HyLAW

National Policy Paper - Austria

Main Author: Alfred Schuch

Contributor(s): Günter Simader

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1. Introduction and summary

1.1 HyLAW Summary and Methodology

HyLaw stands for Hydrogen Law and removal of legal barriers to the deployment of fuel cells and hydrogen applications. It is a flagship project aimed at boosting the market uptake of hydrogen and fuel cell technologies providing market developers with a clear view of the applicable regulations whilst calling the attention of policy makers on legal barriers to be removed.

The project brings together 23 partners from Austria, Belgium, Bulgaria, Denmark, Finland, France, Germany, Hungary, Italy, Latvia, Norway, Poland, Romania, Spain, Sweden, Portugal, the Netherlands and United Kingdom and is coordinated by Hydrogen Europe.

Through extensive research, interview and legal analysis, the HyLaw partners have identified the legislation and regulations relevant to fuel cell and hydrogen applications and legal barriers to their commercialization.

This National Policy Paper provides public authorities with country specific benchmarks and recommend-dations on how to remove these barriers.

1.2 Policy Summary at National level

The production of hydrogen from fossil resources, its transmission, distribution and use within the industry and refining sector are based on mature technologies and applied on a large scale. Therefore no legal and administrative barriers are arising in connection with production, conventional storage and transportation. In other words the deployment of hydrogen in the mentioned sectors is more or less daily business.

The production of hydrogen from renewable energy is, so far, restricted to small or pilot plants – like power to gas facilities – or not in place at large scale like the application of electrolysers, although the deployed technology is very well known, proven and tested. The reason for this fact are mainly the so far high production costs of hydrogen if using renewables.

The use of hydrogen as an energy carrier is beginning to emerge. High interest in hydrogen produced by the usage of renewable energy is signaled by the industry – mainly steel production – and the refining sector. In the mobility sector the hydrogen is recognized as an alternative fuel at EU and national level in the last few years. The hydrogen “fuelled” Fuel Cell Electric Vehicles (FCEVs) are still more expensive than conventional ones, especially due to the lack of economies of scale, size and scope and the small number of circulating vehicles. The high vehicle purchasing prices and the partially lacking hydrogen refueling infrastructure, which is also associated with high capital and operational costs, are the main economical obstacles for a bright deployment of FCEVs. Lengthy processes, for example for the construction and operation of a hydrogen refueling station – resulting from legal and administrative barriers – if any – increase the investment needs, hence can represent barriers for the market uptake of hydrogen as energy carrier; a fact not only in the mobility sector but in the industry as well. Nevertheless it seems to be a realistic approach to start with the deployment of hydrogen in the mobility sector and further on extend to industry and in the long term perspective to stationary fuel cells in the household sector. The reason for this approach is the fact that oil products like diesel or gasoline do have a premium on the price of energy in comparison to – for example - natural gas. Taking this premium into account and considering the relatively small share of the costs for fuel of the total costs of the operation of a vehicle – in addition to the positive visible image signaled by the ownership of an environmental friendly vehicle – it seems to be the most promising target group.

Public and private fleet vehicles can play a significant role in the market introduction phase, increasing the share of FCEVs and creating the initial demand for hydrogen refueling stations.

2. Production of Hydrogen

The analysed legal and administration processes related to the production of hydrogen, deal with centralized and localized units of hydrogen production. Centralized units are defined as the production of hydrogen at one location, in quantities to cover the needs of hydrogen over a relatively large geographic area for a relatively large number of points of use, implying hydrogen transportation. The main mean of hydrogen production is electrolysis, but it can also be a steam methane reforming process. Localized units are small units which produce hydrogen mainly for local demand.

2.1. Overview and Assessment of Current Legal Framework

Three legal and administrative processes are analysed, being considered as the most important milestones to get the approval for the production of hydrogen:

- First: the land use plan including zone prohibition: it corresponds to a branch of urban planning encompassing various disciplines which seek to order and regulate land use in an efficient and ethical way, thus preventing land-use conflicts.
- Second: the permitting process, which is a step in which an applicant files forms to a (regulatory) agency/competent authority with required narratives, maps, etc., to ensure in advance that the proposed operation will be in compliance with the applicable standards.
- Third: the permitting requirements, which are the legal (regulations and standards) requirements for hydrogen production approval.

Regarding legal basis respectively standards, the following reference documents are mentioned:

- 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; to be applied above quantity threshold of five tons of hydrogen
- Directive 2011/92/EC on the assessment of the effects of certain public and private projects on the environment
- Directive 2010/75/EU on industrial emissions (integrated pollution prevention and control)
- Directive 2001/42/EC of the European Parliament and of the Council of 27 June 2001 on the assessment of the effects of certain plans and programmes on the environment
- ATEX Directive 2014/34/EU – addressed to producers regarding CE label
- Environmental Impact Assessment law 2000 (UVP-G 2000)
- Trade Commerce and Industry Regulation Act (Gewerbeordnung)
- Land use plan (Flächenwidmungsplan)
- Ordinance dealing with the protection of accidents in the industry sector (Industrieunfall-verordnung)
- Regulation “Explosion Protection” (Explosionsschutzverordnung 2015)
- Bringing machinery/equipment into circulation and Notification act (Maschinen-Inverkehrsbringungs- und Notifizierungsgesetz)
- Mineral raw material act (Mineralrohstoffgesetz)
- Electrical Engineering Act (Elektrotechnikgesetz)
- Pressure equipment regulation (Druckgeräteverordnung).

Regarding land use plan the hurdles which might arise are that restrictions may be imposed on installations which are not compatible with the specific nature of the area. It is difficult and lengthy to chance the dedication of an existing land use plan.

The permitting requirements and the resulting permitting processes are often a very time consuming and consultancy intensive thus costly process. The thereto related barriers might be based on the commodity "hydrogen" which is still restricted to a body of experts. Thus some authorities might not be familiar with the process "Production of Hydrogen" – in particular with the process "production of hydrogen by using renewables as input energy" – on the one hand and the often per se assumed negative impact on the environment on the other. In case of huge plants an (eased) environmental impact assessment might be necessary and for smaller plants the well-grounded regulations stated in the law on Trade, Commerce and Industry sometimes might lead to a lengthy permitting process – including the necessary permitting requirements.

