

Hydrogen regulations by jurisdiction and changing transmission systems

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

Takeaways

- Germany is using a stop-gap regulatory framework until EU rules take effect
- Separate rules for hydrogen and natural gas transmission are inevitable
- Many countries use existing gas legislation to regulate hydrogen
- Land constraints may prevent some countries from producing green hydrogen



In this article, we look at the regulations in some of the key jurisdictions globally, which includes: European Union, France, Germany, the United Kingdom, China, Singapore, the United Arab Emirates, and the United States. In the last two years, legislators have stepped up their efforts by launching hydrogen strategies.

The climate crisis has become a central policy driver in many jurisdictions, with regulators coming to the view that clean hydrogen may provide the necessary solution to reach the targeted levels of decarbonization, as set out in international treaties such as the Paris Agreement, and as discussed at COP26. Consequently, stakeholders, including industry players, investors, supranational organizations, and governments, have begun harnessing the potential of hydrogen to drive the global green energy transition, creating a hydrogen policy momentum.

Ahead of the development and implementation of product-specific legislation, regulators in many of these jurisdictions have brought hydrogen within the scope of existing laws (for example, those applicable to natural gas). Alongside the use of existing laws, regulators are drafting a comprehensive regulatory framework that will govern the production, storage, transportation, distribution, and associated infrastructure of hydrogen. The forthcoming regulations also will set out rules pertaining to the use, sale, and purchase of low-carbon hydrogen.

The regulators' overarching objective is to facilitate the development and functioning of the domestic hydrogen market, as well as cross-border trade. To this end, some regulators hope to implement public support mechanisms and incentives, and to develop a workable definition of clean hydrogen, which is necessary for the establishment of a licensing regime. Some jurisdictions also are considering the launch of certification tools that provide guarantees of origin and trace the types of hydrogen produced. However, it is worth noting at the outset that, despite certain similarities, hydrogen policy strategies will differ from jurisdiction to jurisdiction. In this article, we seek to provide an overview of the legislation that is currently in place, and provide a summary of forthcoming proposals, in certain key jurisdictions.



European Union

Pressure to create a hydrogen-only distribution system

At the EU level, the only rules regulating the gas market are Directive 2009/73/EC of the European Parliament and of the Council of July 2009 concerning common rules for the internal market in natural gas and repealing Directive 2003/55/EC (*Gasbinnenmarktrichtlinie* – GasRL) and the Regulation of the European Parliament and of the Council on the internal markets for renewable and natural gases and for hydrogen (*Fernleitungszugangsverordnung* – ErdgasZVO).

The currently applicable versions of the GasRL and ErdgasZVO are designed to regulate the transmission, distribution, supply, and storage of natural gas.

Pending legislation

On December 15, 2021, the EU Commission published proposals for the regulation of the natural gas and hydrogen market. This would involve amending the GasRL and ErdgasZVO.

Like Germany's recently amended Energy Industry Act (*Energiewirtschaftsgesetz* – EnWG), both drafts make a clear distinction between the regulation of natural gas networks and that of hydrogen networks. However, unlike the EnWG, the [EU regulatory requirements for hydrogen would apply to all hydrogen network operators](#): There is no opt-in option.

Combined gas and hydrogen operations

There are high hurdles for the combined operation of gas and hydrogen networks.

Operating gas and hydrogen networks in combination, as many transmission and distribution system operators would like to do, would be virtually impossible with the implementation of the regulations.



Definition of “gas” under GasRL and ErdgasZVO

Natural gas is referred to when the gas consists mainly of methane or can be fed into the natural gas grid and transported in a technically safe manner.

Hydrogen, on the other hand, is not defined in more detail, but this is also due to the fact that the EU follows a more technology-open approach; i.e., all production paths for hydrogen generation (electrolysis, steam reforming, methane pyrolysis, etc.) are covered.

Upcoming European Parliament and Council rules for internal market in natural gas

Definition

Under the present drafts, “gas” means not only natural gas, but also hydrogen.

The article 2 of the GasRL treats gases together and does not make an overall distinction between hydrogen and other gases, thereby defining “gases” as “hydrogen and gas.”

Strengthening consumer and end-user markets

Article 10 I ensures that all end customers have the right to be supplied with gases, including hydrogen, by a supplier. This applies regardless of the member state in which the supplier is registered.

Article 10 I further stipulates that in the supply contract end customers are entitled to an overview of the services to be provided, and the various quality levels and maintenance services offered.

