity Trading Act 1992 unless an exemption applies, while dealing in derivatives contracts of which hydrogen is the underlying is licensable under the Securities and Futures Act 2001 unless an exemption applies. Depending on the type of trading activity, exemptions are available for own-account dealing activities and dealing with regulated entities such as banks.

No new legislation is being considered at this time. That said, the government is studying the feasibility of producing hydrogen in Singapore and the role hydrogen could play in decarbonizing the maritime industry in Singapore. (A prior study was undertaken in 2021 and concluded that green hydrogen cannot be produced in Singapore due to land constraints.) In addition, a group of four companies are jointly studying the technical and commercial viability of a liquefied hydrogen supply chain in Singapore.

UNITED ARAB EMIRATES

Petroleum, Energy and Environmental Authorities have Sway Over Hydrogen

At present, the UAE lacks a specific regulatory framework for the licensing and implementation of hydrogen transportation, storage, transmission and distribution networks. The limited regulation of hydrogen in this region is discussed below.

Licenses

In Abu Dhabi, the Supreme Petroleum Council (SPC) creates and oversees the implementation of general and fiscal policy in relation to gas resources.

In Dubai, the Dubai Supreme Council of Energy is responsible for policy development with a view to developing new energy sources.

In Sharjah, the Petroleum Council of Sharjah is responsible for regulating the gas industry and granting concessions.

These departments also oversee licensing activities in the energy sector, proposing fees, tariffs, and prices.

Production, Storage and Transportation

Under UAE law, any entity wishing to participate in the import, distribution, transport, sale or storage of petroleum products, including gas, must first obtain a trading authorization from the SPC, and also a license from the Department of Energy. A license is also required from the Federal Environment Agency before commencing any gas-related project.

Abu Dhabi National Oil Company (ADNOC) has the right to exploit and use all such gas, either alone or in partnership with others, so long as ADNOC's ownership of any project is at least 51 percent.

Upstream concession rights in relation to gas in Abu Dhabi are limited to the right to extract gas in return for a handling and delivery fee: only ADNOC is permitted to sell gas extracted in Abu Dhabi.

ADNOC has a number of subsidiaries involved in exploration and production, processing and refining, and marketing and distribution.

Abu Dhabi imports gas to the Taweelah receiving facilities from Qatar using the Dolphin gas pipeline. Dolphin Energy operates this facility. ADNOC Gas Processing operates the Taweelah-Maqta pipeline.

UNITED STATES

Legislation Would Promote Hydrogen Vehicles but No Plans to Regulate Hydrogen Wholesale

At present, the United States lacks comprehensive federal regulation governing the use of hydrogen. Several federal agencies possess authority—by virtue of their regulatory jurisdiction over conventional energy sources such as oil and natural gas—to regulate hydrogen at different stages in the production. Currently, the main regulators are:

- The Department of Energy (DOE)
- The Federal Energy Regulatory Commission (FERC)
- The Pipeline and Hazardous Materials Safety Administration (PHMSA)
- The Environmental Protection Agency (EPA)
- The Occupational Health and Safety Administration (OSHA)

Licenses

The United States has no federal licensing scheme governing the production, transportation, or sale of hydrogen, and such requirements typically are set at the state level.

Production

The EPA—by virtue of its broad mandate to regulate substances that have an impact on human health and the environment—currently possesses indirect regulatory authority over hydrogen production. For example, hydrogen production is tangentially regulated under the EPA's (i) Mandatory Greenhouse Gas Reporting Program; (ii) effluent standards under the Clean Water Act; and (iii) Chemical Accident Prevention Program. However, under the reporting program and effluent standards, hydrogen is merely regulated as an offshoot of fossil fuel regulation rather than standing alone.

Specifically, the regulatory scope is confined to hydrogen produced as a by-product of traditional fossil fuel production and processing, such as production via feedstock (methane steam reformation to produce “grey hydrogen”) and as a refinery by-product. Accordingly, as production begins to shift away from traditional fossil fuels toward cleaner energy sources, such as wind and solar energy (“green hydrogen”), these sources of regulatory authority will no longer be appropriate, driving the need for updated, tailored federal regulatory power.