In comparison with the other partner countries, Austria – like many other participating countries – does have a functioning system dealing with the permitting process as such and with the development of the required framework – embodied in the land use plan.

2.2. Conclusions

Regarding the land use plan one can say, that a harmonization might be too difficult to be implemented because the land use plan is defined at the very local scale.

However, the existence of a document gathering specific requirements and zone prohibitions at EU scale could be useful in the different countries. It could be considered as a reference document and would avoid any questions from the local services which are probably not well aware about hydrogen and would avoid extra precautions that are often taken when there is a lack of knowledge.

Currently zone prohibition does not distinguish between the various production methods of hydrogen, subjecting environmentally friendly (yet more marginally costly) production methods such as electrolysis to the same restrictions as traditional industrial pathways to hydrogen production. This approach hinders the market-uptake of "green" hydrogen subsequently towards a de-carbonised society.

Because of lack of sufficient knowledge to navigate the requirements smoothly and without significant efforts, project developers and administrations might struggle to succeed in the complex process.

However, the existence of a document, based on the best practices in EU, gathering the mandatory steps and how they could be conducted, could be useful in the different countries.

The permitting process is - irrespective of the production method and scale - long, costly, and its outcome is uncertain. This increases the costs for developers and delays the deployment of hydrogen technology despite the fact that permitting requirements and the out of it resulting permitting process provide on the one hand a sound decision – taking all stakeholders´ justified concerns into account – subsequently provide the investor the comfort of a reliable and sound environment – on the other hand. Such a process can end up in a lengthy time - hence money - consuming process; in particular if an (eased) environmental impact assessment process for huge plants is required. For a localized hydrogen production the permitting process represents in terms of money and required time a higher share in comparison to the share of a centralized unit.

The rules on (industrial) production and storage of hydrogen reflect the traditional view that hydrogen production and storage is a large scale, industrial, chemical process.

2.3. Policy Recommendations

The described processes were recognized by the experts and the relevant authority as often a too lengthy, thus risky procedure (from the investor´s perspective). The identified thereto related barriers were often criticized by media and industry, which lead to a proposal to change the relevant legal provisions in terms of pace as well as in terms of requirements (keyword: gold plating).

The thereto related draft new legal provisions are being controversially discussed but all of the relevant stakeholders are aware that the required processes have to be even more streamlined and shortened. In case cross border impacts are to be expected, a harmonised approach with the neighbouring countries – by closely following the EU wide legal basis – seems to be the most promising access.

The following actions might improve the status quo:

- Develop guidelines for specific requirements and zone prohibitions for hydrogen production units. The addressees are: national, regional and local authorities, zoning experts, researchers.
- Adapt rules and administrative practice to promote environmentally friendly methods of hydrogen production. The addressees are: national, regional and local authorities.
- Develop clear permitting guidelines for both administrations and project developers. The addressees are: national/local authorities with the support of gas producers, electrolyser manufacturers, pre-normative or normative organisations.
- Simplify and streamline the permitting process for hydrogen production plants. The addressees are: national and local authorities.
- Streamline existing regulations (at EU and national level) to consider the specificities of hydrogen distribution for mobility purposes. The addressees are: EU Commission, Parliament, Council, member states.
- Establish simplified processes for small-scale hydrogen production and for non-emitting production methods. The addressees are: national/local authorities.
- Promote simplified processes for demo units to foster the deployment of H2 production units throughout the EU. The addressees are: national/local authorities.

3. Storage of Hydrogen

In order to cope with the hydrogen production fluctuation – caused by the often unsteady energy generation of renewables - short term storage (not seasonal storage) of hydrogen in conventional gas tanks, metallic cylinders and composite vessels is often required. Short term storage of hydrogen often facilitates or renders possible reasonable hydrogen production. All aggregate phases of hydrogen are considered: gas (under pressure at various levels of pressures), liquid and solid (in the form of metal hydrides). Tanks in vehicles are not covered by this application.

3.1. Overview and Assessment of Current Legal Framework

Two legal and administrative processes are analysed, being considered as the most important milestones to get the approval for the installation of a stationary storage.

- First: the land use plan including zone prohibition: it corresponds to a branch of urban planning encompassing various disciplines which seek to order and regulate land use in an efficient and ethical way, thus preventing land-use conflicts.
- Second: the permitting requirements/process including safety distances. They correspond to a process in which an applicant files forms to a (regulatory) agency/competent authority with required narratives, maps, etc. to ensure in advance that the proposed operation will be in compliance with the applicable standards. Permitting requirements are the legal (regulations and standards) requirements. An internal safety distance is the minimal separation distance between a potential hazard source (e.g. equipment involving dangerous substances) and an object (human, equipment or environment), which will mitigate the effect of a likely foreseeable incident and prevent a minor incident escalating into a larger incident (also known as domino effect).

Regarding legal basis respectively standards, the following reference documents are mentioned:

- Directive 2001/42/EC of the European Parliament and of the Council of 27 June 2001 on the assessment of the effects of certain plans and programmes on the environment
- Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora
- Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds
- 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
- Environmental Impact Assessment Directive 2014/52/EU
- Directive 2014/34/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to equipment and protective systems intended for use in potentially explosive atmospheres
- Directive 99/92/EC – risks from explosive atmospheres
- 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
- Regional Planning Acts in Austria
- Environmental Impact Assessment law 2000 (UVP-G 2000)
- Trade, Commerce and Industry Regulation Act (Gewerbeordnung)
- Regulation on flammable liquids (Verordnung über brennbare Flüssigkeiten)
- Verordnung explosionsfähige Atmosphäre - VEXAT
- Industrial safety act (Arbeitnehmerinnenschutzgesetz).
- DIN EN 60079-0:2014-06;VDE 0170-1:2014-06 VDE 0170-1:2014-06 Explosive atmospheres - Part 0: Equipment - General requirements (IEC 60079-0:2011, modified + Cor.:2012 + Cor.:2013); German version EN 60079-0:2012 + A11:2013
- ÖNORM M 7323: 2018 01 15 Installation regulations for stationary pressure vessels for the storage of gases
- ÖNORM M 7379: 2017 03 01 Gas storage - Storage of gas cylinders and other portable pressure vessels

3.2. Conclusions

Currently hydrogen storage is assimilated, from a legal and administrative perspective, to chemical storage of flammable and dangerous gases. Land use plans often relegate such activities to industrial zones in accordance with the traditional view that hydrogen is an industrial gas.