Article 11 gives the customer the right to change hydrogen supplier. In this context, it is stipulated that the switching fees incurred in the event of a switch must be reasonable.

Duties of hydrogen network operators, hydrogen storage facilities, and hydrogen terminals

Article 46 regulates the various duties of hydrogen network operators, hydrogen storage facilities and hydrogen terminals. Among other things, under article 46 I a), a safe and reliable infrastructure for the transportation and storage of hydrogen must be operated, maintained, and further developed.

It further provides that environmental protection must be taken into account and close cooperation must be established with associated and neighbouring hydrogen network operators.

In addition, under article 46 I b), operators must ensure that the hydrogen system can meet a realistic demand for the transportation and storage of hydrogen.

Also, under article 46 I f), operators must provide network users with the information they need for timely access to the infrastructure.

Article 52 I obliges operators of hydrogen networks to send the regulatory authorities, at regular intervals, details of the hydrogen infrastructure that they plan to build.

It should be noted that, as an EU directive, these regulations do not enter into force immediately upon their adoption, but must first be transposed by member states into national law.



Overview of the European Parliament and ErdgasZVO rules

Third-party access

Under article 6 I of the ErdgasZVO, hydrogen network operators must offer their services to all network users on a non-discriminatory basis. If the same service is offered to different customers, equivalent contractual conditions apply. Hydrogen network operators must also publish on their website the contract terms and conditions, the tariffs charged for network access and, where applicable, the balancing charges.

Distribution of capacity rights

Capacity rights for hydrogen storage and distribution should be freely tradable. To this end, article 11 requires each transmission system operator, storage system operator, LNG system operator, and hydrogen system operator to take appropriate measures to ensure that capacity rights can be traded freely, transparently, and in a non-discriminatory manner.

Obligation of hydrogen plant operators

In accordance with article 31 I, hydrogen storage operators must publish details of all services they offer, including the relevant terms and conditions, and the technical information required by hydrogen storage users. Regulatory authorities may require operators to publish additional information for network users.

Article 40 I requires hydrogen network operators to cooperate at the EU level within the framework of the European Network of Hydrogen Network Operators in order to promote the functioning and development of the internal hydrogen market and cross-border trade. This is to ensure optimal management, coordinated operation, and proper technical development of the European hydrogen network.

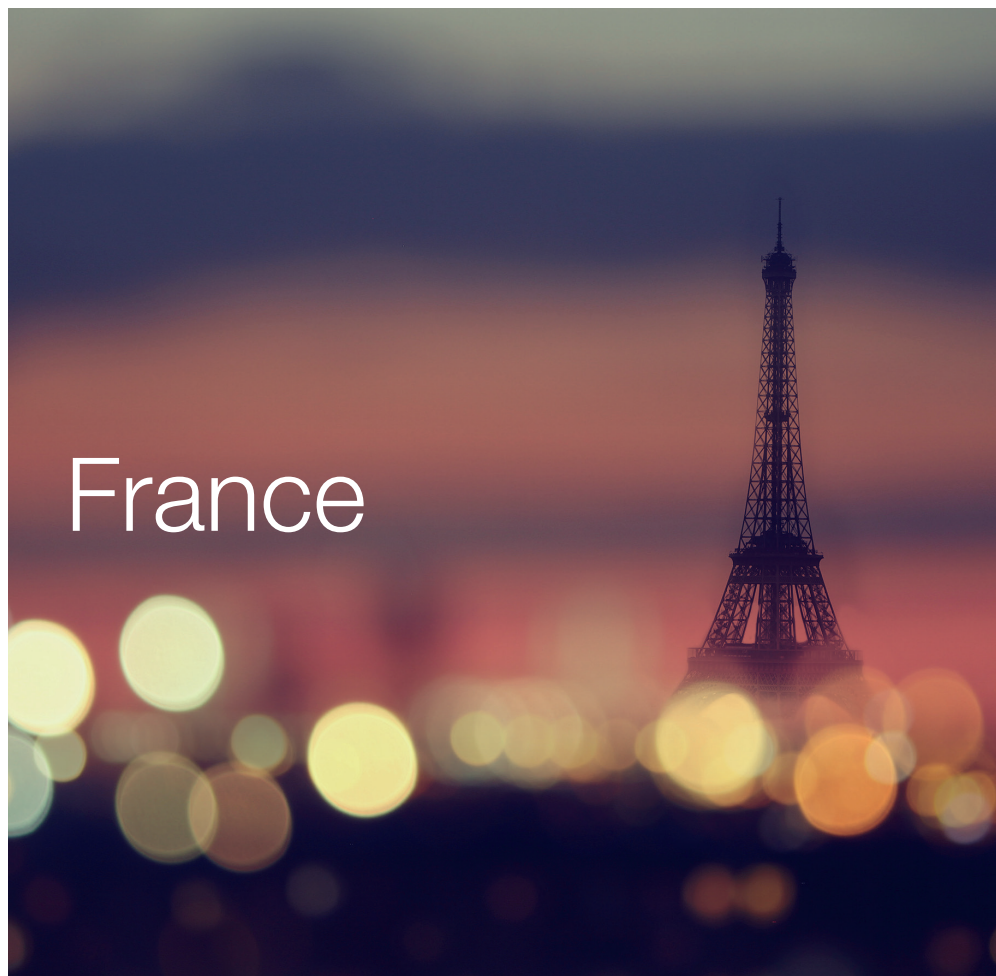
The annex to the Natural Gas Regulation also contains significant proposals for supplementing the Security of Gas Supply Regulation (EU SOS GasVO), which are of particular importance given the current turbulence in prices and low storage levels. This implementation of the third energy package for gas markets is a further concretization of the European Green Deal.

