HyLAW

Deliverable 4.4
EU regulations and directives which impact the deployment of FCH technologies

Main Author(s): Alexandru Floristean, Hydrogen Europe
Contributor(s): Nicolas Brahy, Hydrogen Europe; Dennitsa Nozharova; DWV

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WPL	Dennis Hayter, UKHFCA
Coordinator	Nicolas Brahy, Hydrogen Europe
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Table of contents

TABLE OF CONTENTS 3

1. EXECUTIVE SUMMARY 4
2. INTRODUCTION 5
3. FINDINGS 5
   - 3.1. Production of Hydrogen 6
   - 3.2. Storage of Hydrogen 8
   - 3.3. Transport and Distribution of Hydrogen 10
   - 3.4. The use of Hydrogen as a fuel and Refuelling Infrastructure 11
     - 3.4.1. The use of Hydrogen as Fuel 11
     - 3.4.2. Hydrogen Refuelling Stations 13
   - 3.5. Hydrogen Vehicles 16
     - 3.5.1. Cars, taxis, buses, trolleybuses, trucks 16
     - 3.5.2. Bikes, Motorcycles, Quadracycles 19
     - 3.5.3. Boats, Ships 20
   - 3.6. Electricity grid issues for electrolysers 21
   - 3.7. Gas grid issues 22
   - 3.8. Stationary power; fuel cells (other issues than gas grid and electricity) 25
   - 3.9. Introduction of green hydrogen in Industry 28
4. CONCLUSIONS 28
5. APPENDIX 29
   - 5.1. Full List of EU and International References 29

1. Executive summary

<To be developed in the final version of this deliverable>

2. Introduction

The call for proposal did not require the analysis of EU legislation, however, HyLAW consortium partners consider that such an analysis is absolutely essential. Indeed, some of the legal and administrative processes and rules affecting the deployment of Hydrogen applications in the EU have their origin in EU legislation or are, to a certain extent, impacted by it.

This deliverable focuses on EU legislation which affects rules and processes applicable to hydrogen technologies. It lists the applicable legal acts and describes the scope of the relevant parts, linking them to the category, application and process which they affect.

The report is structured along the nine categories of hydrogen applications covered by the HyLaw project (see Figure 1)

Figure 1: Categories of Hydrogen applications covered by the HyLaw project

Categories of applications
1. Production of Hydrogen
2a. Stationary Storage (Gas / Liquid / Metal Hydride)
2b. Long-term storage (Underground)
3. Transport and distribution of hydrogen
4. Hydrogen as a fuel and refuelling infrastructure for mobility purposes
5. Vehicles
6. Electricity grid issues for electrolysers
7. Gas grid issues
8. Stationary power; fuel cells (other issues than gas grid and electricity)
9. Introduction of green hydrogen in Industry

3. Findings

EU legislation is linked with the deployment of many of the hydrogen applications covered by the HyLaw project. A long list of legislative acts (see full list in Appendix) have been found to be (in different ways) relevant to the deployment of hydrogen technologies.

Many of the relevant acts **impact hydrogen** technology deployment **indirectly**, through its inclusion within the scope of a wider regulatory area (e.g. health and safety, environmental law, labour law, transport law). These EU legislative acts are often the source of obligations for developers and manufacturers. The extent to which they represent an unreasonable barrier to hydrogen deployment depends on the national implementation of these obligations and differs across the countries covered. D4.1 (Country Comparison) and D3.4 (National Policy Papers) will present these barriers in more detail.

Given the increased importance of hydrogen as an energy carrier and as an alternative fuel, a growing body of **EU law references hydrogen directly** and specifically regulates certain elements, such as the GHG intensity of hydrogen, technical requirements to be followed by refuelling stations, etc. These EU Legislative acts, have a major impact on the deployment of Hydrogen Technology, especially on the use of Hydrogen as a fuel and are rarely the source of an unreasonable barrier to hydrogen deployment.

Nevertheless, as the results of the analysis of legal and administrative processes have shown, many of the barriers to hydrogen deployment are a result of regulatory gaps caused by a lack of harmonisation of rules and approaches. (e.g. green hydrogen, certificates of origin, etc.) or by involuntary mismatches between rules imposed at national level (e.g. standards for fuel quality and measurement) rather than high legal and regulatory barriers imposed at EU level.

3.1. Production of Hydrogen

The **production of Hydrogen** is impacted, at EU level, by three legislative acts: the SEVESO Directive, the ATEX Directive and Directive 2010/75/EU on industrial emissions. These acts apply specifically to the production of Hydrogen and generate important obligations on operators involved in the production of Hydrogen as well as on manufacturers of equipment used in the process.

The SEA and EIA Directives apply indirectly to hydrogen production; While they do not explicitly refer to Hydrogen production within their scope, they often require the development of an Environmental Impact Assessment (EIA), subject to national rules (e.g. above 5 tons of hydrogen).

General environmental as well as safety and health requirements also (may) apply; however, these have a broad application and are not hydrogen specific therefore, the list of legislation falling within this category presented in this deliverable is not aimed at being comprehensive.

The EU legislation relevant to the production of Hydrogen is summarized in the table below:

Table 1: EU legislation relevant to the Production of Hydrogen

Legislative Act	Scope of relevant parts and explanations
Directive 2012/18/EU of the European Parliament and of the Council of 4 July 2012 on the control of major-accident hazards involving dangerous substances (so-called **SEVESO Directive**)	The Directive covers situations where dangerous substances may be present (e.g. during processing or storage) in quantities exceeding certain thresholds. It establishes: • General obligations on the operator (Article 5) • Notification (information on the form and amount of substances, the activity, and the surrounding environment) of all concerned establishments (Article 7), • The obligation to deploy a major accident prevention policy (Article 8), • The obligation to produce a safety report for upper-tier establishments (Article 10); • The obligation to produce internal emergency plans for upper tier establishments (Article 12); • Authorities to exert control of the siting of new establishments, modifications to new establishments, and new developments including transport routes, locations of public use and residential areas in the vicinity of establishments, (Article 13) • The obligation to conduct public consultations on specific individual projects that may involve risk of major accidents (Article 15) Annex I, Part 1, establishes Hydrogen as a dangerous substance (therefore within scope) and lists the quantity of hydrogen for the application of lower-tier requirements (≥ 5t) and upper-tier requirements (≥ 50t). For quantities of less than 5 tonnes of hydrogen, none of the obligations above would apply.
ATEX Directive 2014/34/EU - covering equipment and protective systems intended for use in potentially explosive atmospheres	The Directive defines the essential health and safety requirements and conformity assessment procedures (Article 4) to be applied before products are placed on the EU market and is significant for the engineering of hydrogen production plants. It covers *inter alia* equipment and protective systems intended for use in potentially explosive atmospheres. The Directive requires employers to classify areas where hazardous explosive atmospheres may occur into zones. The classification given to a particular zone, and its size and location, depends on the likelihood of an explosive atmosphere

	occurring and its persistence if it does. The Directive requires the manufacturers to design their equipment to be suitable for use within their customer's explosive atmosphere. Therefore, manufacturers of equipment rely upon their customer to give them information about the classification of the zone and the flammable substance(s) within that zone. The Directive describes the rules and regulations for all actors in the value chain, with respect to ensuring that only safe equipment for use in potentially explosive atmospheres are sold and applied. It provides regulation of how the equipment shall be constructed, produced and documented, as well as the rules for CE-labelling. It also contains, *inter alia* conformity assessment procedures (Art 13) EU declaration of conformity (Art 14) and General principles of the CE marking (Art 16)
Directive 2010/75/EU **on industrial emissions** (integrated pollution prevention and control	The Directive, which applies to the production of hydrogen (Annex I, point 4.2) contains *inter alia*: • Basic obligations of the operator (Article 11) • The content of permitting applications (Article 12) • Permitting Conditions (Article 14) • Emission limit values, (Article 15) • Monitoring requirements (Article 16) • Access to information and public participation (Article 24)
SEA and EIA Directives: • Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment (SEA Directive) • Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment (EIA Directive) • Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment).	The Directives (and their subsequent amendments) define a strategic environmental impact assessment procedure. The procedure is summarized as follows: the developer may request the competent authority define what should be covered by the EIA information to be provided by the developer (scoping stage); the developer must provide information on the environmental impact (EIA report – Annex IV); the environmental authorities and the public (and affected Member States) must be informed and consulted; the competent authority decides, taken into consideration the results of consultations. The public is informed of the decision afterwards and can challenge the decision before the courts. In line with the EIA Directive, Production and Storage of Hydrogen falls within the projects listed in Annex II (6a and 6c -production of chemicals; and storage facilities for chemical product), for which Member States shall determine whether the project shall be made subject to an assessment or not. In some EU countries, storage of 5 tons of hydrogen or more falls within the scope of the Directives. The latest amendment, (Directive 2014/52/EU) introduces minimum requirements with regards to the type of projects subject to assessment, the main obligations of developers, the content of the assessment and the participation of the competent authorities and the public.
Council Directive 98/24/EC of 7 April 1998 on the protection of the health and safety of workers from the risks related to chemical agents at work	The requirements of this Directive apply where hazardous chemical agents are present or may be present at the workplace (Article 1.2). When applicable, the Directive imposes certain obligation on the employers • Determination and assessment of risk (Article 4) • General principles for prevention of risks (Article 5) • Specific protection and prevention measures (Article 6) • Arrangements to deal with accidents (Article 7) • Information and training for workers (Article 8)
Directive 2004/35/CE of the European Parliament and of the Council of 21 April 2004 on environmental liability with regard to the prevention and remedying of environmental damage	The Environmental Liability Directive ("ELD") establishes a framework of environmental liability, based on the "polluter-pays" principle, to prevent and remedy environmental damage. The ELD places the financial consequences of certain types of harm caused to the environment on the economic operator who caused this harm. It covers: (a) "damage to protected species and natural habitats" (b) "water damage" and (c) "land damage".

	Additionally, where imminent threats exist or when required by the competent authority operators are required to take preventive measures. The Directive applies to the production to Hydrogen by reference to Annex I, point 4.2 of Directive 2010/75/EU on industrial emissions
Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances [CLP regulation]	The CLP Regulation (Classification, Labelling and Packaging of substances and mixtures) entered into force on the 20th of January 2009 and replaced the two previously existing laws or legal instruments, the Dangerous Substance Directive (DSD) and the Dangerous Preparation Directive (DPD). CLP is based on the Globally Harmonized System (GHS), a set of recommendations drafted by the United Nations. The CLP Regulation is applied to substances since 2010 and to mixtures since June 2015. The Regulation includes hydrogen in its list of substances of hazardous substances (Part 3, Table 3.1) establishes rules for the harmonised classification and labelling of hydrogen.
Directive 2009/104/EC of the European Parliament and of the Council of 16 September 2009 concerning the minimum safety and health requirements for the use of work equipment by workers at work	The general provisions of Chapter II (Employers obligations) apply. However, this legislation applies broadly and is not to be regarded as hydrogen specific.
Directive 2014/68/EU of the European Parliament and of the Council of 15 May 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of pressure equipment.	The Pressure Equipment Directive, applies to the design, manufacture and conformity assessment of pressure equipment and assemblies with a maximum allowable pressure greater than 0.5 bar. Technical requirements and classification according to an ascending level of hazard, depending on pressure, volume or nominal size, the fluid group and state of aggregation, as well as conformity assessment procedures are laid down and required by the Directive Hydrogen is a fluid which falls under Group 1. Group 1 consists of dangerous fluids (flammable, toxic and/or oxidizing). As a result, a large part of the equipment for H2 production, storage and distribution must meet the technical requirements set out in the Pressure Equipment Directive (PED).
Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora.	Applicable in certain conditions (e.g. if facility is located in a special area of conservation, (Annex I)
Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds.	Applicable in certain conditions (e.g. if facility is located in Special Protection Areas (SPAs) for rare or vulnerable species

3.2. Storage of Hydrogen

From the perspective of EU legislation, **the storage of hydrogen** is affected by some of the same legislative acts which impact the production of hydrogen. In particular, both the SEVESO Directive (above 5 tons), the ATEX and Pressure Equipment Directives apply, imposing a number of obligations on operators and manufacturers of equipment.