The process of permitting hydrogen storage - irrespective of scale or purpose - is long and costly. The lack of experience of both economic operators/project developers as well as permitting authorities and the lack of clarity on procedures and applicable legislation often causes delays and may even lead to divergent interpretations of associated obligations.

General rules applicable to the storage of flammable chemicals and gases are used in the permitting process for storage of hydrogen. This is not problematic in itself, but could potentially lead to uncertainties with respect to the scope of applicable obligations and requirements, in particular those associated with safety distances. An excess in precautionary measures can lead to structural barriers that prevent the development of commercially viable applications.

Risk assessments of hydrogen storage plants, in accordance with the SEVESO and ATEX Directives are in line with the purpose and intention of these acts. However, the application of the EIA and SEA Directives and other environmental permits may result in disproportionate administrative burdens on project developers and economic operators wishing to bring hydrogen applications (e.g. HRS's and micro-CHPs) to market despite the extremely low environmental risk posed by hydrogen and hydrogen leakage. In addition, the process itself imposes high costs on operators and further delays the commercial deployment of these applications.

Austria regards the necessary permitting requirements and the out of it resulting permitting process as neutral because the results of this process provides on the one hand a sound decision – taking all stakeholders´ justified concerns into account – subsequently provides the investor the comfort of a reliable and sound environment. On the other hand such a process can end up in a lengthy time, hence money, consuming process.

3.3. Policy Recommendations

The described processes were recognized by the experts and the relevant authority as often too lengthy, thus risky procedure (from the investor´s perspective). The identified thereto related barriers were often criticized by media and industry, which lead to a proposal to change the relevant legal provisions in terms of pace as well as in terms of requirements (keyword: gold plating).

The thereto related draft new legal provisions are being controversially discussed but all of the relevant stakeholders are aware that the required processes have to be even more streamlined and shortened. In case cross border impacts are to be expected, a harmonised approach with the neighbouring countries – by closely following the EU wide legal basis – seems to be the most promising access.

The following actions might improve the status quo:

- Establish the storage needs of various hydrogen applications which are ready for commercial deployment and which require the storage of hydrogen outside industrial zones. The addressees are: industry.
- Allow the storage of hydrogen below pre-determined thresholds in the same zones as the commercial applications consuming it. The addressees are: national/local authorities.
- Simplify the permitting process by decreasing the number of permits and the number of administrations involved. The addressees are: national/local authorities.
- Promote simplified processes for small amounts of storage and demonstration units. The addressees are: national and local administrations.
- Shorten the duration to receive the permits, and if a maximum response time is set, take measures to meet this target. The addressees are: national/local authorities.
- Incorporate H2-specific (H2 storage-specific) rules into the existing, relevant legislation in order to avoid uncertainties and un-adapted application of rules. The addressees are: national/local authorities.
- Avoid the unnecessary application of environmental impact assessments. The addressees are: national authorities.

4. Transport and distribution of hydrogen

This application deals with the transport of hydrogen in conventional gas tanks, metallic cylinders and composite vessels on the road. All states of hydrogen are considered: gas (under pressure at various levels of pressures), liquid and solid (in the form of metal hydrides). This legal administrative process indicates if hydrogen has to follow specific requirements when transported, and if the regulations are different from the transport of other types of gas. It identifies the competent authorities to allocate the routes.

4.1. Overview and Assessment of Current Legal Framework

The following four legal and administrative processes are investigated, being considered as the most important milestones.

- First: the road planning: this legal administrative process indicates if hydrogen has to follow specific requirements when transported, and if the regulations are different from the transport of other types of gas. It identifies the competent authorities to allocate the routes.
- Second: restriction of road transport (e.g. tunnels or bridges): this legal administrative process refers to the restriction on road transport of hydrogen and specifies the requirements regarding tunnels, bridges, parking etc.
- Third: permitting process/requirements for, on one hand, the drivers/transporting company and on the other hand the equipment (trailer). It defines which certification is needed for a driver/transporting company to transport hydrogen on public roads and which authority is competent to deliver the certification. It also gives information about the requirements needed for an equipment to be allowed to transport hydrogen on public roads, and if there is any specific approval required for the equipment.
- Fourth: quantity and pressure limitation: it underlines what are the requirements and limitations in terms of pressure and quantity of hydrogen for hydrogen transport. Finally, it shows if it is possible to increase the pressure/quantity, and - if yes - which authority is competent, what is the process to follow, how long does it take and what are the costs associated if known.

Regarding legal basis, the following 3 EU reference documents are mentioned:

- Directive 2008/68/EC of the European Parliament and of the Council of 24 September 2008 on the inland transport of dangerous goods
- ADR European Agreement concerning the international carriage of dangerous goods by roads
- Safety data Sheet SDS Eiga067A
- Directive 2004/54/EF of 29. April 2004 Minimal safety requirements for tunnels in the trans-European roads
- Law on transportation of dangerous goods (Bundesgesetz über die Beförderung gefährlicher Güter)
- ÖNORM M 7379: 2017 03 01 Gas storage - Storage of gas cylinders and other portable pressure vessels
- Information sheet Nr. 17 A: safe transport of gas bundles and cryo container = Informationsblatt Nr. 17A; Sicherer Transport von Gasflaschen und Kryo-Behältern
- Law on pressure equipment (Druckgerätegesetz)
- Regulation on explosion protection (Explosionsschutzverordnung).

At national level, the most important reference seems to be for most of the countries the translation of the ADR.