Effective dates

The Commission's drafts will be discussed in the European Parliament and the Council this year. Adoption is not expected before the end of 2022, and more than likely not until 2023.

While the ErdgasZVO and the EU SOS GasVO will have immediate legal effect upon adoption and publication, the GasRL, as a directive, must then be transposed into national law.





France

Regulators define three types of hydrogen by production type

Under article L. 811-1 of the French Energy Code, Hydrogen is defined as a gas containing various concentrations of dihydrogen molecules obtained after application of an industrial process.

According to article L. 811-1, three types of hydrogen are defined:

- **Renewable hydrogen**, which is produced either by electrolysis using electricity from renewable energy sources, or by means of any other technology that uses exclusively one or more of these same renewable energy sources and does not conflict with other uses allowing their direct recovery. In all cases, its production process emits, per kilogram of hydrogen produced, a quantity of carbon dioxide equal to no more than a given threshold.
- **Low-carbon hydrogen**, where the production process generates no more emissions than the threshold set for renewable hydrogen, but the hydrogen does not meet the other criteria necessary to be designated as renewable hydrogen.
- **Carbonaceous hydrogen**, which is neither low-carbon, nor renewable.

The threshold and proportions necessary to classify hydrogen according to the above definitions have not yet been established.

Pursuant to article L. 821-2, the renewable or low-carbon characteristics of hydrogen can be proven by traceability warranties based on a model similar to the one used to guarantee origin for renewable electricity.



Public support

In accordance with article L. 812-1 et seq., a system of grants was introduced in the Energy Code to support hydrogen production.

Production

Hydrogen production is subject to the “classified facilities for protection of the environment” regulation (*installations classées pour la protection de l’environnement* – ICPE), which imposes specific requirements and enhanced state scrutiny on facilities and activities that may harm the environment. The facilities and activities in scope are divided into sections.

Under section 3420 of the ICPE, the production of inorganic chemicals such as hydrogen in industrial quantities by chemical or biological transformation is subject to state authorization regardless of the quantities produced.

This authorization covers: (i) programs to mitigate risks to the environment; (ii) programs to prevent pollution of, and protect, water; and (iii) limits on greenhouse gas emissions.

Storage

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

Under section 4715 of the ICPE, storage is subject to:

- State authorization when the quantity of hydrogen likely to be present in the facility is equal to or greater than 1 tonne.
- Notification to the regulatory authorities when the quantity of hydrogen is greater than or equal to 100 kg, but less than 1 tonne.

Under these thresholds, no permit is required.

The Mining Code covers the possibility of storing hydrogen underground.

Underground hydrogen storage is regulated by concession contracts. In principle, any concession must be subject to a public inquiry and open to competing bids. The concession contract determines the scope of the underground facility and the geological formations concerned. The duration of the concession is also determined by the contract and cannot exceed 50 years.

Transportation

Transportation is subject to different regulatory frameworks depending on whether hydrogen is transported via the pipelines of a dedicated transportation network or through the existing natural gas transportation network:

- If the pipeline is part of a transportation network dedicated solely to hydrogen, the regulatory framework has yet to be defined by the government.
- If the pipeline is part of the existing natural gas transportation network (this applies only to renewable hydrogen), the hydrogen is subject to the same regulatory framework as natural gas, namely:
 - o The right of access to natural gas transportation facilities must be guaranteed by operators under the terms of the contract.
 - o Charges for using transportation networks must be determined in a transparent and non-discriminatory manner.