Similarly, The SEA and EIA Directives would also apply, subject to national conditions (e.g. above 5 tons of hydrogen storage).

Finally, general environmental as well as safety and health requirements also (may) apply; however, these have a broad application and are not hydrogen specific, therefore, as above the list presented of acts within this category presented in this deliverable is not aimed at being comprehensive.

Table 2: EU legislation relevant to Hydrogen Storage

Legislative Act	Scope of relevant parts and explanations
Directive 2012/18/EU of the European	The Directive covers situations where dangerous substances may be present

Parliament and of the Council of 4 July 2012 on the control of major-accident hazards involving dangerous substances (so-called **SEVESO Directive**)	(e.g. during processing or storage) in quantities exceeding certain thresholds. It establishes: • General obligations on the operator (Article 5) • Notification (information on the form and amount of substances, the activity, and the surrounding environment) of all concerned establishments (Article 7), • The obligation to deploy a major accident prevention policy (Article 8), • The obligation to produce a safety report for upper-tier establishments (Article 10); • The obligation to produce internal emergency plans for upper tier establishments (Article 12); • Authorities to exert control of the siting of new establishments, modifications to new establishments, and new developments including transport routes, locations of public use and residential areas in the vicinity of establishments, (Article 13) • The obligation to conduct public consultations on specific individual projects that may involve risk of major accidents (Article 15) Annex I, Part 1, establishes Hydrogen as a dangerous substance (therefore within scope) and lists the quantity of hydrogen for the application of lower-tier requirements (≥ 5t) and upper-tier requirements (≥ 50t).
ATEX Directive 2014/34/EU - covering equipment and protective systems intended for use in potentially explosive atmospheres	The Directive defines the essential health and safety requirements and conformity assessment procedures (Article 4) to be applied before products are placed on the EU market and is significant for the engineering of hydrogen production plants. It covers *inter alia* equipment and protective systems intended for use in potentially explosive atmospheres. The Directive requires employers to classify areas where hazardous explosive atmospheres may occur into zones. The classification given to a particular zone, and its size and location, depends on the likelihood of an explosive atmosphere occurring and its persistence if it does. The Directive requires the manufacturers to design their equipment to be suitable for use within their customer's explosive atmosphere. Therefore, manufacturers of equipment rely upon their customer to give them information about the classification of the zone and the flammable substance(s) within that zone. The Directive describes the rules and regulations for all actors in the value chain, with respect to ensuring that only safe equipment for use in potentially explosive atmospheres are sold and applied. It provides regulation of how the equipment shall be constructed, produced and documented, as well as the rules for CE-labelling. It also contains, *inter alia* conformity assessment procedures (Art 13) EU declaration of conformity (Art 14) and General principles of the CE marking (Art 16)
SEA and EIA Directives: • Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment (SEA Directive) • Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment (EIA Directive)	The Directives define a strategic environmental impact assessment procedure. The procedure is summarized as follows: the developer may request the competent authority define what should be covered by the EIA information to be provided by the developer (scoping stage); the developer must provide information on the environmental impact (EIA report – Annex IV); the environmental authorities and the public (and affected Member States) must be informed and consulted; the competent authority decides, taken into consideration the results of consultations. The public is informed of the decision afterwards and can challenge the decision before the courts. In line with the EIA Directive, Production and Storage of Hydrogen falls

• Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment).	within the projects listed in Annex II (6a and 6c -production of chemicals; and storage facilities for chemical product), for which Member States shall determine whether the project shall be made subject to an assessment or not. In some EU countries, storage of 5 tons of hydrogen or more falls within the scope of the Directives. The latest amendment, (Directive 2014/52/EU) introduces minimum requirements with regards to the type of projects subject to assessment, the main obligations of developers, the content of the assessment and the participation of the competent authorities and the public.
Directive 2014/68/EU of the European Parliament and of the Council of 15 May 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of pressure equipment.	The Pressure Equipment Directive, applies to the design, manufacture and conformity assessment of pressure equipment and assemblies with a maximum allowable pressure greater than 0.5 bar. Technical requirements and classification according to an ascending level of hazard, depending on pressure, volume or nominal size, the fluid group and state of aggregation, as well as conformity assessment procedures are laid down and required by the Directive Hydrogen is a fluid which falls under Group 1. Group 1 consists of dangerous fluids (flammable, toxic and/or oxidizing). As a result, a large part of the equipment for H2 production, storage and distribution must meet the technical requirements set out in the Pressure Equipment Directive (PED).

3.3. Transport and Distribution of Hydrogen

The **transportation and distribution of hydrogen** is subject to the same rules applicable to the transport of dangerous goods by road, by rail or by inland waterway within or between Member States. At European level the most relevant acts are Directive 2008/68/EC on the inland transport of dangerous goods and the UN agreements on which it is based (ADR, RID and AND).

In addition to the above, Directive 2010/35/EU on transportable pressure equipment lays down rules which affect the particularities of hydrogen transportation, as they refer to the assessment of transportable cylinders, tubes, cryogenic vessels and tanks for transporting gases.

Transportation of hydrogen is also subject to the use of safety data sheets whose content is described in Regulation 453/2010/ EU (as part of the REACH legislative acquis).

Table 3: EU legislation relevant to the Transport and Distribution of Hydrogen

Legislative Act	Scope of relevant parts and explanations
Directive 2008/68/EC of the European Parliament and of the Council of 24 September 2008 on the inland transport of dangerous goods.	This Directive applies to the transport of dangerous goods by road, by rail or by inland waterway within or between Member States, including the activities of loading and unloading, the transfer to or from another mode of transport and the stops necessitated by the circumstances of the transport. (Article 1) While the ADR, RID and ADN lay down uniform rules for the safe international transport of dangerous goods, this regulation is on how to extend such rules to national transport in order to harmonize across the EC and ensure the proper functioning of the common transport market.
Directive 2010/35/EU of 16 June 2010 on transportable pressure equipment	The Directive applies to the design, manufacture, conformity assessment and periodic reassessment of transportable cylinders, tubes, cryogenic vessels and tanks for transporting gases as well as hydrogen cyanide, hydrogen fluoride and hydrofluoric acid. It also covers their associated valves and other pressure equipment. The Directive defines 3 categories for pressure equipment, based on its pressure volume product (P.V) in bar litres and hence its stored energy.
Commission Regulation (EU) No 453/2010 of 20 May 2010 amending	The Regulation defines the requirement for safety data sheets. It provides, as part of Annex 1 and 2 detailed requirements for the compilation of safety data

Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)	sheets, which should include, *inter alia*: (i) Identification of the substance/mixture and of the company/undertaking, (ii) Hazards identification, (iii) Composition/information on ingredients, (iii) First aid measures, (iv) Accidental release measures, (v) Handling and storage, (vi) Exposure controls/personal protection, (vii) Physical and chemical properties, (viii) Toxicological information, (ix) Ecological information, (x) Transport information, (xi) Regulatory information
Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances [CLP regulation]	The CLP Regulation (Classification, Labelling and Packaging of substances and mixtures) entered into force on the 20th of January 2009 and replaced the two previously existing laws or legal instruments, the Dangerous Substance Directive (DSD) and the Dangerous Preparation Directive (DPD). CLP is based on the Globally Harmonized System (GHS), a set of recommendations drafted by the United Nations. The CLP Regulation is applied to substances since 2010 and to mixtures since June 2015. The Regulation includes hydrogen in its list of substances of hazardous substances (Part 3, Table 3.1) establishes rules for the harmonised classification and labelling of hydrogen.
Other international agreements:	
European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR)	The parts on general regulations, classification, list of dangerous substances and exceptions for specific quantities, and regulation of transportation, loading, unloading and handling are relevant to hydrogen technologies.
Regulations concerning the International Carriage of Dangerous Goods by Rail (RID)	
European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways (ADN)	
International Maritime Dangerous Goods (IMDG)	
Technical Instructions for the Safe Transport of Dangerous Goods by Air	

3.4. The use of Hydrogen as a fuel and Refuelling Infrastructure

3.4.1. The use of Hydrogen as Fuel

The most relevant EU legislative act for the use of Hydrogen as a fuel is the **Alternative Fuels Infrastructure Directive** (AFID). The AFID establishes a common framework of measures for the deployment of alternative fuels infrastructure in the Union in order to minimize dependence on oil and to mitigate the environmental impact of transport. It sets out minimum requirements for the building-up of alternative fuels infrastructure, including refuelling points for hydrogen.

Directive 2009/28/EC on the promotion of the use of energy from renewable sources (RED) **has a strong, albeit indirect impact** on hydrogen fuel deployment as it sets mandatory national targets for the overall share of energy from renewable sources. The Directive also lays down a legally binding definition of renewable liquid and gaseous transport fuels of non-biological origin (which would apply to Hydrogen) for the purpose of calculating the targets.

Although not originally designed to have any effect on the use of Hydrogen as a Fuel, Directive 98/70/EC relating to the quality of petrol and diesel fuels (and it's subsequent amendments) incentivises the use of low carbon intensity fuels (including hydrogen) by requiring a 6% reduction in life cycle greenhouse gas emissions per unit of energy by 2020. For the purpose of monitoring the progress towards this target, **Directive (EU) 2015/652 impacts hydrogen directly** by establishing the legally binding efficiency factor of hydrogen fuel cell electric powertrains (0,4) and the GHG intensity of Compressed Hydrogen in a fuel cell (expressed in g CO2eq/MJ) produced by various methods.

Table 4: EU Legislation relevant to the use of Hydrogen as Fuel

Legislative Act	Scope of relevant parts and explanations
Directive 2014/94/EU of the European Parliament and of the Council of 22 October 2014 on the deployment of alternative fuels infrastructure (AFID)	The AFID establishes a common framework of measures for the deployment of alternative fuels infrastructure in the Union in order to minimize dependence on oil and to mitigate the environmental impact of transport. The Directive sets out minimum requirements for the building-up of alternative fuels infrastructure, including recharging points for electric vehicles and refuelling points for natural gas (LNG and CNG) and hydrogen, to be implemented by means of Member States' national policy frameworks, as well as common technical specifications for such recharging and refuelling points, and user information requirements. Article 2 defines 'Alternative fuels' as *fuels or power sources which serve, at least partly, as a substitute for fossil oil sources in the energy supply to transport and which have the potential to contribute to its decarbonisation and enhance the environmental performance of the transport sector*. They include, inter alia: hydrogen. It lays down, in Article 5, that Member States which decide to include hydrogen refuelling points accessible to the public in their national policy frameworks shall ensure that, by 31 December 2025, an appropriate number of such points are available, to ensure the circulation of hydrogen-powered motor vehicles, including fuel cell vehicles, within networks determined by those Member States, including, where appropriate, cross-border links. Annex II contains technical specifications for hydrogen refuelling points for motor vehicles and additionally lays down that: • Outdoor hydrogen refuelling points dispensing gaseous hydrogen used as fuel on board motor vehicles shall comply with the technical specifications of the ISO/TS 20100 Gaseous Hydrogen Fuelling specification. • The hydrogen purity dispensed by hydrogen refuelling points shall comply with the technical specifications included in the ISO 14687-2 standard. • Hydrogen refuelling points shall employ fuelling algorithms and equipment complying with the ISO/TS 20100 Gaseous Hydrogen Fuelling specification. • Connectors for motor vehicles for the refuelling of gaseous hydrogen shall comply with the ISO 17268 gaseous hydrogen motor vehicle refuelling connection devices standard.
Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources (RED) • Directive (EU) 2015/1513 amending Directive 98/70/EC relating to the quality of petrol and diesel fuels and amending Directive 2009/28/EC on the promotion of the use of energy from renewable sources (Indirect Land Use Change (ILUC) Directive)	Directive 2009/28/EC establishes a common framework for the promotion of energy from renewable sources. It sets mandatory national targets for the overall share of energy from renewable sources in gross final consumption of energy and for the share of energy from renewable sources in transport. It sets national overall targets for the share of energy from renewable sources (Article 3 and part A of Annex I) as well as a legally binding 10% target (energy content) for renewable energy in transport in 2020. It also, (in Article 15) defines the role and the scope of guarantees of origin of electricity, heating and cooling produced from renewable energy sources Directive (EU) 2015/151 additionally promotes the use of advanced sustainable biofuels and **renewable liquid and gaseous transport fuels of non-biological origin**. It defines[1] "Renewable liquid and gaseous transport fuels of non-biological origin" as *liquid or gaseous fuels other than biofuels whose energy content comes from renewable energy sources other than biomass, and which are used in transport;* It also provides that the contribution of renewable liquid and gaseous transport fuels of