Transportation and Distribution

At present, the transportation and distribution of hydrogen is primarily regulated by PHMSA. For example, under 49 CFR Part 192, PHMSA is tasked with imposing “minimum safety requirements for pipeline facilities and the transportation of gas.” Additionally, 49 CFR Section 173.301–302 governs the shipment of compressed gases, while Section 173.230 regulates the design of fuel cell cartridges. As such, because hydrogen falls within the definitional scope of a “flammable gas,” these standards apply. However, because these minimum standards only contemplate the small-scale usage of hydrogen or the regulation of compressed gases generally, PHMSA has been conducting research to inform the updating of these standards to enable the commercial-scale transportation of hydrogen. Thus, it is likely that as commercial-scale hydrogen transportation and deployment become more prevalent, PHMSA will update its standards and regulations to address the chemical/compositional risks associated with hydrogen transportation.

Storage

OSHA is the primary federal regulator regarding hydrogen storage. In particular, 29 CFR Section 1910.103 of the OSHA regulations specifically deals with hydrogen storage, prescribing standards concerning, among other things, (i) location; (ii) testing; (iii) supervision; and (iv) ventilation. Additionally, other sections of the OSHA regulations not specifically intended to contemplate hydrogen may be used to regulate hydrogen, such as standards associated with liquefied and compressed gases.

Trading

There are currently no comprehensive regulations or rules governing the trading of hydrogen.

Pending Legislation

There are currently no legislative proposals contemplating the wholesale regulation of hydrogen in the United States. However, there have been a flurry of bills introduced in Congress related to hydrogen. For example, a more narrowly focused bill sponsored by U.S. Senators Chris Coons (D-Del.) and John Cornyn (R-Texas), dubbed the Hydrogen for Trucks Act (S.3806), was recently introduced in the Senate, with companion legislation also introduced in the House of Representatives.

In short, the bill would: (i) incentivize the adoption of heavy-duty hydrogen fuel cell vehicles by covering the cost difference between these vehicles and traditional diesel vehicles; (ii) encourage parallel deployment of vehicles and fueling stations; and (iii) use fleet performance data to incentivize private investment and accelerate hydrogen deployment.

Similarly, Debbie Lesko (R-Ariz.) introduced a bill dubbed the Advancing Hydrogen Power Research and Development Act in February 2022. In essence, the bill would aim to facilitate the identification of barriers to hydrogen as a fuel source, paving the way for the future exploration and use of hydrogen.

Although it is not certain—nor likely—that these bills will pass, the confluence of legislative and executive interest in hydrogen continues to grow. For example, there has been keen interest by the Biden administration in the deployment of hydrogen as an effective means to reach broad decarbonization pronouncements. In his first State of the Union address, President Biden made express his administration’s interest in hydrogen as a means to meeting clean energy goals. As such, with interest in hydrogen permeating the highest levels of government, it is inevitable that comprehensive regulation is likely to follow in lockstep with increased adoption and deployment.

Bipartisan Infrastructure Law (BIL)

The BIL, signed by President Biden on November 15, 2021, authorizes about \$9.5 billion for hydrogen-related matters. The BIL appropriates \$8 billion for regional clean hydrogen hubs, \$1 billion for a clean hydrogen electrolysis program and \$500 million for the clean hydrogen manufacturing initiative and the clean hydrogen technology recycling RD&D program. With respect to regional clean hydrogen hubs, the BIL requires the DOE to “establish a program to support the development of at least four regional clean hydrogen hubs that:

- (1) Demonstrably aid the achievement of the clean hydrogen production standard developed under the BIL,
- (2) Demonstrate the production, processing, delivery, storage, and end-use of clean hydrogen, and
- (3) Can be developed into a national clean hydrogen network to facilitate a clean hydrogen economy.”

On February 15, 2022, the DOE issued a Request for Information (RFI) regarding regional clean hydrogen hubs, in order to assist in decarbonizing industry sectors, such as transportation, residential and commercial heating, power generation, and ammonia and steel. Under the BIL, one of the four hubs must address feedstock diversity and one must address end-use diversity. In addition, the hubs shall be located in different geographic regions of the United States, with at least two of the hubs located in regions with the greatest natural gas resources.

The DOE issued a second RFI regarding the clean hydrogen electrolysis program on February 15, 2022. The second RFI “focuses on hydrogen and related technologies, such as electrolyzers, fuel cells, and storage tanks” that “can play a key role in decarbonizing multiple [industry] sectors.”