Distribution

Distribution will be subject to different regulatory frameworks depending on whether hydrogen is distributed by pipelines that are part of a dedicated distribution network or the existing natural gas distribution network:

- If the pipeline is part of a distribution network dedicated solely to hydrogen (unlike the regulatory framework for transportation, this applies only to renewable energy), the regulatory framework has yet to be defined by the government.
- If the pipeline is part of the natural gas distribution network (this applies only to renewable hydrogen), the hydrogen is subject to the same regulatory framework as the distribution of natural gas:
 - A right of access to natural gas distribution facilities must be guaranteed by operators under the terms of the contract.
 - Charges for using natural gas distribution networks must be determined in a transparent and non-discriminatory manner.
 - In municipalities that are already served by a natural gas network, state owned gas distribution system operators are required to connect customers who so request to the existing state owned distribution networks.

Sales

The production of renewable hydrogen and its sale to end users take place in competitive markets that are not regulated by the Energy Code.

The sale of renewable gas injected into the natural gas network is not subject to supply authorization, provided that this gas is sold by the producer to a natural gas supplier.

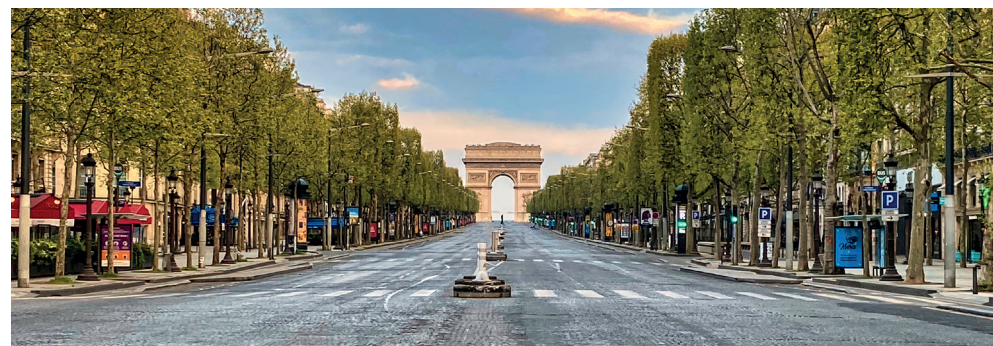
Pending legislation

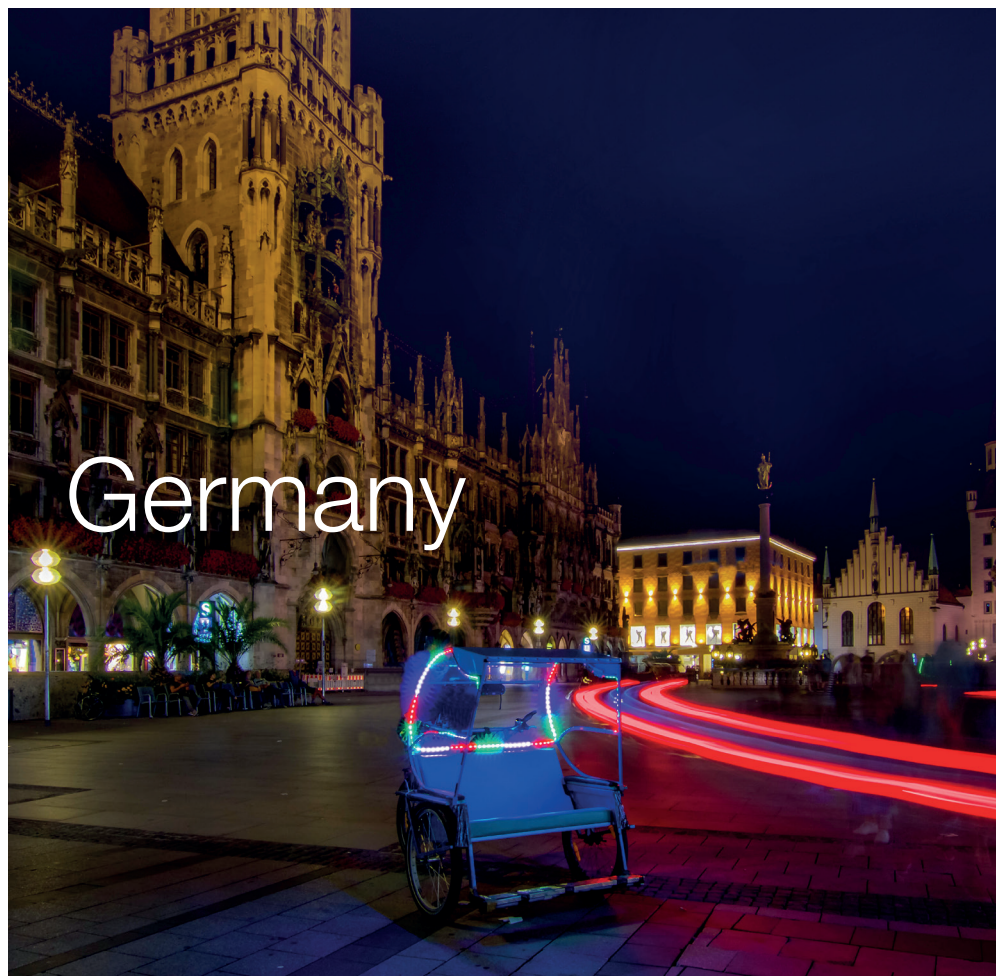
On September 8, 2020, the French government announced a National Strategy for the Development of Decarbonized Hydrogen, which will provide €7 billion in public support by 2030, including €2 billion by 2022 under [France's Recovery and Investments for the Future](#) (*"France Relance et du Programme d'Investissements d'avenir"*) plans.