[1] Directive 2015/1513, Article 1 *Amendments to Directive 98/70/EC*

	non-biological origin towards the target shall be considered to be twice its energy content.[2]
Directive 98/70/EC relating to the quality of petrol and diesel fuels and amending Council Directive 93/12/EEC (FQD) • Directive 2009/30/EC amending Directive 98/70/EC as regards the specification of petrol, diesel and gas-oil and introducing a mechanism to monitor and reduce greenhouse gas emissions.	Although not originally designed to impact (negatively or positively) alternative fuels (The objective of these legislative acts being to set technical specifications on health and environmental grounds for fuels to be used for vehicles equipped with positive-ignition and compression-ignition engines), Directive 98/70/ EC and its subsequent amendments indirectly affect the use of fuels which are defined by low life cycle greenhouse gas emissions per unit of energy as well the use of carbon capture and storage. In particular, Article 7a of Directive 2009/30/EC states that Member States shall require suppliers to reduce as gradually as possible life cycle greenhouse gas emissions per unit of energy from fuel and energy supplied by 6 % by 31 December 2020 and aim for an additional 2% reduction through the use of any technology (including carbon capture and storage) capable of reducing life cycle greenhouse gas emissions per unit of energy from fuel or energy supplied.
Directive (EU) 2015/652 of 20 April 2015 laying down calculation methods and reporting requirements pursuant to Directive 98/70/EC of the European Parliament and of the Council relating to the quality of petrol and diesel fuels	This Directive establishes the Method for the calculation and reporting of the life cycle greenhouse gas intensity of fuels and energy by suppliers It establishes the efficiency factor of the hydrogen fuel cell electric powertrain to be 0,4. It also lays down the average life cycle greenhouse gas intensity default values for fuels other than biofuels and electricity. It lays down the GHG intensity of compressed synthetic methane in a spark ignition engine resulting from the Sabatier reaction of hydrogen from non-biological renewable energy electrolysis at 3,3 gCO2eq/MJ (the lowest GHG intensity of the fuels considered) and the Compressed Hydrogen in a fuel cell resulting from the electrolysis fully powered by non-biological renewable energy at 9,1g CO2eq/MJ (second lowest intensity).

3.4.2. Hydrogen Refuelling Stations

The **Alternative Fuels Directive** remains one of the central EU legislative acts in relation to hydrogen refuelling stations, not only does this directive set out minimum requirements for the building-up of alternative fuels infrastructure, but it also sets **technical specifications for hydrogen refuelling points.**

Similar to the production and storage of hydrogen, both the **SEVESO Directive** (if the quantities involved are higher than 5 tons) and the **ATEX,** and the **Pressure Equipment Directives** continue to be relevant when considering the deployment of hydrogen refuelling stations. Additionally, the **SEA and EIA Directives** may both be applicable for land use plans and for projects for HRS (with on-site production or with a large H2 storage)

In addition to the above, **Directive 2014/94/EU** is highly relevant to the design and deployment of Hydrogen Refuelling stations across the EU as it sets out minimum requirements for the building-up of alternative fuels infrastructure, including refuelling points for hydrogen, as well as common technical specifications for such recharging and refuelling points.

General environmental as well as safety and health requirements also (may) apply; however, these have a broad application and are not hydrogen specific therefore, the list of legislation falling within this category presented in this deliverable is not aimed at being comprehensive

Table 5: EU Legislation relevant to hydrogen refuelling stations

Legislative Act	Scope of relevant parts and explanations
Directive 2014/94/EU of the European Parliament and of the Council of 22 October 2014 on the deployment of alternative fuels infrastructure (AFID)	The Directive sets out minimum requirements for the building-up of alternative fuels infrastructure, including refuelling points for hydrogen, to be implemented by means of Member States' national policy frameworks, as well as common technical specifications for such recharging and refuelling points, and user information requirements. It lays down, in Article 5, that Member States which decide to include hydrogen refuelling points accessible to the public in their national policy frameworks shall

[2] Directive 2015/151, Annex II, point 3, paragraph r

	ensure that, by 31 December 2025, an appropriate number of such points are available, to ensure the circulation of hydrogen-powered motor vehicles, including fuel cell vehicles, within networks determined by those Member States, including, where appropriate, cross-border links. **Annex II contains technical specifications for hydrogen refuelling points** for motor vehicles and additionally lays down that: • Outdoor hydrogen refuelling points dispensing gaseous hydrogen used as fuel on board motor vehicles shall comply with the technical specifications of the ISO/TS 20100 Gaseous Hydrogen Fuelling specification. • The hydrogen purity dispensed by hydrogen refuelling points shall comply with the technical specifications included in the ISO 14687-2 standard. • Hydrogen refuelling points shall employ fuelling algorithms and equipment complying with the ISO/TS 20100 Gaseous Hydrogen Fuelling specification. • Connectors for motor vehicles for the refuelling of gaseous hydrogen shall comply with the ISO 17268 gaseous hydrogen motor vehicle refuelling connection devices standard.
Directive 2012/18/EU of the European Parliament and of the Council of 4 July 2012 on the control of major-accident hazards involving dangerous substances (so-called **SEVESO Directive**)	The Directive covers situations where dangerous substances may be present (e.g. during processing or storage) in quantities exceeding certain thresholds. It establishes: • General obligations on the operator (Article 5) • Notification (information on the form and amount of substances, the activity, and the surrounding environment) of all concerned establishments (Article 7), • The obligation to deploy a major accident prevention policy (Article 8), • The obligation to produce a safety report for upper-tier establishments (Article 10); • The obligation to produce internal emergency plans for upper tier establishments (Article 12); • Authorities to exert control of the siting of new establishments, modifications to new establishments, and new developments including transport routes, locations of public use and residential areas in the vicinity of establishments, (Article 13) • The obligation to conduct public consultations on specific individual projects that may involve risk of major accidents (Article 15) Annex I, Part 1, establishes Hydrogen as a dangerous substance (therefore within scope) and lists the quantity of hydrogen for the application of lower-tier requirements (≥ 5t) and upper-tier requirements (≥ 50t).
ATEX Directive 2014/34/EU - covering equipment and protective systems intended for use in potentially explosive atmospheres	The Directive defines the essential health and safety requirements and conformity assessment procedures (Article 4) to be applied before products are placed on the EU market and is significant for the engineering of hydrogen production plants. It covers *inter alia* equipment and protective systems intended for use in potentially explosive atmospheres. The Directive requires employers to classify areas where hazardous explosive atmospheres may occur into zones. The classification given to a particular zone, and its size and location, depends on the likelihood of an explosive atmosphere occurring and its persistence if it does. The Directive requires the manufacturers to design their equipment to be suitable for use within their customer's explosive atmosphere. Therefore, manufacturers of equipment rely upon their customer to give them information about the classification of the zone and the flammable substance(s) within that zone. The Directive describes the rules and regulations for all actors in the value chain, with respect to ensuring that only safe equipment for use in potentially explosive atmospheres are sold and applied. It provides regulation of how the equipment shall be constructed, produced and documented, as well as the rules for CE-labelling.

	It also contains, *inter alia* conformity assessment procedures (Art 13) EU declaration of conformity (Art 14) and General principles of the CE marking (Art 16)
Directive 2014/68/EU of the European Parliament and of the Council of 15 May 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of pressure equipment.	The Pressure Equipment Directive (PED), applies to the design, manufacture and conformity assessment of pressure equipment and assemblies with a maximum allowable pressure greater than 0.5 bar. Technical requirements and classification according to an ascending level of hazard, depending on pressure, volume or nominal size, the fluid group and state of aggregation, as well as conformity assessment procedures are laid down and required by the Directive Hydrogen is a fluid which falls under Group 1. Group 1 consists of dangerous fluids (flammable, toxic and/or oxidizing). As a result, a large part of the equipment for H2 production, storage and distribution must meet the technical requirements set out in the Pressure Equipment Directive (PED),
SEA and EIA Directives: • Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment (SEA Directive) • Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment (EIA Directive) Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment).	The Directives (and their subsequent amendments) define a strategic environmental impact assessment procedure. The procedure is summarized as follows: the developer may request the competent authority define what should be covered by the EIA information to be provided by the developer (scoping stage); the developer must provide information on the environmental impact (EIA report – Annex IV); the environmental authorities and the public (and affected Member States) must be informed and consulted; the competent authority decides, taken into consideration the results of consultations. The public is informed of the decision afterwards and can challenge the decision before the courts. In line with the EIA Directive, Production and Storage of Hydrogen falls within the projects listed in Annex II (6a and 6c -production of chemicals; and storage facilities for chemical product), for which Member States shall determine whether the project shall be made subject to an assessment or not. In some EU countries, storage of 5 tons of hydrogen or more falls within the scope of the Directives. The latest amendment, (Directive 2014/52/EU) introduces minimum requirements with regards to the type of projects subject to assessment, the main obligations of developers, the content of the assessment and the participation of the competent authorities and the public. The SEA and EIA Directives **are both applicable for land use plans** and for projects for HRS (with on-site production or with a large H2 storage)
Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures,	The CLP Regulation (Classification, Labelling and Packaging of substances and mixtures) entered into force on the 20th of January 2009 and replaced the two previously existing laws or legal instruments, the Dangerous Substance Directive (DSD) and the Dangerous Preparation Directive (DPD). CLP is based on the Globally Harmonized System (GHS), a set of recommendations drafted by the United Nations. The CLP Regulation is applied to substances since 2010 and to mixtures since June 2015. The Regulation includes hydrogen in its list of substances of hazardous substances (Part 3, Table 3.1) establishes rules for the harmonised classification and labelling of hydrogen.
Directive 2006/42/EC of 17 May 2006 on machinery Directive 2014/35/EU relating to electrical equipment designed for use within certain voltage limits[3]	These Directives lay down technical specification requirements and procedures for assessing the conformity for *inter alia* (i) machinery and safety components; (ii) low voltage electrical equipment and (iii) simple pressure vessels. In this context they are generally relevant (albeit to a low extent) for the deployment of hydrogen refuelling stations.

[3] Directive 2014/35 (Low voltage Directive) covers health and safety risks on electrical equipment operating with an input or output voltage of between (i) 50 and 1000 V for alternating current and (ii) 75 and 1500 V for direct current

Directive 2014/29/EU on simple pressure vessels	
Directive 1999/92/EC on minimum requirements for improving the safety and health protection of workers potentially at risk from explosive atmospheres (in force) Directive 2009/104/EC concerning the minimum safety and health requirements for the use of work equipment by workers at work Council Directive 89/654/EEC concerning the minimum safety and health requirements for the workplace Council Directive 89/391/EEC of 12 June 1989 on the introduction of measures to encourage improvements in the safety and health of workers at work	Directive 1999/92/EC lays down minimum requirements for the safety and health protection of workers potentially at risk from explosive atmospheres which will apply to facilities involved in the production, storage and distribution of hydrogen. It sets out a number of specific obligations on the employer, including *inter alia:* • Prevention of and protection against explosions • Assessment of explosion risks • Special requirements for work equipment and workplaces Directive 2009/104/EC and Council Directive 89/654/EEC both down generally applicable minimum safety and health requirements for the use of work equipment by workers at work. They prescribe that the work equipment made available to workers in the undertaking or establishment shall be made suitable for the work to be carried out or properly adapted for that purpose and may be used by workers without impairment to their safety or health

3.5. Hydrogen Vehicles

3.5.1. Cars, taxis, buses, trolleybuses, trucks

The **type-approval** of motor vehicles is highly harmonized across the EU and an important number of EU legislative acts are relevant. Well established acts (e.g. Directive 1999/37/EC; Regulation (EC) No 692/2008) set the general framework for the type approval while more recent, legislative acts (e.g. Regulation (79/2009 Commission Regulation (EU) No 406/2010) extend the provisions specifically to hydrogen powered vehicles by laying down harmonized safety requirements for hydrogen-powered vehicles, detailed technical specifications and test procedures, etc.