4.2. Conclusions

When it comes to road planning, restrictions of road transport (e.g. tunnels or bridges) or permitting process/requirements, one can see the positive impacts of the ADR: the situation is already quite well harmonised throughout EU – including Austria. There is only room left for harmonisation on the duration of the certificates´ validity for drivers and equipment. For bridges and parking, the situation seems unclear and not yet unified; some efforts could be made to provide clearer and harmonised prescriptions in all EU countries.

Regarding quantity and pressure limitations there are still differences between the participating countries. However, trucks can cross Europe. Composite tanks are more than useful for light vehicles and could be used for other vehicles as well.

The lack of regulations, codes and standards slows down their introduction and by consequence the one of H2 vehicles.

4.3. Policy Recommendations

In order to support the provisions regarding

- Road planning
- Restriction of road transport (e.g. tunnels or bridges)
- Permitting process/requirements for - on one hand - the drivers/transporting company and on the other hand the equipment (trailer)
- Quantity and pressure limitation

the following actions might even improve the status quo:

- Support/initiate the development of a EU regulation or at least recommendation for the durability of the certificates´ validity for drivers and equipment
- Support the development of guidelines for bridges and parkings, based on the practices of EU countries where this is already clear and defined, in order to share it with countries where the situation is less clear or where it has not yet happened, in order to save time and money and to speed up the future deployment. This could be done by the authorities in charge of the road traffic, and municipalities for the parking.
- Support/initiate the elaboration of a document defining a unique maximum limit for quantity and pressure for hydrogen valid for whole Europe
- Support/initiate the elaboration of unified rules among the various EU countries in terms of assessment to be performed
- Support/initiate the generation of an EU legislation dedicated to H2 tanks for transportation.

These actions, drafting of documents etc. could be done by the regulation authorities with the support of transport companies and container producers.

In addition a working group could be installed in the frame of the ISO to start the process and to prepare a standard. This working group could be composed of developers of regulations, codes and standards and tank producers.

5. Hydrogen as a fuel and refuelling infrastructure for mobility purposes

This section covers the legal status of hydrogen as a fuel and the procedures for certification of hydrogen. Among other aspects, it investigates whether hydrogen is recognized as an alternative fuel and under what conditions. The existence of common definitions of what constitutes “green” hydrogen is also researched.

5.1. Overview and Assessment of Current Legal Framework

The following legal and administrative processes are investigated, being considered as the most important milestones:

- Fuel origin and certification
- Fuel quality requirements
- Fuel quality measurement (tools, process and methods)
- Hydrogen Refueling Stations (HRSs) and hydrogen delivered to stations.

Regarding legal basis respectively standards, the following reference documents are mentioned:

- Directive 2014/94/EU of the European Parliament and of the Council of 22 October 2014 on the deployment of alternative fuels infrastructure (AFID)
- 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
- 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
- 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
- Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment
- Directive 2010/75/EU on industrial emissions (integrated pollution prevention and control)
- 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 to be applied above the quantity threshold of five tons
- Directive 2014/34/EU covering equipment and protective systems intended for use in potentially explosive atmospheres
- Directive 99/92/EC – risks from explosive atmospheres
- ISO 14687–2:2012 specifies the quality characteristics of hydrogen fuel in order to ensure uniformity of the hydrogen product as dispensed for utilization in proton exchange membrane (PEM) fuel cell road vehicle systems. (Currently the quality standard has 13 gaseous impurities levels specified.)
- SAE J2719_201511 provides background information and a hydrogen fuel quality standard for commercial proton exchange membrane (PEM) fuel cell vehicles
- ISO TR 19880-1 introduces the concept of assuring the quality of hydrogen either supplied to a hydrogen station, or dispensed from the station, by considering the likely contaminants that could be expected to be present according to the methods used, recognizing that not all impurities need be tested in all cases
- National strategy frame Clean Energy in the Transport Sector = Nationaler Strategierahmen “Saubere Energie im Verkehr”
- NREAP-AT for Renewables in Austria 2010
- Ordinance on fuel quality (Kraftstoffverordnung)
- Land use plan
- Trade, Commercial and Industry Regulation Act (Gewerbeordnung)
- Regulation on explosion protection (Explosionsschutzverordnung 2015)
- Verordnung explosionsfähige Atmosphäre - VEXAT

- Regulation on pressure equipment (Druckgeräteverordnung)
- Bringing machinery/equipment into circulation and Notification act (Maschinen-Inverkehrs-bringungs- und Notifizierungsgesetz)
- Law on electrical engineering (Elektrotechnikgesetz).

Overall, purity requirements are defined by the ISO 14687–2 and SAE J2719_201511 international standards. As Directive 2014/94/EU states in Annex II, that the ISO 14687 standard shall be followed, no significant legal barriers are associated. Nevertheless, due to the high purity requirements for hydrogen, standard ISO 14687–2:2012 is costly to implement, measure and enforce. The reason for this is that there are just a few independent laboratories (in the world) which can verify the purity required by ISO 14687–2:2012. In other words, the purity of hydrogen for Fuel Cell Electric Vehicles cannot be guaranteed because the required measurements to show compliance with the standard are expensive/not available. In practice, measurement is done on key contaminants which are checked continuously, however, due to the associated costs, not all contaminants listed in the norm are checked. This can be viewed as an economic barrier. However, it is in the interest of all those involved in building the market for hydrogen and Fuel Cell Vehicles to develop standards accepted by everyone and develop and improve technologies.

The transposition of the Directive 2014/94/EU has led to a regulation on H2 as an energy carrier for road transport, but the quality measurement requirements have not been fixed yet in this legislative act. A legally mandated quality control procedure exists in most countries in which HRS have been installed.

The lack of detailed requirements as to when and to what extent quality must be tested seems to give the actors involved a certain freedom in this area. This can have both positive and negative aspects.