Following the adoption of Law No. 2019-1147 of November 8, 2019 on energy and climate, article L. 100-4 of the Energy Code on national energy policy was amended to include the objective of "developing low-carbon and renewable hydrogen and its industrial, energy and mobility uses." The Law also empowers the government to take any measure by ordinance that would "define a support and traceability framework for renewable and low-carbon hydrogen." This is the purpose of Ordinance No. 2021-167 of February 17, 2021 on hydrogen.

The Ordinance creates a new Book VIII in the Energy Code and defines three types of hydrogen according to their production methods. It also sets up a public support mechanism for hydrogen production and creates a mechanism for guarantees of origin and traceability to certify the type of hydrogen produced. Finally, a new regime for self-consumption of hydrogen has been introduced.

The Ordinance will be supplemented by three decrees and two application orders, which have yet to be enacted.





Germany

Hydrogen and natural gas networks will be subject to separate rules

Until now, only a few pipelines have been used exclusively for hydrogen. The pipelines used so far for hydrogen are mainly used for industrial purposes. These pipelines are classified as so-called “closed distribution networks” under Section 110 of the Energy Industry Act (EnWG). Therefore these pipelines are subject to only partial regulation and are exempt from incentive regulation in particular due to their use for industrial purposes. In fact, there has so far been no independent regulation of the hydrogen market in Germany. However, with the amendments to [the Energy Industry Act of July 26, 2021, \(Energiewirtschaftsgesetz – EnWG\)](#), new regulations on the use of hydrogen networks have come into force.

Pending legislation

According to the legal explanatory memorandum, the purpose of the amendments to the EnWG is the gradual development of hydrogen infrastructure in Germany. The regulations are intended as a transitional solution until European requirements are in place.

In the memorandum, the Federal Ministry of Economics (BMWi) also presented key considerations for the transitional regulation of hydrogen networks. According to these, the definition of gas should not be extended to hydrogen; instead hydrogen should be regulated separately, independently of the previous regulations regarding gas, under the EnWG.

The German government has stated that [separate regulation of hydrogen and natural gas networks is imperative under the current EU legal framework](#). The EU Commission submitted proposals on this subject at the end of 2021 (see below). Transposition into German law is expected from 2025 onwards.

In light of evolving EU law, section 112b EnWG seeks to adapt the regulatory framework for the joint regulation and financing of gas and hydrogen networks.



The amendments to the EnWG add new or revise existing definitions under section 3, and include new provisions on the regulation of hydrogen networks under sections 28j-q, and on transitional regulation under sections 133a-c EnWG.

Separate definition of “hydrogen”

In the definition of “energy” in section 3 No. 14 EnWG, the words “and gas” are replaced by the words “gas and hydrogen.” This basically places hydrogen alongside gas as a separate energy carrier. However, this should only apply to pure hydrogen pipelines. For the process of blending hydrogen into the natural gas grid, the existing legal framework remains in place. This is also illustrated by the unchanged wording of section 3 No. 19a EnWG, pursuant to which hydrogen produced by water electrolysis also falls under the gas definition.