Directive 2007/46 establishes a framework for the type approval of motor vehicles classes M (passenger cars and busses), N (trucks), O (trailers), and of systems and components intended for such vehicles. The framework directive is amended by Regulation (EC) No. 79/2009 (hydrogen regulation) with the aim to specify harmonized safety requirements for hydrogen powered vehicles based on an internal combustion engine or a fuel cell. The hydrogen regulation contains general requirements for the type approval of hydrogen systems and components.

Detailed technical specifications and test procedures implementing the general provisions are laid down in the Commission Regulation (EU) No. 406/2010 (implementing regulation).

Next to the hydrogen regulation and corresponding implementing regulation the framework Directive lists a number of separate technical Directives, EU Regulations and UNECE regulations the vehicle must comply with in order to obtain type approval. The UNECE Regulations listed in Part II of Annex IV are recognized as being equivalent to the corresponding separate directives or regulations in as much as they share the same scope and subject matter

The Directive 2007/46 is substantially transposed in all partner countries. The EU Regulations are binding in their entirety and directly applicable in all Member States.

The **registration of vehicles** in EU, irrespective on the power train or type of fuel is partly regulated by Council Directive 1999/37/EC on the registration documents of vehicles, amended by Directive 2003/127/EC. The both directives are transposed in partner countries and for registration documents applies mutual recognition. Vehicle registration requirements and procedures are subject to the national law.

The **movement of hydrogen vehicles** on European Roads is regulated by The European Agreement concerning the International Carriage of dangerous Goods by Road (ADR) and Directive 2008/68 on the inland transport of dangerous

goods. While certain restrictions may apply, as hydrogen vehicles are considered to be dangerous goods, these are very limited in their extent (See D4.2 on the comparison of EU Countries for a more detailed analysis of national rules).

Incentives for ownership of hydrogen vehicles are only referenced, at EU level, by Directive 2009/33 (Clean vehicles Directive) that aims at incentivizing different procurers (subject to the EU public procurement directives and the public service regulation) to invest in environmentally friendly vehicles.

There is no overall EU legislation regulating **the service and maintenance requirements and procedures for hydrogen vehicles**. At national level are issued a limited number of guidelines concerning this matter. Generally, the manufacturers of hydrogen vehicles publish guides for maintenance and service of the vehicles.

Directive 2014/45/EU on periodic roadworthiness tests for motor vehicles and their trailers and repealing Directive 2009/40/EC (with effect from 20 May 2018) establishes minimum requirements for a regime of periodic roadworthiness tests of vehicles used on public roads and updates the technical requirements laid down in Directive 2009/40/EC. According to both Directives each Member State shall ensure that vehicles registered in its territory are periodically tested by testing centres authorized by the Member State. Directive 2009/40 is transposed into national legislation of the partner countries.

Table 6: EU Legislation relevant to Hydrogen vehicles (cars, busses, trucks)

Legislative Act	Scope of relevant parts and explanations
Directive 2007/46/EC of the European Parliament and of the Council of 5 September 2007 establishing a framework for the approval of motor vehicles and their trailers, and of systems, components and separate technical units intended for such vehicles	Directive 2007/46 establishes a framework for the type approval of motor vehicles classes M (passenger cars and busses), N (trucks), O (trailers), and of systems and components intended for such vehicles Specific technical requirements concerning the construction and functioning of vehicles is laid down in subsequent regulatory acts, the exhaustive list of which is set out in Annex IV. The UNECE Regulations[4] listed in Part II of Annex IV are recognized as being equivalent to the corresponding separate directives or regulations in as much as they share the same scope and subject matter
Regulation (Ec) No 79/2009 Of the European Parliament and of the Council Of 14 January 2009 on Type-Approval of Hydrogen-Powered Motor Vehicles, and Amending Directive 2007/46/EC	Regulation (EC) No. 79/2009 (hydrogen regulation) amends Directive 2007/46 with the aim to specify harmonized safety requirements for hydrogen-powered vehicles based on an internal combustion engine or a fuel cell. Regulation 79/2009 lays down fundamental provisions on requirements for the type–approval of motor vehicles with regard to hydrogen propulsion, for the type–approval of hydrogen components and hydrogen systems and for the installation of such components and systems.
Commission Regulation (EU) No 406/2010 of 26 April 2010 implementing Regulation (EC) No 79/2009 of the European Parliament and of the Council on type–approval of hydrogen–powered motor vehicles	Regulation 406/2010 contains detailed technical specifications and test procedures, including, but not limited to: • Administrative provisions for EC type-approval of a vehicle with regard to hydrogen propulsion (Article 2) • Administrative provisions for EC component type-approval of hydrogen components and systems (Article 3) • Requirements for the installation of hydrogen components and systems designed to use liquid hydrogen on hydrogen powered vehicles • Requirements for hydrogen containers designed to use compressed (gaseous) hydrogen • Vehicle identification requirements
Commission Regulation (EC) No 692/2008 of 18 July 2008 on type-approval of motor vehicles with respect to emissions from light passenger and commercial vehicles (Euro 5 and Euro 6) and on access to vehicle repair and maintenance	Regulation 692 / 2008 contains *inter alia* general requirements for type-approval and other provisions related to the application for EC type-approval of a vehicle with regard to emissions and access to vehicle repair and maintenance information Regulation 630/2012 extends the scope of Regulation (EC) No 692/2008 to hydrogen fuel cell vehicle

[4] E.g. UNECE 134 hydrogen fuelled vehicles

information Commission Regulation (EU) No 630/2012 of 12 July 2012 amending Regulation (EC) No 692/2008, as regards type–approval requirements for motor vehicles fuelled by hydrogen and mixtures of hydrogen and natural gas with respect to emissions, and the inclusion of specific information regarding vehicles fitted with an electric power train in the information document for the purpose of EC type–approval	
Council Directive 1999/37/EC of 29 April 1999 on the registration documents for vehicles	The registration of vehicles in EU, irrespective on the power train or type of fuel is partly regulated by Council Directive 1999/37/EC on the registration documents of vehicles, amended with Directive 2003/127/EC. Both directives are transposed in partner countries and for registration documents applies mutual recognition. Vehicle registration requirements and procedures are subject to the national law.
Commission Directive 2003/127/EC of 23 December 2003 amending Council Directive 1999/37/EC on the registration documents for vehicles	In view of the increasing introduction of electronic and telematics equipment in vehicles, the Annexes to Directive 1999/37/EC should be adapted to scientific and technical progress to allow Member States to issue vehicle registration documents in microprocessor smart card format instead of paper documents.
Directive 2014/45/EU of the European Parliament and of the Council of 3 April 2014 on periodic roadworthiness tests for motor vehicles and their trailers	This Directive establishes minimum requirements for a regime of periodic roadworthiness tests of vehicles used on public roads. This applies to vehicles with a design speed exceeding 25 km/h of the following categories: M1, M2 and M3 (passenger motor vehicles, N1, N2 and N3 (motor vehicles for the carriage of goods, O3 and O4 (trailers over 3,5 tonnes) L (two or three wheels over 125cm3).
Directive 2009/33/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of clean and energy-efficient road transport vehicles (Clean vehicle directive)	This Directive requires contracting authorities, contracting entities as well as certain operators to take into account lifetime energy and environmental impacts, including energy consumption and emissions of CO 2 and of certain pollutants, when purchasing road transport vehicles with the objectives of promoting and stimulating the market for clean and energy efficient vehicles and improving the contribution of the transport sector to the environment, climate and energy policies of the Community. The Directive also sets the methodology for the calculation of operational lifetime as well as data for the calculation of operational lifetime costs of road transport vehicles, including hydrogen
The European Agreement concerning the International Carriage of dangerous Goods by Road (ADR)	The European Agreement concerning the International Carriage of dangerous Goods by Road (ADR) lays down the uniform rules for the **safe international transport of dangerous goods**. Apart from some excessively dangerous goods, other dangerous goods may be carried internationally in road vehicles subject to compliance with the conditions set out in Annex A and B to ADR. According to Annex A hydrogen and fuel cell engines are classified as dangerous goods. However, no tunnel restriction code has been assigned for hydrogen and fuel cell vehicles.
Directive 2008/68/EC of The European Parliament and Of The Council of 24 September 2008 on the inland transport of dangerous goods	Directive 2008/68 on the inland transport of dangerous goods extents the uniform rules of ADR to the national transport. All partner countries are ADR contracting parties and have transposed Directive 2008/68 into national law
Directive 2009/33/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of clean and energy-	Directive 2009/33 (Clean vehicles Directive) aims at incentivizing different procurers (subject to the EU public procurement directives and the public service regulation) to invest in environmentally friendly vehicles. The Directive is transposed into national legislation of the partner countries. However, the

efficient road transport vehicles	latest EU Commission evaluation revealed the results have been limited. In November 2017, the EU Commission proposed a revision of the Directive (see COM 2017(653)). The proposal aims to promote clean mobility solutions in public procurement tenders and thereby raise the demand for clean vehicles. The proposal provides a definition for clean light-duty vehicles based on a combined CO2 and air-pollutant emissions threshold; for heavy-duty vehicles, it gives a definition based on alternative fuels.

3.5.2. Bikes, Motorcycles, Quadracycles

Similar to other categories of motor vehicles, the type approval of two or three wheeled vehicles is highly harmonised. The general framework for all vehicles is common while specificities, at EU level are dealt with in Regulation (EU) No 168/2013 and Commission Delegated Regulation (EU) No 134/2014.

Table 7: EU Legislation relevant to Hydrogen Vehicles (Bikes, Motorcycles)

Legislative Act	Scope of relevant parts and explanations
Regulation (EU) No 168/2013 of the European Parliament and of the Council of 15 January 2013 on the approval and market surveillance of two– or three–wheel vehicles and quadricycles	This Regulation establishes the administrative and technical requirements for the type-approval of all new vehicles, systems, components and separate technical units of all two- or three-wheel vehicles and quadricycles as categorised in Article 4 and Annex I ('L-category vehicles'), This Regulation also establishes the requirements for the market surveillance of vehicles, systems, components and separate technical units as well as the requirements for the market surveillance of parts and equipment for such vehicles. ANNEX V additional lays down the obligations to conduct environmental performance tests for approval and extensions. According to the Regulation, Hydrogen is bound to none of the tests with the exception of fuel consumption
Commission Delegated Regulation (EU) No 134/2014 of 16 December 2013 supplementing Regulation (EU) No 168/2013	This Regulation establishes the detailed technical requirements and test procedures regarding environmental and propulsion unit performance for the approval of L–category vehicles and the systems, components and separate technical units intended for such vehicles in accordance with Regulation (EU) No 168/2013 and sets out a list of UNECE regulations and amendments thereto. (incl. hydrogen fuel cell vehicles)
Directive 2014/45/EU of the European Parliament and of the Council of 3 April 2014 on periodic roadworthiness tests for motor vehicles and their trailers	This Directive establishes minimum requirements for a regime of periodic roadworthiness tests of vehicles used on public roads. This applies to vehicles with a design speed exceeding 25 km/h of the following categories: M1, M2 and M3 (passenger motor vehicles, N1, N2 and N3 (motor vehicles for the carriage of goods, O3 and O4 (trailers over 3,5 tonnes) L (two or three wheels over 125cm3)
Council Directive 1999/37/EC of 29 April 1999 on the registration documents for vehicles	The registration of vehicles in EU, irrespective on the power train or type of fuel is partly regulated by Council Directive 1999/37/EC on the registration documents of vehicles, amended with Directive 2003/127/EC. Both directives are transposed in partner countries and for registration documents applies mutual recognition. Vehicle registration requirements and procedures are subject to the national law.
Commission Directive 2003/127/EC of 23 December 2003 amending Council Directive 1999/37/EC on the registration documents for vehicles	In view of the increasing introduction of electronic and telematics equipment in vehicles, the Annexes to Directive 1999/37/EC should be adapted to scientific and technical progress to allow Member States to issue vehicle registration documents in microprocessor smart card format instead of paper documents.
Directive 2009/33/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of clean	This Directive requires contracting authorities, contracting entities as well as certain operators to take into account lifetime energy and environmental impacts, including energy consumption and emissions of CO 2 and of certain

and energy-efficient road transport vehicles (Clean vehicle directive)	pollutants, when purchasing road transport vehicles with the objectives of promoting and stimulating the market for clean and energy efficient vehicles and improving the contribution of the transport sector to the environment, climate and energy policies of the Community. The Directive also sets the methodology for the calculation of operational lifetime as well as data for the calculation of operational lifetime costs of road transport vehicles, including hydrogen

3.5.3. Boats, Ships

The rules and regulations applicable to boats and ships are generally established at international level (IMO). The SOLAS (not described in detail within this deliverable) is relevant in this context. A list of international relevant sources is attached to this report

At EU level, Directives 2014/90/EU on marine equipment; 2009/45/EC on safety rules and standards for passenger ships and 2009/16/EC on port state control are the most relevant legislative sources specific to boats and ships.