5.2. Conclusions

The following main conclusions can be drawn:

- There is no uniform, binding guarantee of an origin certification system for hydrogen established at European level.
- The absence of a Guarantee of Origin (GO) scheme for green hydrogen hinders the development of a green hydrogen market.
- Only 14 member states address hydrogen infrastructure in their national policy frameworks.
- Missing national policy frameworks which include Hydrogen Refueling Stations (HRS) accessible to the public limit the development of a transport system hence hinder the use of hydrogen-powered vehicles, including fuel cell vehicles, thus hinder the de-carbonization of the transport sector.
- The lack of specific rules regarding HRS – which do not differ significantly from conventional refueling stations in terms of land use perspective - raises the risk that legislation applicable to hydrogen production or hydrogen storage would be strictly interpreted and applied mutatis mutandis to HRS thus limiting the zones where some HRSs could be located.
- HRS with an onsite production of hydrogen would result in being classified as an industrial activity. Thus such an HRS would only be permitted in an area designated as an industrial zone, significantly reducing the convenience-level of users.
- Regarding the process of permitting the construction and operation of an HRS, there are only few countries already where there exists a specific administrative guidance detailing the process to be followed.

- Without much experience and guidance, authorities are left to interpret which requirements would apply and which would not when considering permitting an HRS on a case-by-case basis.
- Lack of experience of both operators and public authorities on building up HRS infrastructure, coupled with the lack of guidelines for local authorities cause delays and extra costs. Permitting authorities impose overly-restrictive, excessive safety distances for HRSs in some countries because of over-reliance on general rules applicable to industrial production and storage.
- For the commercial deployment of HRSs it is necessary to design specific administrative rules, procedures and methodologies which standardize the safety rules applicable to HRS's.

5.3. Policy Recommendations

In order to support the provisions regarding

- Fuel origin and certification
- Fuel quality requirements
- Fuel quality measurement (tools, process and methods)
- Hydrogen Refueling Stations (HRSs) and hydrogen delivered to stations

the following actions might even improve the status quo:

- Support the development of a Guarantee of Origin-system for green (renewable) hydrogen at EU level. The certification should include the carbon intensity and other relevant parameters, and the renewable character of the hydrogen should be transferrable independently. The addressees are: member states, EU Commission, industry (e.g. CertifHy).
- Support a full transposition of the AFID and all provisions relevant to hydrogen in all EU-MS, and back ambitious national policy frameworks regarding deployment of hydrogen infrastructure. The addressees are: member states, EU Commission, Parliament.
- Back the mandatory inclusion of hydrogen infrastructure in any future revision of the AFID in order to ensure continuity of service across Europe, especially on the TEN-T network. The addressees are: member states, EU Commission, Parliament.
- Support the implementation of the same standards in all EU-MS - ideally by reference to the Alternative Fuels Directive. The addressees are: industry, standardisation bodies, member states.
- Support fuel quality requirements - including thereto related changes - which are within the scope of ISO 14687 in order not to jeopardize the coherence of the legislative basis. The addressees are: industry, standardisation bodies, member states.
- Support the harmonisation of a practical implementing method for hydrogen quality control in which minimum analysis requirements of impurities are specified per hydrogen supply. The addressees are: industry, standardization bodies, member states.
- Ensure that Hydrogen Refueling Stations are explicitly treated in the same manner as conventional refueling stations from the perspective of land use plans and zone prohibitions. The addressees are: member states, EU Commission.
- Back exclusion of emission free (e.g. via electrolysis) production of hydrogen from the scope of legislative acts (e.g. EU and national laws) which currently cover the production of hydrogen. The addressees are: member states, EU Commission.
- Support the development of approval guidelines for HRS's to support a smooth procedural implementation by both local authorities as well as HRS operators (they should be developed in

close cooperation (and endorsed by) competent authorities). The addressees are: national/ regional and local authorities, standardisation bodies (e.g. ISO TC 197 WG24).

- Support the determination of safety distances applicable for hydrogen storage at HRS on the basis of risk assessments.

6. Vehicles

A hydrogen powered vehicle is a vehicle that uses hydrogen as it is on board fuel for motive power. The chemical energy of hydrogen is converted to mechanical energy either by burning hydrogen in an internal combustion engine, or by reacting hydrogen with oxygen in a fuel cell to run electric motors.

This application deals with the administrative-legal provisions and procedures for type-approval and registration of hydrogen powered cars, buses and trucks, the requirements for their maintenance and service, as well as the existing restrictions and support schemes for their market deployment.

This section examines

- The differences in the type-approval and registration processes between hydrogen powered and conventional vehicles,
- The maintenance and service procedures for hydrogen powered vehicles and requirements for service and inspection companies,
- The restrictions imposed on hydrogen powered vehicles using the road infrastructure elements and existing financial and non- financial incentives

for their market entry.

The aim is to identify existing good practices for hydrogen powered cars, busses and trucks, and to assess any legal, operational and economic barriers across the partner countries hindering the broad-scale.

6.1. Overview and Assessment of Current Legal Framework

Regarding legal basis respectively standards, the following reference documents are mentioned:

- 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 (Framework Directive)
- Regulation (EC) No 661/2009 of the European Parliament and of the Council of 13 July 2009 concerning type-approval requirements for the general safety of motor vehicles, their trailers and systems, components and separate technical units intended therefore
- 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
- 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 (EU) 2018/858 of the European parliament and the Council of 30 May 2018 on the approval and market surveillance of motor vehicles and their trailers, and of systems, components and separate technical units intended for such vehicles, amending Regulations (EC) No 715/2007 and (EC) No 595/2009 and repealing Directive 2007/46/EC
- Proposal for a Regulation of the European Parliament and of the Council on type-approval requirements for motor vehicles and their trailers, and systems, components and separate technical units intended for such vehicles, as regards their general safety and the protection of

vehicle occupants and vulnerable road users, amending Regulation (EU) 2018 and repealing Regulations (EC) No 78/2009, (EC) No 79/2009 and (EC) No 661/2009

- European Agreement concerning the International Carriage of Dangerous Goods by Road
- Directive 2008/68/EC of the European Parliament and of the Council of 24 September 2008 on the inland transport of dangerous goods
- Directive 2014/94/EU of the European Parliament and of the Council of 22 October 2014 on the deployment of alternative fuels infrastructure
- 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
- Directive 2014/45/EU[1] on periodic roadworthiness tests
- Directive 2014/47/EU[2] on technical roadside inspections for commercial vehicles
- Directive 2014/46/EU [3]on vehicle registration documents
- 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
- Commission Delegated Regulation (EU) No 3/2014 of 24 October 2013 supplementing Regulation (EU) No 168/2013 of the European Parliament and of the Council with regard to vehicle functional safety requirements for the approval of two- or three-wheel vehicles and quadricycles
- The European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR)
- Road Traffic act – Kraftfahrgesetz
- Regulation on the execution of the Road traffic act
- Summarized legal provisions regarding transport of dangerous goods (Gefahrenguttransport).