Under the new definition, hydrogen is only considered “energy” within the meaning of the EnWG if it is used for grid-based energy supply, but not if used for non-performance-related supply.

Separate definition of “hydrogen network”

“Hydrogen network” is now defined independently in the EnWG and [classified as a general supply network](#). Therefore, industrial pipelines that connect a generation plant only with specific consumption points and therefore are not general supply pipelines, are not covered by the EnWG under the term “hydrogen network.”

Definitions of “gas” and “biogas”

The existing definitions of “gas” and “biogas” will be amended to distinguish clearly between the two substances. As a result, the existing definition of “gas” in the EnWG will be cleansed of its “hydrogen components.”

Distinction between “hydrogen network operators” and “hydrogen plant operators”

A distinction is made between “hydrogen network operators” and “hydrogen plant operators” on the basis of the new unbundling rules. Pursuant to section 28m EnWG, operators of hydrogen networks are not allowed to build, operate or own facilities for the production, storage, and distribution of hydrogen. The intention of this provision is to prevent cross-subsidization and discrimination.

Opt-in clause until the new provisions under the EnWG come into effect

In the transitional phase, until new regulations have to be implemented in the EnWG as a result of new EU provisions, hydrogen pipeline operators are free to decide whether they wish to be subject to the hydrogen network regulation under the EnWG (via an opt-in clause). Operators of hydrogen storage facilities are therefore able to declare that access to their facilities should be in accordance with the regulations of the EnWG. Submission can be made by issuing an “opt-in declaration.” If the pipeline operators, however, refuse to be subject to the EnWG, the few existing industrial hydrogen networks are not subject to the EnWG network regulation, until new EnWG regulations come into force.

If operators choose to opt-in under the regulations of the EnWG in the transitional phase, the regulations of the EnWG apply holistically, and not only to individual pipeline sections but to all the operators sections. Those who choose not to be regulated are not covered by the requirements regarding network access, tariff setting and unbundling. However, it is expected that this decision will only be of a temporary nature, because the German legislature (*Deutscher Bundestag*) anticipates that, in the medium term, it will be necessary to introduce comprehensive and mandatory regulations, without an opt-in clause, that apply for all hydrogen networks.

Infrastructure

Section 113a of the EnWG governs the transfer and continued validity of rights of way and land easements for gas pipelines. The provisions also apply to the operation of these pipelines if transporting hydrogen. This is intended to facilitate the conversion of gas pipelines into hydrogen pipelines.

Under section 113b EnWG, transmission system operators can identify pipelines that could be converted into hydrogen pipelines as part of the gas network development plan. They must ensure that the remaining network can meet capacity requirements.



Finance

As mentioned, the definition of “gas” in the EnWG will not be extended to hydrogen. Hydrogen will be regulated separately in the EnWG. This also means that there is no provision for interlinked financing via natural gas network fees.

On the question of financing, the BMWi holds the opinion that joint financing via joint network tariffs, to be paid by natural gas and hydrogen customers, is not permissible under EU law. According to the BMWi, financing should therefore be provided solely by hydrogen grid users, although public funding is likely to be required to avoid prohibitively high grid-usage tariffs from preventing the market from ramping up.

Section 28o of the EnWG provides for a cost-based tariff largely in line with section 21 of the EnWG.

The terms and conditions, and tariffs must be reasonable, non-discriminatory, and transparent, and must not be less favorable than those applied by network operators in comparable cases for services within their company or to affiliated or associated companies.

Operators of hydrogen networks have the option of receiving a monetary subsidy if they submit to an assessment by the German Federal Network Agency (BNetzA) of the adequacy of the respective hydrogen network infrastructure in terms of secure and economical supply. The prerequisites for such an assessment of the need for individual hydrogen network infrastructures are regulated under section 28p of the EnWG. If the assessment is successful in respect of the operator's hydrogen network, the Federal Network Agency (BNetzA) approves the costs determined. However, the charges are not approved in accordance with section 23a of the EnWG.

Finally there is a provision in the EnWG, authorizing ordinances to establish the terms and conditions for the determination of costs.





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.

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, and is expected to publish its findings later this year. Over the coming months, 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
- 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 information 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 pending 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](#).