In addition, the ATEX Directive (2014/34/EU) as well as the Directive 1999/92/EC on minimum requirements for improving the safety and health protection of workers potentially at risk from explosive atmospheres and Directive 2012/18/EU on the control of major-accident hazards involving dangerous substances (Seveso III) remain relevant for certain activities (e.g. landing, bunkering, etc.)

Table 8: EU Legislation relevant to Hydrogen Vehicles (Boats and Ships)

Legislative Act	Scope of relevant parts and explanations
Directive 2014/90/EU of the European Parliament and of the Council of 23 July 2014 on marine equipment	Directive 2014/90/EU makes the minimum SOLAS requirements mandatory in the EU. Several countries outside the EU area also automatically approve and accept products with M.E.D. 96/98/EC authorization. This Directive applies to equipment placed or to be placed on board an EU ship and for which the approval of the flag State administration is required by the international instruments, regardless of whether the ship is situated in the Union at the time when it is fitted with the equipment. The directive covers types of marine equipment that fall under following International Conventions developed by the International Maritime Organization (IMO): •SOLAS 1974: Life–saving appliances/navigation equipment/radio equipment •MARPOL 1973: Marine
Directive 2009/45/EC of the European Parliament and of the Council of 6 May 2009 on safety rules and standards for passenger ships	Directive 2009/45/EC introduces uniform rules on new and existing passenger ships and high-speed passenger craft, when both categories of ships and craft are engaged on domestic (intra- EU) voyages. Article 6 defines the general safety requirements for passenger ships. Article 9, introduces Additional safety requirements, equivalents, exemptions. The Directive also states that member states may adopt additional measures and adopt measures allowing equivalents for the detail requirements laid down in Annex 1 to the Directive, according to a stated procedure. Chapter II–2 of Annex 1, is specifically on requirements with respect to fire protection, detection and extinction.
Directive 2009/16/EC on port State control and Directive 2013/38/EU amending Directive 2009/16/EC on port State control	Directive 2009/16 introduces within the EU a port State control system based on the inspections performed within the Community and the Paris MOU. It's purpose is to increase compliance with international and relevant Community legislation on maritime safety, maritime security, protection of the marine environment and onboard living and working conditions of ships of all flags; It does so by establishing common criteria for control of ships by the port State and by harmonising procedures on inspection and detention

Directive 2012/18/EU of the European Parliament and of the Council of 4 July 2012 on the control of major-accident hazards involving dangerous substances (so-called SEVESO Directive)	The Directive covers situations where dangerous substances may be present (e.g. during processing or storage) in quantities exceeding certain thresholds. It establishes: • General obligations on the operator (Article 5) • Notification (information on the form and amount of substances, the activity, and the surrounding environment) of all concerned establishments (Article 7), • The obligation to deploy a major accident prevention policy (Article 8), • The obligation to produce a safety report for upper-tier establishments (Article 10); • The obligation to produce internal emergency plans for upper tier establishments (Article 12); • Authorities to exert control of the siting of new establishments, modifications to new establishments, and new developments including transport routes, locations of public use and residential areas in the vicinity of establishments, (Article 13) • The obligation to conduct public consultations on specific individual projects that may involve risk of major accidents (Article 15) Annex I, Part 1, establishes Hydrogen as a dangerous substance (therefore within scope) and lists the quantity of hydrogen for the application of lower-tier requirements (≥ 5t) and upper-tier requirements (≥ 50t). The Directive is relevant for both the approval of bunkering / landing installations as well as on board transport of hydrogen
ATEX Directive 2014/34/EU - covering equipment and protective systems intended for use in potentially explosive atmospheres	The Directive defines the essential health and safety requirements and conformity assessment procedures (Article 4) to be applied before products are placed on the EU market and is significant for the engineering of hydrogen production plants. It covers *inter alia* equipment and protective systems intended for use in potentially explosive atmospheres. The Directive describes the rules and regulations for all actors in the value chain, with respect to ensuring that only safe equipment for use in potentially explosive atmospheres are sold and applied. It provides regulation of how the equipment shall be constructed, produced and documented, as well as the rules for CE-labelling. The Directive is relevant for the approval of landing / bunkering installations
Directive 2014/68/EU of the European Parliament and of the Council of 15 May 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of pressure equipment.	The Directive applies to the design, manufacture and conformity assessment of pressure equipment and assemblies with a maximum allowable pressure greater than 0.5 bar. Technical requirement and classification according to an ascending level of hazard, depending on pressure, volume or nominal size, the fluid group and state of aggregation, as well as conformity assessment procedures are defined. The Directive is relevant for the approval of landing / bunkering installations

3.6. Electricity grid issues for electrolysers

<Findings on this category to be drafted as part of the final version of this deliverable>

Table 9: EU Legislation affecting electricity grid issues for electrolysers

Legislative Act	Scope of relevant parts and explanations
Directive 2009/72/EC of the	Directive 2009/72/EC establishes common rules for the generation, transmission,

European Parliament and of the Council of 13 July 2009 concerning common rules for the internal market in electricity	distribution and supply of electricity, together with consumer protection provisions. It lays down the rules relating to the organisation and functioning of the electricity sector, open access to the market, the criteria and procedures applicable to calls for tenders and the granting of authorisations and the operation of systems. It also lays down universal service obligations and the rights of electricity consumers and clarifies competition requirements. In addition to general rules for the organisation of the sector, the Directive contains provisions on: generation (e.g. authorisation procedure for new capacity) transmission (e.g. Unbundling, independence, etc.), distribution system operation, the organisation of access to the system, etc.
Commission Regulation (EU) 2016/1388 of 17 August 2016 establishing a Network Code on Demand Connection	Regulation 2016/1388 establishes a network code which lays down the requirements for grid connection of: • transmission-connected demand facilities; • transmission-connected distribution facilities; • distribution systems, including closed distribution systems; • demand units, used by a demand facility or a closed distribution system to provide demand response services to relevant system operators and relevant TSOs.
Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency	This Directive establishes a common framework of measures for the promotion of energy efficiency within the Union in order to ensure the achievement of the Union's 2020 20 % headline target on energy efficiency and to pave the way for further energy efficiency improvements beyond that date. It lays down rules designed to remove barriers in the energy market and overcome market failures that impede efficiency in the supply and use of energy, and provides for the establishment of indicative national energy efficiency targets for 2020. Article 15.8, particularly relevant as it, asks Member States to *inter alia*: encourage demand side resources, such as demand response, to participate alongside supply in wholesale and retail markets; promote access to and participation of demand response in balancing, reserve and other system services markets
Commission Regulation (EU) 2017/2195 of 23 November 2017 establishing a guideline on electricity balancing	This Regulation lays down a detailed guideline on electricity balancing including the establishment of common principles for the procurement and the settlement of frequency containment reserves, frequency restoration reserves and replacement reserves and a common methodology for the activation of frequency restoration reserves and replacement reserves.
Directive 2009/73/EC of the European Parliament and of the Council of 13 July 2009 concerning common rules for the internal market in natural gas	Relevant to Power-to-Gas plants, Directive 2009/73/EC establishes common rules for the transmission, distribution, supply and storage of natural gas. It lays down the rules relating to the organisation and functioning of the natural gas sector, access to the market, the criteria and procedures applicable to the granting of authorisations for transmission, distribution, supply and storage of natural gas and the operation of systems.
Directive 2010/75/EU on industrial emissions (integrated pollution prevention and control	Similarly, relevant to Power-To-Gas plants, Directive 2010/75/EU established an integrated approach towards prevention and control. This integrated approach means that the permits must take into account the whole environmental performance of the plant, covering e.g. emissions to air, water and land, generation of waste, use of raw materials, energy efficiency, noise, prevention of accidents, and restoration of the site upon closure. The permit conditions including emission limit values must be based on the Best Available Techniques (BAT).

3.7. Gas grid issues

<Findings on this category to be drafted as part of the final version of this deliverable>

Table 10: EU Legislation affecting hydrogen on the Gas Grid

Legislative Act	Scope of relevant parts and explanations

Directive 2009/73/EC of the European Parliament and of the Council of 13 July 2009 concerning common rules for the internal market in natural gas	Directive 2009/73/EC establishes common rules for the transmission, distribution, supply and storage of natural gas. Its provisions and obligations apply to Hydrogen Gas by virtue of Article 1 (2), which states that *the rules established by this Directive for natural gas, including LNG, shall also apply in a non–discriminatory way to biogas and gas from biomass or other types of gas in so far as such gases can technically and safely be injected into, and transported through, the natural gas system*. Other relevant provisions for the injection of hydrogen at transmission level are contained in Article 42 "*Regulatory regime for cross–border issues*" and Article 43 "*Compliance with the guidelines*" Article 8 "Technical rules", Article 25 "Tasks of a distribution system operator"; Article 28 "Closed distribution systems" Article 41 "Duties and powers of the regulatory authorities" Article 35 "Refusal of access"; Article 8 "Technical rules"; "
Regulation 715/2009 on conditions for access to the natural gas transmission networks	Regulation 715/2009 sets non-discriminatory rules for access conditions to (a) natural gas transmission systems; (b) LNG facilities and storage facilities taking into account the special characteristics of national and regional markets To achieve this, it sets harmonised principles for tariffs, or the methodologies underlying their calculation, for access to the network, but not to storage facilities, the establishment of third-party access services and harmonised principles for capacity-allocation and congestion-management, the determination of transparency requirements, balancing rules and imbalance charges, and the facilitation of capacity trading.
Regulation (EC) No 713/2009 of the European Parliament and of the Council of 13 July 2009 establishing an Agency for the Cooperation of Energy Regulators	This Regulation establishes an Agency for the Cooperation of Energy Regulators in order to assist the regulatory authorities in various regulatory tasks. Article 8 sets the Agency's "*Tasks as regards terms and conditions for access to and operational security of cross border infrastructure"* thus making it a relevant stakeholder in the regulatory landscape of hydrogen gas transmission and distribution.
Commission Regulation (EU) 2015/703 of 30 April 2015 establishing a network code on interoperability and data exchange rules	Regulation 2015/703 establishes a network code which sets out rules regarding interoperability and data exchange as well as harmonised rules for the operation of gas transmission systems. The network code on interoperability aligns the complex technical procedures used by network operators within the EU, and possibly with network operators in the Energy Community and other countries neighbouring the EU. This Regulation may also apply at entry points from and exit points to third countries, subject to the decision of the national authorities.
Commission Regulation (EU) 2017/460 of 16 March 2017 establishing a network code on harmonised transmission tariff structures for gas	Regulation (EU) 2017/460 establishes a network code setting out the rules on harmonised transmission tariff structures for gas, including rules on the application of a reference price methodology, the associated consultation and publication requirements as well as the calculation of reserve prices for standard capacity products. The network code on harmonised transmission tariff structures for gas enhances tariff transparency and tariff coherency by harmonising basic principles and definitions used in tariff calculation, and via a mandatory comparison of national tariff–setting methodologies against a benchmark methodology. It also stipulates publication requirements for information on tariffs and revenues of transmission system operators.
Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and	This Directive establishes a common framework for the promotion of energy from renewable sources. It sets mandatory national targets for the overall share of energy from renewable sources in gross final consumption of energy and for the share of energy from renewable sources in transport. It lays down rules relating to statistical transfers between Member States, joint projects between Member States and with third countries, guarantees of origin, administrative procedures, information and training, and access to the electricity grid for energy from renewable sources. It establishes sustainability criteria for biofuels and bioliquids. Article 15, in particular, states that Member States need to ensure that a guarantee of origin is