The use of hydrogen as an energy carrier is beginning to rise. Since the production of hydrogen from fossil resources, its transmission, distribution and use within the industry and refining sector are based on mature technologies and applied on a large scale, no legal and administrative barriers are arising in this regard.

In the mobility sector the hydrogen is recognized as an alternative fuel at EU and national level in the last few years. Hydrogen powered vehicles, in particular cars and buses, might play a significant role in the achievement of the EU climate goals. Due to the lack of economies of scale and the small number of circulating vehicles, the Fuel Cell Electric Vehicles (FCEVs) are still more expensive. In addition to the high purchase price, the lacking hydrogen refueling infrastructure can be regarded as the main economic barriers for the bright deployment of the FCEVs. In order to induce the initial demand for hydrogen refueling stations, public and private fleet vehicles could play a supportive role in the market introduction phase.

The type-approval of hydrogen powered vehicles as new technologies entering the market provides to some extent the possibility of interpretation and different applications of the requirements and testing procedures by the national type approval authorities and bodies. Such potential ambiguity may cause a

[1] 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

[2] Directive 2014/47/EU of the European Parliament and of the Council of 3 April 2014 on the technical roadside inspection of the roadworthiness of commercial vehicles circulating in the Union and repealing Directive 2000/30/EC

[3] Directive 2014/46/EU of the European Parliament and of the Council of 3 April 2014 amending Council Directive 1999/37/EC on the registration documents for vehicles

significant cost increase and an unreasonable delay in obtaining type-approval. In order to reduce the possible divergences in the interpretation of the requirements and procedures and ensure their unified application, an intensive exchange of information between the relevant authorities is necessary.

In this context, policy regimes that promote a level playing field (versus the incumbents) for all modes of clean transportation are needed in order to either optimise, redesign or extend the current policies thus ensure increased deployment of zero-emission technologies. In case of application of support mechanism it is important to provide a level playing field for alternative fuel type of vehicles in order to provide a fair play, so that low-carbon technologies can emerge as an alternative for deployment.

In addition strong environmental policy and supportive legal conditions are key in facilitating the market entry of hydrogen powered motorcycles and quadricycles. Specific support measures, taking into account the potential users of low (zero) emission "L category"-vehicles and providing technology neutral and environmental based performance criteria could accelerate the market uptake of clean technologies.

The motorcycles, bikes and quadricycles are excluded from the requirements of periodical roadworthyness inspections at EU level. The European legislation will extend from 1 January 2022 the requirements for roadworthiness testing to the two-and three wheel motorcycles, powered tricycles and heavy quadricycles, with a design speed exceeding 25 km/h and an engine displacement of more than 125 cm^3.

Currently, only a few manufacturers intend to commercialise hydrogen powered motorcycles and bikes in Europe. A limited number on hydrogen bikes and scooters are already on the roads. In order to ensure the safety on the road and to increase the acceptance of the technology, clear service requirements might be supportive.

Of course the service and technical inspection facilities and equipment must meet certain safety requirements for workplaces where potentially explosive atmospheres may occur and be in accordance with the specifications provided by the manufacturers.

6.2. Conclusions

The following main conclusions can be drawn:

- In order to accelerate the market penetration of Fuel Cell Electric Vehicles (FCEVs), supportive national framework and financial incentives are needed. Various financial and non-financial incentives from direct purchase grants to tax exemptions, zero VAT, special fees for parking and so on can push the deployment of FCEVs.
- Green public procurement policies favoring FCEVs may be an important and positive driver for vehicles sales. The implementation of zero-emission vehicles by public bodies creates the initial demand for refueling stations which are pre-conditions for making FCEVs more popular among individual car users and private fleet managers.
- The politicians' and movie stars' etc. role model status when driving a FCEV can be very supportive for the market uptake of FCEVs.
- A harmonisation of the implementation of the type-approval requirements and procedures for hydrogen powered vehicles across the EU is necessary.
- Promotion of a level playing field for hydrogen powered vehicles compared to other zero emission solutions is needed.
- A unified implementation of the type-approval requirements and procedures for hydrogen powered "L category"-vehicles across the EU were supportive.
- A supportive legal framework for deployment of hydrogen powered "L category"-vehicles were helpful for the market uptake of such vehicles.

- Uniform rules/guidelines for the companies providing service and maintenance for hydrogen powered motorcycles, bikes and quadricycles are needed.
- Specific rules for the type-approval of hydrogen and hydrogen fuel cells vessels should be developed.
- Clear and streamlined applicable rules for the landing and bunkering of hydrogen are necessary.
- Minimum requirements for the operation and maintenance of HFC vessels are needed.