UAE

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, this 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. For example, in his first state of the union address, President Joe 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. Comments on the regional clean hydrogen hub RFI were due on March 21, 2022.

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.” Comments on this RFI were due on March 29, 2022.





Authors

Nicolas Borda (United States)



Nicolas is based in Reed Smith's Houston office and is an international business transaction lawyer with a focus on energy and natural resources, infrastructure, and Latin America. Nicolas focuses his energy practice on all facets of oil and gas (upstream, midstream, and downstream), power and renewable energy projects. He advises clients on international and cross-border transactions, regulatory matters, mergers and acquisitions, corporate, joint ventures, energy infrastructure project development, government procurement, public policy, anticorruption, compliance, HSE, NAFTA, USMCA, international trade, and dispute resolution in the energy sector. Nicolas has been involved in many energy projects and transactions throughout Latin America. Nicolas is ranked by Chambers Global and Chambers Latin America. Nicolas advises U.S. and international companies in all kinds of business and cross border transactions regarding natural resources.

Simone Goligorsky (United Kingdom)



Simone is a partner based in Reed Smith's London office. She advises banks, hedge funds, utilities and energy and commodity companies on a variety of transactional, trading, cross-border regulatory, compliance and risk management matters within the energy sector. Simone has extensive experience working on transactions involving the acquisition and disposal of energy and non-energy commodity portfolios, assets and businesses; along with more structured transactions, involving energy management and market optimization structures, as well as market access arrangements. She has documented, structured, analysed and negotiated both physical and financial UK and European energy commodity agreements for a range of clients. Simone is ranked as a Rising Star in the Legal 500 UK.

Simon Grieser (Germany)



Simon is a founding partner of the firm's Frankfurt office and a member of the Financial Industry Group of Reed Smith. His practice focuses on the advice of national and international financial institution in connection with banking & finance and banking regulatory issues as well as on securitization. He advises frequently investors and financiers on all aspects of regulatory topics to provide financial services and energy matters in Germany. He is a frequent speaker and author on banking & finance and regulatory topics. National and international publications recommend him regularly in the area of "Regulatory Banking Sector."

Colette D. Honorable (United States)



Colette leads the firm's Energy Regulatory group and is a member of the firm's executive committee. She is also a member of the firm's ESG group and is resident in the Washington, D.C., office. Colette is a highly regarded thought leader and strategist in domestic and international energy sectors. Colette recently served as Commissioner at the Federal Energy Regulatory Commission (FERC). She was nominated by President Barack Obama in August 2014, and unanimously confirmed by the U.S. Senate, serving from January 2015 until her term expired in June 2017. At the firm, Colette is a trusted advisor and counselor to several Fortune 500 energy companies, investor-owned utilities, renewable energy and technology companies. In this capacity, she provides strategic advice and counsel in a number of areas, including ratemaking matters, clean energy integration, performance-based ratemaking, achieving ESG goals and environmental justice issues. In her work, Colette supports clients working to mitigate the impacts of climate change, and also advises clients on the development and execution of inclusion strategies.



Eric Lin (China)



Eric has more than 22 years' experience in energy and natural resources projects, cross-border M&A and foreign direct investment in China. He has particular experience in advising on complex foreign investment transactions in China with some of them being the first of their kind or multibillion-dollar joint ventures. Eric has also developed a China outbound practice in advising Chinese clients for overseas investment. Eric has worked on transactions involving the industries of power (conventional, renewable and hydro), mining, petrochemicals and machinery production for the hydrogen supply chain.

Adela Mues (UAE)



Adela is a partner in our Global Corporate Group in Dubai. She has extensive experience working on broad transactional and regulatory matters across a variety of industries, focusing on venture capital, private equity, mergers and acquisitions, corporate reorganizations, joint ventures, fund formation, equity capital markets, commercial agreements, employment, and general corporate matters. Adela has worked extensively across the Middle East and the United Kingdom and has been based in the Middle East for over 13 years.

Debra A. Palmer (United States)



Debra is based in the Washington, D.C., office. Her practice focuses on energy regulatory matters, with an emphasis on matters involving the Federal Energy Regulatory Commission (FERC), state public utility commissions, and the federal courts. She has more 30 years of experience with federal regulatory issues facing the energy industry, and has assisted her clients in pursuing their goals before FERC, state regulatory agencies, and the federal appellate courts. Debra advises clients with varied interests in the energy & natural resources sector, including natural gas companies, local distribution companies, oil and gas pipeline companies, and electric utilities. Her ability to understand regulators' goals and present her clients' interests accordingly has helped her become a leading advocate for energy firms across the United States. Deb understands the interrelationship between operational, business, and regulatory concerns faced by the energy industry. She has cultivated a deep knowledge in these areas, earning a reputation as a trusted advisor in the planning, operating, financial, regulatory and reliability issues facing the rapidly changing natural gas and electric industries.