subsequently repealing Directives 2001/77/EC and 2003/30/EC (RED)	issued in response to a request from a renewable energy producer or producers, the issuance of which is to be supervised by the competent national authority / authorities through appropriate mechanisms
ATEX Directive 2014/34/EU - covering equipment and protective systems intended for use in potentially explosive atmospheres	The Directive defines the essential health and safety requirements and conformity assessment procedures (Article 4) to be applied before products are placed on the EU market and is significant for the engineering of hydrogen production plants. It covers *inter alia* equipment and protective systems intended for use in potentially explosive atmospheres. The Directive requires employers to classify areas where hazardous explosive atmospheres may occur into zones. The classification given to a particular zone, and its size and location, depends on the likelihood of an explosive atmosphere occurring and its persistence if it does. The Directive requires the manufacturers to design their equipment to be suitable for use within their customer's explosive atmosphere. Therefore, manufacturers of equipment rely upon their customer to give them information about the classification of the zone and the flammable substance(s) within that zone. The Directive describes the rules and regulations for all actors in the value chain, with respect to ensuring that only safe equipment for use in potentially explosive atmospheres are sold and applied. It provides regulation of how the equipment shall be constructed, produced and documented, as well as the rules for CE-labelling. It also contains, *inter alia* conformity assessment procedures (Art 13) EU declaration of conformity (Art 14) and General principles of the CE marking (Art 16)
Directive 2010/75/EU on industrial emissions (integrated pollution prevention and control	Directive 2010/75/EU established an integrated approach towards prevention and control. This integrated approach means that the permits must take into account the whole environmental performance of the plant, covering e.g. emissions to air, water and land, generation of waste, use of raw materials, energy efficiency, noise, prevention of accidents, and restoration of the site upon closure. The permit conditions including emission limit values must be based on the Best Available Techniques (BAT).
Regulation (EU) 2016/426 of the European Parliament and of the Council of 9 March 2016 on appliances burning gaseous fuels	This Regulation **applies to appliances burning gaseous fuels** used for cooking, refrigeration, air-conditioning, space heating, hot water production, lighting or washing, and also forced draught burners and heating bodies to be equipped with such burners and to safety devices, controlling devices or regulating devices and sub-assemblies thereof, designed to be incorporated into an appliance or to be assembled to constitute an appliance (fittings). Article 7 sets the **obligations of manufacturers** which should *inter alia:* • ensure that appliances and fittings meet the essential requirements set out in Annex I. • draw up the technical documentation referred to in Annex III ('technical documentation') • carry out the relevant conformity assessment procedure • keep the technical documentation and the EU declaration of conformity for 10 years • ensure that procedures are in place for series production to remain in conformity • carry out sample testing of appliances made available on the market, • investigate, and, if necessary, keep a register of complaints, of non-conforming appliances and fittings and recalls of such appliances and fittings, and shall keep distributors informed of any such monitoring. • ensure that their appliances and fittings bear a type, batch or serial number or other element allowing their identification, and the inscriptions provided for in Annex IV. • indicate on the appliance their name, registered trade name or registered trade mark, and the postal address at which they can be contacted • ensure that the appliance or fitting is accompanied by instructions and safety information • ensure that the fitting is accompanied by a copy of the EU declaration of conformity containing, inter alia, instructions for incorporation or assembly, adjustment, operation and maintenance • take corrective measures necessary to bring that appliance or fitting into conformity, to withdraw it or recall it, if appropriate. • where the appliance or the fitting presents a risk, immediately inform the competent national authorities giving details, in particular, of the non-compliance and of any

corrective measures taken
- provide competent national authority with all the information and documentation necessary to demonstrate the conformity of the appliance.

Article 9 sets **obligations for importers** which should *inter alia:*
- ensure that the appropriate conformity assessment procedure has been carried out
- ensure that the manufacturer has drawn up the technical documentation, that the appliance bears the CE marking and is accompanied by instructions and safety information and that the manufacturer has complied with the requirements set out in Article 7(5) and (6).
- indicate on the appliance their name, registered trade name or registered trade mark, and the postal address at which they can be contacted
- ensure that the appliance is accompanied by instructions and safety information in accordance with point 1.5 of Annex I, in a language which can be easily understood by consumers and other end-users, as determined by the Member State concerned.
- ensure that the fitting is accompanied by a copy of the EU declaration of conformity containing, inter alia, instructions for incorporation or assembly, adjustment, operation and maintenance in accordance, in a language which can be easily understood by appliance manufacturers, as determined by the Member State concerned.
- ensure that, while an appliance or a fitting is under their responsibility, storage or transport conditions do not jeopardise its compliance with the essential requirements
- carry out sample testing of appliances made available on the market, investigate, and, if necessary, keep a register of complaints, of non-conforming appliances and fittings and recalls of such appliances and fittings, and shall keep distributors informed of any such monitoring.
- for 10 years after the appliance or the fitting has been placed on the market, keep a copy of the EU declaration of conformity at the disposal of the market surveillance authorities and ensure that the technical documentation can be made available to those authorities, upon request
- further to a reasoned request from a competent national authority, provide it with all the information and documentation necessary to demonstrate the conformity of an appliance or a fitting in a language which can be easily understood by that authority

Article 10 sets the **obligations of distributors** which should *inter alia:*
- verify that the appliance bears the CE marking and that it is accompanied by instructions and safety information and that the manufacturer and the importer have complied with the requirements set out in Article 7(5) and (6) and Article 9(3) respectively
- not make the appliance or the fitting available on the market until it has been brought into conformity.
- ensure that, while an appliance or a fitting is under their responsibility, storage or transport conditions do not jeopardise its compliance with the essential requirements
- make sure that the corrective measures necessary to bring that appliance or fitting into conformity, to withdraw it or recall it, if appropriate, are taken. Furthermore, where the appliance or the fitting presents a risk, distributors shall immediately inform the competent national authorities of the Member States in which they made the appliance or the fitting available on the market to that effect, giving details, in particular, of the non-compliance and of any corrective measures take

Additionally, the contains rules on: **Conformity assessment procedures** for appliances and fittings (Article 14; Article 15 and Annex III); **Rules and conditions for affixing the CE marking** (Article 17) Requirements relating to notifying authorities (Article 21) Procedure at national level for dealing with appliances or fittings presenting a risk (Article 37)

Central to the Regulation are the **essential requirements set out in Annex I**

3.8. Stationary power; fuel cells (other issues than gas grid and electricity)

The most significant EU legislative act impacting **stationary power** (micro CHP)'s is **Regulation (EU) 2016/426**. This act, which is directly applicable in all EU Member States and EEA countries **contains essential requirements**

concerning appliances burning gaseous fuels and their fittings and **prescribes the obligations** of manufacturers, importers and distributors of such appliances and fittings when placing them on the market.

Directives 2009/73/EC and 2009/72/EC, **affect** this category of hydrogen applications **only indirectly** as they set general rules for the transmission, distribution, supply and storage of natural gas and electricity, but impose obligations only on Member States and *distribution system operator*.

Similarly, Directive 2012/27/EU only **indirectly** affects this category by setting general measures for the promotion of energy efficiency within the EU.

Table 11: EU Legislation affecting stationary power, fuel cells and micro-CHPs

Legislative Act	Scope of relevant parts and explanations
Regulation (EU) 2016/426 of the European Parliament and of the Council of 9 March 2016 on appliances burning gaseous fuels	This Regulation applies to appliances burning gaseous fuels used for cooking, refrigeration, air-conditioning, space heating, hot water production, lighting or washing, and also forced draught burners and heating bodies to be equipped with such burners and to safety devices, controlling devices or regulating devices and sub-assemblies thereof, designed to be incorporated into an appliance or to be assembled to constitute an appliance (fittings). Article 7 sets the **obligations of manufacturers** which should inter alia: • ensure that appliances and fittings meet the essential requirements set out in Annex I. • draw up the technical documentation referred to in Annex III ('technical documentation') • carry out the relevant conformity assessment procedure • keep the technical documentation and the EU declaration of conformity for 10 years • ensure that procedures are in place for series production to remain in conformity • carry out sample testing of appliances made available on the market, • investigate, and, if necessary, keep a register of complaints, of non-conforming appliances and fittings and recalls of such appliances and fittings, and shall keep distributors informed of any such monitoring. • ensure that their appliances and fittings bear a type, batch or serial number or other element allowing their identification, and the inscriptions provided for in Annex IV. • indicate on the appliance their name, registered trade name or registered trade mark, and the postal address at which they can be contacted • ensure that the appliance or fitting is accompanied by instructions and safety information • ensure that the fitting is accompanied by a copy of the EU declaration of conformity containing, inter alia, instructions for incorporation or assembly, adjustment, operation and maintenance • take corrective measures necessary to bring that appliance or fitting into conformity, to withdraw it or recall it, if appropriate. • where the appliance or the fitting presents a risk, immediately inform the competent national authorities giving details, in particular, of the non-compliance and of any corrective measures taken • provide competent national authority with all the information and documentation necessary to demonstrate the conformity of the appliance. Article 9 sets **obligations for importers** which should inter alia: • ensure that the appropriate conformity assessment procedure has been carried out • ensure that the manufacturer has drawn up the technical documentation, that the appliance bears the CE marking and is accompanied by instructions and safety information and that the manufacturer has complied with the requirements set out in Article 7(5) and (6). • indicate on the appliance their name, registered trade name or registered trade mark, and the postal address at which they can be contacted • ensure that the appliance is accompanied by instructions and safety information in accordance with point 1.5 of Annex I, in a language which can be easily understood by consumers and other end-users, as determined by the Member State concerned. • ensure that the fitting is accompanied by a copy of the EU declaration of conformity containing, inter alia, instructions for incorporation or assembly, adjustment, operation and maintenance in accordance, in a language which can be easily understood by appliance manufacturers, as determined by the Member State concerned. • ensure that, while an appliance or a fitting is under their responsibility, storage or transport

	conditions do not jeopardize its compliance with the essential requirements • carry out sample testing of appliances made available on the market, investigate, and, if necessary, keep a register of complaints, of non-conforming appliances and fittings and recalls of such appliances and fittings, and shall keep distributors informed of any such monitoring. • for 10 years after the appliance or the fitting has been placed on the market, keep a copy of the EU declaration of conformity at the disposal of the market surveillance authorities and ensure that the technical documentation can be made available to those authorities, upon request • further to a reasoned request from a competent national authority, provide it with all the information and documentation necessary to demonstrate the conformity of an appliance or a fitting in a language which can be easily understood by that authority Article 10 sets the **obligations of distributors** which should inter alia: • verify that the appliance bears the CE marking and that it is accompanied by instructions and safety information and that the manufacturer and the importer have complied with the requirements set out in Article 7(5) and (6) and Article 9(3) respectively • not make the appliance or the fitting available on the market until it has been brought into conformity. • ensure that, while an appliance or a fitting is under their responsibility, storage or transport conditions do not jeopardise its compliance with the essential requirements • make sure that the corrective measures necessary to bring that appliance or fitting into conformity, to withdraw it or recall it, if appropriate, are taken. Furthermore, where the appliance or the fitting presents a risk, distributors shall immediately inform the competent national authorities of the Member States in which they made the appliance or the fitting available on the market to that effect, giving details, in particular, of the non-compliance and of any corrective measures take Additionally, the contains rules on: **Conformity assessment procedures** for appliances and fittings (Article 14; Article 15 and Annex III); Rules and conditions for affixing the CE marking (Article 17) Requirements relating to notifying authorities (Article 21) Procedure at national level for dealing with appliances or fittings presenting a risk (Article 37) Central to the Regulation are the **essential requirements set out in Annex I**
Directive 2009/73/EC of the European Parliament and of the Council concerning common rules for the internal market in natural gas and repealing Directive 2003/55/EC	Directive 2009/73/EC establishes common rules for the transmission, distribution, supply and storage of natural gas. Its provisions and obligations apply to Hydrogen Gas by virtue of Article 1 (2), which states that *the rules established by this Directive for natural gas, including LNG, shall also apply in a non–discriminatory way to biogas and gas from biomass or other types of gas in so far as such gases can technically and safely be injected into, and transported through, the natural gas system*. Article 25 establishes the "*Tasks of the distribution system operator*" which include: ensuring the long-term ability of the system to meet reasonable demands for the distribution of gas […];shall provide any other distribution, transmission, LNG, and/or storage system operator with sufficient information […] as well as to ensure that the system operator does not discriminate between system users or classes of system including, including e.g. when setting rules for the charging of system users, etc Article 32 sets the rules on "Third party access": access to the transmission and distribution system, and LNG facilities shall be based on published tariffs, applicable to all eligible customers, including supply undertakings, and applied objectively and without discrimination between system users.
Directive 2009/72/C of the European Parliament and of The Council of 13 July 2009 concerning common rules for the internal	Directive 2009/72/EC establishes common rules for the generation, transmission, distribution and supply of electricity, together with consumer protection provisions. It lays down the rules relating to the organisation and functioning of the electricity sector, open access to the market, the criteria and procedures applicable to calls for tenders and the granting of authorisations and the operation of systems. It also lays down universal service obligations and the rights of electricity consumers and clarifies competition requirements. Article 25 establishes the "*Tasks of the distribution system operator*" which include: ensuring the