6.3. Policy Recommendations

- Initiate/support incentive schemes favouring the deployment of FCEVs. Increase the grant amount and prolong the term of the existing support programme for purchases of FCEVs. The addressees are: EU Commission/national policy makers/national approval and market surveillance authorities.
- Support legislative frameworks for granting tax and registration fee exemptions for FCEVs/ zero-emission vehicles. The addressees are: EU Commission/national policy makers.
- Back development of public procurement rules for acquisition of clean vehicles e.g. allocation of minimum procurement quota. The addressees are: EU Commission/national policy makers.
- Initiate the deployment of FCEVs within colleagues. The addressees are: national policy maker.
- Support non-financial incentives like access to the bus lines and free or reduced fee parking for FCEV-drivers.
- Promote/support the development of a level playing field for hydrogen powered vehicles compared to other zero emission solutions. The addressees are: EU Commission/national policy makers.
- Back a unified implementation of the type-approval requirements and procedures for hydrogen powered "L category"-vehicles across the EU. The addressees are: EU Commission/national policy makers/national approval and market surveillance authorities.
- Back a supportive legal framework for deployment of hydrogen powered "L category"-vehicles in order to enable the market uptake of such vehicles. The addressees are: EU Commission/ national policy makers.
- Support the development of uniform rules/guidelines for the companies providing service and maintenance for hydrogen powered motorcycles, bikes and quadricycles. The addressees are: vehicle manufacturers, educational and professional organisations.
- Support the development of specific rules for the type-approval of hydrogen and HFC vessels. The addressees are: EU Commission/national policy makers/national approval and market surveillance authorities.
- Support the development of clear and streamlined applicable rules for the landing and bunkering of hydrogen. The addressees are: EU Commission/national policy makers.
- Support the development of minimum requirements for the operation and maintenance of HFC vessels. The addressees are: EU Commission/national policy makers.

7. Electricity grid issues for electrolysers

This legal administrative process concerns hydrogen production via an electricity grid connected electrolysis unit to supply, for example, transport fuel hydrogen on-site at a refueling station or for industrial purposes.

A fair access to the electricity grid represents a sound basis for hydrogen production via electrolysis. The fulfillment of this requirement was achieved by the liberalisation of the electricity grids and transmission/distribution networks. Subsequently market and legal barriers were removed and the market was opened to competition, thus the electrolyser, hydrogen and fuel cell technology could be included in the electricity sector.

In the context of the power-to-gas aspects of a grid connected electrolyser and operated to generate hydrogen, the covering legal framework establishes common rules for the transmission, distribution, supply and storage of natural gas and sets 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.

This section examines:

- Connecting of the E-grid to the electrolyser
- Legal status of power-to-gas plants and energy storage facilities (energy consumer or energy producer)
- Power-to-gas plants and their role in the electricity balancing market.

7.1. Overview and Assessment of Current Legal Framework

Regarding legal basis respectively standards, the following reference documents are mentioned:

- 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 and repealing Directive 2003/54/EC
- 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 and repealing Directive 2003/55/EC
- 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
- Regulation (EC) No 714/2009 of the European Parliament and of the Council of 13 July 2009 on conditions for access to the network for cross-border exchanges in electricity and repealing Regulation (EC) No 1228/2003
- Regulation (EC) No 715/2009 of the European Parliament and of the Council of 13 July 2009 on conditions for access to the natural gas transmission networks and repealing Regulation (EC) No 1775/2005
- Austrian Trade, Commerce and Industry Regulation Act (Gewerbeordnung)
- Austrian Electricity Act 2010 – so the transposition of Directive 2009/72/EC
- Austrian Natural Gas Act 2011 – so the transposition of Directive 2009/73/EC.

The “Power to Gas (P2G)” process chain, which links the power grid with the gas grid by converting surplus power into grid compatible gas via a process involving H2 production by water electrolysis and H2 conversion to CH4 via methanation to create substitute natural gas (SNG). This is increasingly recognised as having a significant role to play in decarbonising and sustaining energy independence in European and (wider) energy systems. The generated methane can be injected into the existing gas grid or gas storage systems, used as SNG motor fuel, or utilised in natural gas facilities. The alternative is direct injection of H2 into the gas grid.

P2G offers considerable energy independence and sustainability benefits in enhancing the use of renewables (and addressing intermittency) alongside electricity and gas grid operation, and electricity grid connection for electrolysis is well understood and legally supported. Nevertheless the lack of legal recognition and formative regulatory framework is constraining wider P2G deployment.

7.2. Conclusions

It can be concluded that there are few, if any, fundamental issues across the partner member states in connecting an electrolyser to the grid. This can be seen as a tribute to the wide scale implementation of the 'energy package' legislative framework and associated directives and which has liberalised and opened electricity markets to competition. Having said this, there are hence no specific recommenddations that are needed for this legal administrative process.

For a grid connected electrolyser, operated to generate hydrogen – in the context of the P2G aspects - the covering legal framework includes Directive 2009/73/EC.

It is essential that the operational framework for P2G has to be clarified with regard to the combination of electrolyser plants and related energy storage facilities in order to provide a legal basis for P2G. Regardless of the operation mode - energy consumption and energy generation (ancillary services) mode and the extent to which safety requirements are typically already covered under existing legal codes - regulatory frameworks and existing support mechanisms can be carried over to P2G operations and services.

A P2G plant can potentially provide a balancing service to 'switch-on' the electrolyser when the network has excess power; and to generate power (using stored hydrogen or SNG) when the grid has less power than needed to maintain load/frequency, subsequently it should be part of a regulated (mandatory) network requirement. This would necessarily exclude primary reserve provision (typically for large scale generators) and mainly cover secondary reserve provision.

Despite the fact that electricity grid connection for electrolysers is well understood and legally supported, recognition of the basis for the provision of ancillary services via electrolysers is blurred – and interpreted differently across partner states. In order to ensure wider utilisation of electrolysers in the provision of ancillary services it is essential that the operational framework and technical capabilities (and merits) are more coherently framed and should meet all applicable EC regulatory frameworks.

7.3. Policy Recommendations

- Support the provision of a legal basis for P2G more widely across Europe, clarifying the operational framework with regard to the combination of electrolyser plants and related energy storage facilities – in both energy consumption and energy generation (ancillary services) modes. The addressees are: EC member states, national e-grid operators, Agency for the Cooperation of Energy Regulators (ACER).
- Support the development of more coherently framed operational framework and technical capabilities (and merits) which should meet all applicable EC regulatory frameworks. The elaboration of the relevant document should be done by EC and national policy makers plus e-grid entities/grid operators. The addressees are: EC member states, national e-grid operators, Agency for the Cooperation of Energy Regulators (ACER), industry.