Hagen Rooke (Singapore)



Hagen is based in Reed Smith's Singapore office and has extensive experience advising on financial regulatory matters. His practice covers a broad range of areas, including financial services licensing and approvals, conduct of business and regulatory change projects. His clients include banks, payment services firms, digital asset exchanges and dealers, capital markets intermediaries, funds and fund managers, exchanges, proprietary trading houses and commodity groups. With extensive experience of engaging with the Monetary Authority of Singapore (MAS) and other regulators, and of practising in Asia and Europe, Hagen provides strategically valuable advice and has a unique understanding of the international issues and synergies that are relevant to clients. Clients have also commented that "His advice has always been practical, sharp, commercial and technically sound."



Nicolas Walker (France)



Nicolas is a partner in the firm's Paris office. He focuses on environmental law, urban planning and more generally in all aspects of administrative and real estate law. Bilingual French-English and dual-trained in Common and Civil law systems, Nicolas assists a range of international clients with large development projects, compliances issues and relationships with French government authorities. Nicolas appears regularly before the administrative courts in merits review cases. Nicolas also devotes a significant portion of his practice to corporate social responsibility and human rights matters, with a focus on environmental sustainability, green advertising, reforestation (public-private partnerships) and the right to water for vulnerable communities.

Karim Alhassan (United States)



Karim is based in the Washington, D.C., office and focuses his practice on assisting clients with their compliance obligations regarding data privacy and security. More specifically, he has experience advising clients on their regulatory obligations stemming from emerging state privacy laws, as well as assisting in the defense of companies subject to regulatory investigations and actions by the Federal Trade Commission. Additionally, Karim has experience navigating the emerging and rapidly changing regulatory landscape in connection with digital assets, assisting on matters related to cryptocurrency advertising and under the federal securities laws.

Albertine Aquenin (France)



Albertine is an associate in the Paris office in the Energy & Natural Resources Industry Group, specialised in public law, with experience in environmental law, urban planning energy law, public contracts and procurement, procedures with regulators and all forms of merits and judicial review of government action. Albertine assists international and domestic clients with their legal and regulatory compliance issues and relationships with French public institutions.

Nicole Cheung (United Kingdom)



Nicole is an associate based in Reed Smith's London office. She works with clients in the energy and commodities sectors on a variety of transactional, cross-border regulatory, compliance and risk management matters.



Tufayel Hussain (UAE)



Tufayel is an associate in the Global Corporate Group. He advises clients across a broad range of sectors on corporate and commercial matters, with particular experience in mergers and acquisitions, cross-border transactions and commercial advisory work. Tufayel's experience covers a wide range of industry sectors and has acted for various clients, including major listed corporations, growth companies and start ups. Tufayel qualified in London and is based in the firm's Dubai office. He has gained invaluable commercial exposure in the Middle East and has extensive experience in the laws of that region and working for companies and assisting with their general commercial needs.

Zahir Sabur (UAE)



Zahir is a senior associate in our Global Corporate Group in Dubai with over 10 years' experience advising on a broad range of transactions across the world, including the United Kingdom, North and South America, the Middle East and Africa. Zahir's practice focusses on international M&A and private equity transactions, direct and indirect investment, venture capital and joint ventures. He also counsels clients on corporate governance and ethics and compliance matters involving government entities and multinational corporations. Zahir has depth of experience across a broad range of sectors, including oil & gas (both exploration and downstream), renewables, commodity trading, real estate, agriculture, health care, banking, hospitality and life sciences.

Ievgeniia Burkhart (United Kingdom)



Eva is a paralegal in our Energy & Natural Resources Group and Reed Smith's Future Trainee Solicitor. Eva joined the firm as a Queen Mary placement student in 2021 and gained experience in contentious and non-contentious energy and commodity matters. Eva has assisted clients with complex commercial disputes before the English High Court, as well as acted in trade association arbitrations, including under the GAFTA and FOSFA rules. Eva's non-contentious experience has involved drafting a bespoke Reed Smith's precedent for an offtake of oil products.