market in electricity and repealing Directive 2003/54/EC	long-term ability of the system to meet reasonable demands for the distribution of electricity […] as well as to ensure that the system operator does not discriminate between system users or classes of system users including e.g. when setting rules for the charging of system users, etc. Article 25 allows, however to require the distribution system operator to give priority to generating installations using renewable energy sources or waste or producing combined heat and power. Article 32 sets the rules on "Third party access": access to the transmission and distribution system, and LNG facilities shall be based on published tariffs, without discrimination between system users. The transmission or distribution system operator may refuse access where it lacks the necessary capacity. Duly substantiated reasons must be given for such refusal,
Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency	This Directive establishes a common framework of measures for the promotion of energy efficiency within the Union in order to ensure the achievement of the Union's 2020 20 % headline target on energy efficiency and to pave the way for further energy efficiency improvements beyond that date. It lays down rules designed to remove barriers in the energy market and overcome market failures that impede efficiency in the supply and use of energy and provides for the establishment of indicative national energy efficiency targets for 2020.
European Parliament resolution of 12 September 2013 on microgeneration — small-scale electricity and heat generation (2012/2930(RSP)	Although devoid of legal effect, the EU Parliament Resolutions affirms that microgeneration must be a vital element in future energy generation if the EU is to meet its renewable energy targets in the long term; recalls that microgeneration is contributing to the increase in the overall share of renewables in the EU energy mix and enables efficient electricity consumption close to the point of generation while avoiding transmission losses and Stresses that microgeneration technologies such as micro-CHP and small-scale renewables make it possible to have zero-energy and positive-energy buildings which feed into the grid surplus electricity generated on the premises; It calls on the Commission and the Member States to take steps to publicise microgeneration solutions and best practices in this field and to to draw up recommendations, based on best practices for regulators and system operators, on how to shorten and simplify the administrative procedures involved in operating and connecting microgeneration units to the grid, with a particular focus on setting up one-stop-shop procedures;

3.9. Introduction of green hydrogen in Industry

<Findings on this category to be drafted as part of the final version of this deliverable>

Table 12: EU legislation affecting the use of green hydrogen in Industry

Legislative Act	Scope of relevant parts and explanations

4. Conclusions

<Conclusions to be drafted as part of the final version of this deliverable>

5. Appendix

5.1. Full List of EU and International References

Table 13 Complete List of EU legislation affecting (directly or indirectly)

Legislative Act	Applicable Categories / Applications / LAPs

Directive 2012/18/EU of the European Parliament and of the Council of 4 July 2012 on the control of major-accident hazards involving dangerous substances (so-called SEVESO Directive)	• Production and Storage of Hydrogen (1.X.X; 2.X.X)
	• Hydrogen Refuelling Stations (4.4.X)
	• Boat / Ships
	  ○ Approval of Landing / Bunkering (5.4.3.)
	  ○ On-Board Transport of H2 (5.4.5)

ATEX Directive 2014/34/EU - covering equipment and protective systems intended for use in potentially explosive atmospheres	• Production, Storage of Hydrogen (1.X.X; 2.X.X)
	• Hydrogen Refuelling Stations (4.4.X)
	• Boat / Ships
	  ○ Approval of Landing / Bunkering (5.4.3.)
	  ○ On-Board Transport of H2 (5.4.5)
	• Injection of Hydrogen in the Gas Grid (including methanation) - Safety requirements (7.X.5)

Directive 2010/75/EU on industrial emissions (integrated pollution prevention and control)	• Production of Hydrogen (1.X.X) • Electricity grid issues for electrolysers – Legal Status of power to gas plants (6.1.2) • Injection of Hydrogen in the Gas Grid (including methanation) – Safety Requirements (7.X.5)
Directive 2014/68/EU of the European Parliament and of the Council of 15 May 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of pressure equipment.	• Production and Storage of Hydrogen (1.X.X; 2.X.X) • Transport and Distribution of Hydrogen (3.X.X) • Hydrogen Refuelling Stations (4.4.X) • Boat / Ships ○ Approval of Landing / Bunkering (5.4.3.)
Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment).	• Production and Storage of Hydrogen (1.X.X; 2.X.X) • Hydrogen Refuelling Stations – Safety Requirements (4.4.3)
European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment (EIA Directive)	• Production and Storage of Hydrogen (1.X.X; 2.X.X)
Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment (SEA Directive)	• Production and Storage of Hydrogen (1.X.X; 2.X.X) • Injection of Hydrogen in the Gas Grid (including methanation) – Safety Requirements (7.X.5)
Council Directive 98/24/EC of 7 April 1998 on the protection of the health and safety of workers from the risks related to chemical agents at work	• Production of Hydrogen (1.X.X)
Directive 2004/35/CE of the European Parliament and of the Council of 21 April 2004 on environmental liability with regard to the prevention and remedying of environmental damage	• Production of Hydrogen (1.X.X)
European Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances [CLP regulation]	• Production of Hydrogen (1.X.X) • Transport and Distribution of Hydrogen (3.1.1)
European Parliament and of the Council of 16 September 2009 concerning the minimum safety and health requirements for the use of work equipment by workers at work	
Directive 1999/92/EC of the European Parliament and of	• Production of Hydrogen (1.X.X)

the Council of 16 December 1999 on minimum requirements for improving the safety and health protection of workers potentially at risk from explosive atmospheres	• The use of Hydrogen as a Fuel – Hydrogen Refuelling stations (4.4.X) • Boat / Ships ○ Approval of Landing / Bunkering (5.4.3.)
Council Directive 89/654/EEC of 30 November 1989 concerning the minimum safety and health requirements for the workplace	• Production of Hydrogen (1.X.X) • Production of Hydrogen (1.X.X)
Council Directive 89/391/EEC of 12 June 1989 on the introduction of measures to encourage improvements in the safety and health of workers at work	• Production of Hydrogen (1.X.X) •
Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora.	• Storage of Hydrogen (2.X.X)
European Parliament and of the Council of 30 November 2009 on the conservation of wild birds.	• Storage of Hydrogen (2.X.X)
Directive 2008/68/EC of the European Parliament and of the Council of 24 September 2008 on the inland transport of dangerous goods.	• Transport and distribution of Hydrogen – Road Transport (3.1.X) • Vehicles (Road Vehicles) – Restrictions (5.1.3 and 5.2.3)
ADR European Agreement concerning the international carriage of dangerous goods by roads.	• Transport and distribution of Hydrogen – Road Transport (3.1.X) • Vehicles (Road Vehicles) – Restrictions (5.1.3 and 5.2.3)
Commission Regulation (EU) No 453/2010 of 20 May 2010 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)	• Transport and distribution of Hydrogen – Road Transport (3.1.X)
Directive 2004/54/EC of 29. April 2004 on minimal safety requirements for tunnels in the trans-European roads.	• Transport and distribution of Hydrogen – Road Transport (3.1.X) • Vehicles (Road Vehicles) – Restrictions (5.1.3 and 5.2.3)
Directive 2010/35/EU, the Transportable Pressure Equipment Directive (TPED)	• Transport and distribution of Hydrogen – Road Transport (3.1.X)
Directive 2014/94/EU of the European Parliament and of the Council of 22 October 2014 on the deployment of alternative fuels infrastructure (AFID)	• The use of Hydrogen as a Fuel and Hydrogen Refuelling Stations (4.X.X)
Directive (EU) 2015/1513 of the European Parliament and of the Council of 9 September 2015 amending Directive 98/70/EC relating to the quality of petrol and diesel fuels and amending Directive 2009/28/EC on the promotion of the use of energy from renewable sources (Indirect Land Use Change (ILUC) Directive)	• The use of Hydrogen as a Fuel – Legal Status and Certificates of origin (4.1.1).
Directive 98/70/EC of the European Parliament and of the Council of 13 October 1998 relating to the quality of petrol and diesel fuels and amending Council Directive 93/12/EEC (FQD)	• The use of Hydrogen as a Fuel – Legal Status and Certificates of origin (4.1.1). • The use of Hydrogen as a Fuel – Quality Requirements (4.2.1).
Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC (RED)	• The use of Hydrogen as a Fuel – Legal Status and Certificates of origin (4.1.1). • Gas Grid Issues – Guarantees of Origin: (7.X.0)
Council Directive (EU) 2015/652 of 20 April 2015 laying down calculation methods and reporting requirements pursuant to Directive 98/70/EC of the European Parliament and of the Council relating to the quality of petrol and diesel fuels	• The use of Hydrogen as a Fuel – Quality Requirements (4.2.1).
Directive 2006/42/EC of 17 May 2006 on machinery	• The use of Hydrogen as a Fuel – Hydrogen Refuelling stations (4.4.X)
Directive 2014/35/EU relating to electrical equipment designed for use within certain voltage limits	• The use of Hydrogen as a Fuel – HRS (4.4.X)
Directive 2014/29/EU on simple pressure vessels	• The use of Hydrogen as a Fuel – HRS (4.4.X)

Directive 2007/46/EC of the European Parliament and of the Council of 5 September 2007 establishing a framework for the approval of motor vehicles and their trailers, and of systems, components and separate technical units intended for such vehicles	• Vehicles – Car, Buses, Trucks – Type Approval and Registration - (5.1.1 and 5.1.2)
Regulation (EC) No 79/2009 of the European Parliament and of the Council of 14 January 2009 on type–approval of hydrogen–powered motor vehicles, and amending Directive 2007/46/EC	• Vehicles – Car, Buses, Trucks – Type Approval and Registration - (5.1.1 and 5.1.2)
Commission Regulation (EU) No 406/2010 of 26 April 2010 implementing Regulation (EC) No 79/2009 of the European Parliament and of the Council on type–approval of hydrogen–powered motor vehicles	• Vehicles – Car, Buses, Trucks – Type Approval and Registration - (5.1.1 and 5.1.2)
Commission Regulation (EU) No 630/2012 of 12 July 2012 amending Regulation (EC) No 692/2008, as regards type–approval requirements for motor vehicles fuelled by hydrogen and mixtures of hydrogen and natural gas with respect to emissions, and the inclusion of specific information regarding vehicles fitted with an electric power train in the information document for the purpose of EC type–approval.	• Vehicles – Car, Buses, Trucks – Type Approval and Registration - (5.1.1 and 5.1.2)
Commission Regulation (EC) No 692/2008 of 18 July 2008 implementing and amending Regulation (EC) No 715/2007 of the European Parliament and of the Council on type–approval of motor vehicles with respect to emissions from light passenger and commercial vehicles (Euro 5 and Euro 6) and on access to vehicle repair and maintenance information.	• Vehicles – Car, Buses, Trucks – Type Approval and Registration (5.1.1 and 5.1.2) • Vehicles – Car, Buses, Trucks – Service and maintenance - (5.1.4)
Regulation (EU) No 168/2013 of the European Parliament and of the Council of 15 January 2013 on the approval and market surveillance of two– or three–wheel vehicles and quadricycles	• Vehicles – Motorcycles, (bikes) and Quadricycles – Type approval and Registration (5.2.1 and 5.2.2
Commission Delegated Regulation (EU) No 134/2014 of 16 December 2013 supplementing Regulation (EU) No 168/2013	• Vehicles – Motorcycles, (bikes) and Quadricycles – Type approval and Registration (5.2.1 and 5.2.2
Commission Directive 2003/127/EC of 23 December 2003 amending Council Directive 1999/37/EC on the registration documents for vehicles	• Vehicles – Car, Buses, Trucks – Type Approval and Registration (5.1.1 and 5.1.2)
Council Directive 1999/37/EC of 29 April 1999 on the registration documents for vehicles	• Vehicles – Car, Buses, Trucks – Type Approval and Registration (5.1.1 and 5.1.2) • Vehicles – Motorcycles, (bikes) and Quadricycles – Type approval and Registration (5.2.1 and 5.2.2)
Commission Directive 2003/127/EC of 23 December 2003 amending Council Directive 1999/37/EC on the registration documents for vehicles	• Vehicles – Car, Buses, Trucks – Type Approval and Registration (5.1.1 and 5.1.2) • Vehicles – Motorcycles, (bikes) and Quadricycles – Type approval and Registration (5.2.1 and 5.2.2)
Directive 2014/45/EU of the European Parliament and of the Council of 3 April 2014 on periodic roadworthiness tests for motor vehicles and their trailers and repealing Directive 2009/40/EC Text with EEA relevance (with effect from 20 May 2018)	• Vehicles – Car, Buses, Trucks – Service and maintenance - (5.1.4) • Vehicles – Motorcycles, (bikes) and Quadricycles – Service and maintenance - (5.2.4)
Directive 2009/33/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of clean and energy-efficient road transport vehicles (Clean vehicle directive)	• Vehicles – Incentives and Restrictions (5.1.3 and 5.2.3)
Directive 2014/90/EU of the European Parliament and of the Council of 23 July 2014 on marine equipment	• Boats / Ships - Design and Type approval (5.4.1)

Directive 2009/45 on safety rules and standards for passenger ships.	• Boats / Ships - Design and Type approval (5.4.1)
Directive 2009/16/EC on port State control	• Boats / Ships – Approval of landing / Bunkering operations 5.4.3)
Directive 2013/38/EU of the European Parliament and of the Council of 12 August 2013 amending Directive 2009/16/EC on port State control	• Boats / Ships – Approval of landing / Bunkering operations 5.4.3)
Commission Regulation (EU) 2016/1388 of 17 August 2016 establishing a Network Code on Demand Connection	• Electricity grid issues for electrolysers – Connecting an electrolyser to the grid (6.1.1)
Directive 96/92/EC concerning common rules for the internal market in electricity	• Electricity grid issues for electrolysers – Connecting an electrolyser to the grid (6.1.1)
Directive 2009/72/EC of the European Parliament and of the Council of 13 July 2009 concerning common rules for the internal market in electricity	• Electricity grid issues for electrolysers – Legal Status of power to gas plants (6.1.2) • Stationary power – Residential stationary FC (micro CHP) (8.1.1)
Commission Regulation (EU) 2017/2195 establishing a guideline on electricity balancing	• Electricity grid issues for electrolysers – Power to Gas and their role in electricity balancing (6.1.3)
Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency	• Electricity grid issues for electrolysers – Power to Gas and their role in electricity balancing (6.1.3) • Stationary power – Residential stationary FC (micro CHP) - Price of electricity and support mechanisms (8.1.1)
Directive 2009/73/EC concerning common rules for the internal market in natural gas	• Electricity grid issues for electrolysers – Legal Status of power to gas plants (6.1.2) • Gas Grid issues (7.X.X) • Stationary power – Residential stationary FC (micro CHP) (8.1.1)
Regulation 715/2009 on conditions for access to the natural gas transmission networks	• Gas Grid issues (7.X.X)
Regulation (EC) No 713/2009 of the European Parliament and of the Council of 13 July 2009 establishing an Agency for the Cooperation of Energy Regulators	• Gas Grid issues (7.X.X)
Commission Regulation establishing a Network Code on interoperability and data exchange rules (703/2015/EU)	• Gas Grid issues (7.X.X)
Commission Regulation (EU) 2017/460 of 16 March 2017 establishing a network code on harmonized transmission tariff structures for gas	• Gas Grid issues – Injection of Hydrogen in the gas grid – payment issues (7.1.3)
Regulation (EU) 2016/426 of the European Parliament and of the Council of 9 March 2016 on appliances burning gaseous fuels and repealing Directive	• Gas grid issues – Injection of hydrogen – Safety requirements (compliance with safety regulation / risk control expectations (7.1.5) and end user safety requirements (7.2.6)
European Parliament resolution of 12 September 2013 on microgeneration — small–scale electricity and heat generation (2012/2930(RSP))	• Residential stationary FC (micro-CHP) - Price of electricity and support mechanisms (8.1.3)

Table 14: International References

Legislative Act	Relevant Category / Application / Process
UNECE 134 hydrogen fuelled vehicles	Vehicles – 5.1X and 5.2.X
UN Regulation 110 Compressed and liquefied natural gas system components of motor vehicles, issued by the United Nations Economic Commission for Europe (UNECE)	Hydrogen shall be limited to 2 Vol.–% when cylinders are manufactured from a steel with an ultimate tensile strength exceeding 980MPa. This limitation applies to CNG type 1 cylinders and implies that CNG fuelling stations, as well as the supplying gas network are affected by the 2 Vol.–% hydrogen limitation.
IGF Code: International Code of Safety for	• Boats / Ships - Design and Type approval (5.4.1)

Ships Using Gases or Other Low-Flashpoint Fuels, 2016 Edition (I109E)	
United Nations Convention on Conditions for Registration of Ships IMO Resolution A.600(15), IMO identifications of ships	• Boats / Ships - Registration for ships (5.4.2)
International Management Code for the Safe Operation of Ships and for Pollution Prevention (ISM Code) IMO resolution MSC 391(95): Adoption of the international code of safety for ships using gases or other low-flashpoint fuels (IGF Code)	• Boats / Ships - Design and Type approval (5.4.1) • Boats / Ships - Registration for ships (5.4.2)
"Resolution MSC.420(97) (adopted on 25 November 2016) Interim recommendations for carriage of liquefied hydrogen in bulk " Resolution MSC.370(93) (adopted on 22 May 2014); Amendments to the international code for the construction and equipment of ships carrying liquefied gases in bulk (IGC Code) "International Maritime Dangerous Good Code (IMDG Code) "International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk (IBC Code) "	• Boat / Ships - On board hydrogen transport (5.4.5)
ISO 14687-2:2012 Hydrogen fuel - Product specification - Part 2: Proton exchange membrane (PEM) fuel cell applications for road vehicles.	• The use of Hydrogen as a Fuel – Fuel quality Requirements and Measurement (4.2.1 and 4.3.1).
SAE J2719_201511 Hydrogen Fuel Quality for Fuel Cell Vehicles	• The use of Hydrogen as a Fuel – Fuel quality Requirements and Measurement (4.2.1 and 4.3.1).
ISO/TS 19880-1 Gaseous hydrogen – Fuelling stations	• The use of Hydrogen as a Fuel – o Fuel quality Requirements and Measurement (4.2.1 and 4.3.1). o Hydrogen Refuelling stations (4.4.X)
ISO/CD 19880-8 Gaseous hydrogen – Fuelling stations – Hydrogen quality control – Under development	• The use of Hydrogen as a Fuel – o Fuel quality Requirements and Measurement (4.2.1 and 4.3.1). o Hydrogen Refuelling stations (4.4.X)
IGC Document 155/09/E Best available techniques for hydrogen production by steam methane reforming IGC Document 122/11 Environmental impacts of hydrogen plants IGC Document 15/06 Gaseous hydrogen stations IGC Document 100/11 Hydrogen cylinders and transport vessels IGC Document 121/14 Hydrogen transportation pipelines	• The use of Hydrogen as a Fuel – Hydrogen Refuelling stations (4.4.X)

IGC Document 114/09 Operation of static cryogenic vessels IGC Document 6/02 Safety in storage, handling and distribution of liquid hydrogen IGC Document 23/08 Safety training of employees IGC Document 75/07 Determination of Safety Distances IGC Document 134/12 Potentially explosive atmosphere	
ISO/CD 19881 Gaseous Hydrogen – Land vehicles fuel tanks ISO/CD 19882 Gaseous Hydrogen – Land vehicle fuel tanks – Thermally activated pressure relief devices ISO/AWI 17268 Gaseous hydrogen land vehicle refuelling connecting devices ISO/TS 15869 Gaseous hydrogen and hydrogen blend – Land vehicle fuel tanks ISO 13984:1999 Liquid hydrogen – Land vehicle fuelling system interface ISO 13985:2006 Liquid hydrogen – Land vehicle fuel tanks ISO/TR 15916:2015 Basic considerations for the safety of hydrogen systems ISO 23273:2013 Fuel cells road vehicles – safety specifications – Protection against hydrogen hazards for vehicles fuelled with compressed	• Vehicles – Type approval (5.1.1 and 5.2.1)
UN Regulation 110 Compressed and liquefied natural gas system components of motor vehicles, issued by the United Nations Economic Commission for Europe (UNECE)	• Gas Grid issues – Injection of Hydrogen in the gas grid – legal Framework, permissions and restrictions (7.1.1 and 7.2.1) • Gas grid issues – Injection of hydrogen – Safety requirements related to end user equipment (7.1.6)
EN 16726:2015 Gas infrastructure – Quality of Gas Group H EN 16723–1 Natural gas and biomethane for use in transport and biomethane for injection in the natural gas network, issued by the European Committee for Standardisation (CEN) ISO 13686 Natural gas — Quality designation, issued by the International Organisation for Standardisation (ISO)	• Gas Grid issues – Injection of Hydrogen in the gas gri – legal Framework, permissions and restrictions (7.1.1 and 7.2.1)
Common Business Practice (CPB) 2005–1/02 Harmonisation of gas qualities, issued by the	• Gas Grid issues – Injection of Hydrogen in the gas grid – legal Framework, permissions and restrictions (7.1.1 and 7.2.1)

European Association for the Streamlining of Energy Exchange–Gas (EASEE–gas)	•
UNI–ENI 16723–2 Natural gas and bio–methane for use in transport and bio–methane for injection in the natural gas network.	• Gas Grid issues – Injection of Hydrogen in the gas grid (transmission level) – permission to connect, inject (7.1.2)
UNI TR 11537 Bio–methane injection in the natural gas network	• Gas Grid issues – Injection of Hydrogen in the gas grid (transmission level)– permission to connect, inject (7.1.2) •
IGC 15/06 Gaseous hydrogen stations (includes security measures for injection IGC 121/04 Hydrogen transportation pipelines, issued by the European Industrial Gas Association	• Gas grid issues – Injection of hydrogen – Safety requirements (compliance with safety regulation / risk control expectations (7.1.5 and 7.2.5)
UNI–ENI 16723–2 Natural gas and bio–methane for use in transport and bio–methane for injection in the natural gas network.	• Gas Grid issues – Injection of Hydrogen in the gas grid (distribution level) – permission to connect, inject (7.2.2) •
UNI TR 11537 Bio–methane injection in the natural gas network	• Gas Grid issues – Injection of Hydrogen in the gas grid (distribution level) – permission to connect, inject (7.2.2)
ISO 69674–6 Natural gas — Determination of composition with defined uncertainty by gas chromatography — Part 6: Determination of hydrogen, helium, oxygen, nitrogen, carbon dioxide and C1 to C8 hydrocarbons using three capillary columns	• Gas Grid issues – Injection of Hydrogen in the gas grid (distribution level) – H2 Quality requirements (7.2.2) •
ISO 6976 Natural gas — Calculation of calorific values, density, relative density and Wobbe indices from composition	• Gas Grid issues – Injection of Hydrogen in the gas grid (distribution level) – H2 Quality requirements (7.2.2) •