8. Gas Grid issues

Hydrogen produced by usage of renewable sources and injected in the natural gas network would effectively contribute to the decarbonisation of the relevant sectors. The transport and storage capacities of the existing gas network infrastructure could be used for indirect electricity transport and for (seasonal) energy storage.

This application deals with the injection of hydrogen into the gas grid, whether for P2G, energy storage, or other purposes, at the Transmission Service Operator (TSO) level, where the TSO is typically responsible for managing and maintaining the national high pressure, long distance, gas grid 'trunking' network and provides the network interface with any international gas grid connections and local distribution network connections.

This section examines:

- legal framework allowing hydrogen injection
- permitting process to connect/inject hydrogen
- payment arrangements
- gas quality requirements
- safety requirements for connection/injection of hydrogen
- safety requirements regarding end-user equipment.

8.1. Overview and Assessment of Current Legal Framework

Regarding legal basis respectively standards, the following reference documents are mentioned:

- 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
- Regulation 715/2009 on conditions for access to the natural gas transmission networks
- 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
- Commission Regulation (EU) 2015/703 of 30 April 2015 establishing a network code on interoperability and data exchange rules
- Commission Regulation (EU) 2017/460 of 16 March 2017 establishing a network code on harmonised transmission tariff structures for gas
- 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)
- ATEX Directive 2014/34/EU covering equipment and protective systems intended for use in potentially explosive atmospheres – addressed to producers regarding CE label
- Directive 99/92/EC – risks from explosive atmospheres
- Directive 2010/75/EU on industrial emissions (integrated pollution prevention and control
- Regulation (EU) 2016/426 of the European Parliament and of the Council of 9 March 2016 on appliances burning gaseous fuels
- Austrian Environmental Impact Assessment law
- Austrian Natural Gas Act 2011 – so the transposition of Directive 2009/73/EC
- Verordnung explosionsfähige Atmosphäre - VEXAT

- Tariffs for the use of the infrastructure
- Regulation on pressure equipment
- Bringing machinery/equipment into circulation and notification
- Gas appliances safety ordinance
- Regulation on explosion protection
- Austrian standards ÖVGW 31 and 33.

8.2. Conclusions

Transmission system and/or distribution grid operators traditionally managed natural gas networks against safety, system technical integrity and gas quality parameters. Hydrogen as an energy storage vector and use of hydrogen in support of decarbonisation targets is not widely recognised at the grid level so far – besides the fact of widely diverging limits to the level of hydrogen permitted in national gas grid networks – and lack of the required consistent or coherent policy and regulatory framework to allow connection/injection of hydrogen to the grid. In this sense grid connection/injection requirements between the hydrogen supplier and the gas grid operator should be included within relevant EC regulatory frameworks.

So far there has been no formal basis established for hydrogen facilities and hydrogen injection regarding tariff arrangements, despite existing adjustments for biomethane injection in some EU-MS, which has created a substantive barrier to the business case for P2G and overlooks the value of related decarbonisation and sustainability benefits.

Safety requirements are typically based on conventional natural gas flows in national gas grid networks. The injection of hydrogen at higher concentration levels for HNG blends will engender safety concerns across all aspects of generation sites, blending, connection and injection since, so far, safety requirements are typically based on conventional natural gas flows in national gas grid networks. While varying levels of hydrogen concentration in the gas grid is accepted there is no consistent approach to safety aspects across member states for hydrogen facilities and hydrogen flows. Thereto related missing provisions have resulted in a substantive barrier to the business case of P2G and overlook the value of related de-carbonisation and sustainability benefits.

When it comes to end-user-equipment, one can say that there is no clear position on the threshold at which overall appliance design and individual component changes will need to be made to gas appliances at different concentration levels, and varying legal code strategies could be applied (limit the hydrogen concentration at a specific point, e.g. 10vol.% or within a Wobbe index range and no change to GAR), or allow a transition to much higher hydrogen concentrations and require changes under the GAR to H2 tolerant gas appliances).

For CNG vehicles: The use of the gas grid for CNG vehicle refueling would be constrained if the hydrogen concentration was increased (above 2% vol.) due to storage cylinder safety issues. Consequently there would be a need for gas treatment at the refueling facilities to provide an acceptable quality mix – or the gas storage cylinders would need modification.

Although electricity grid connection for electrolysers is covered under most legal frameworks as part of a P2G configuration, there is no formal gas grid equivalent recognition of P2G plants on a technical and/or operational basis. Besides, there is no coherent or consistent legal framework for deployment of facilities with a sphere of influence across borders.

8.3. Policy Recommendations

- Support/initiate the reviews of relevant technical and gas quality issues for injection and use of hydrogen in EC gas networks and establish legal pathways to support P2G operations and increased hydrogen use in gas networks. The reviews should be done by EC notified safety bodies (CEN, etc.), national gas grid operators and National Regulatory Agencies. The addressees are: EC notified safety bodies (CEN, etc.), CNG vehicle and fueling industry, national gas grid operators and National Regulatory Agencies.
- Support the set-up of an operational basis and legal framework for hydrogen access to European gas grids. The development of the operational basis and the legal framework should be done by EC member states, national gas grid operators, the Agency for the Cooperation of Energy Regulators (ACER) and the hydrogen industry. The addressees are: EC member states, national gas grid operators, Agency for the Cooperation of Energy Regulators (ACER), hydrogen industry.
- Support the review of relevant payment and tariff arrangements and identify legally appropriate pathways to allow increased hydrogen flows into European gas networks. The review should be done by EC member states, national gas grid operators, the Agency for the Cooperation of Energy Regulators (ACER) and the hydrogen industry. The addressees are: EC member states, national gas grid operators, Agency for the Cooperation of Energy Regulators (ACER), hydrogen industry.
- Support the review of safety requirements and corresponding legal frameworks for safety compliance to allow increased hydrogen flows into European gas networks. This should be conducted by EC member states, EC nominated safety bodies, JRC, the Agency for the Cooperation of Energy Regulators (ACER) and the hydrogen industry. The addressees are: EC member states, national gas grid operators, Agency for the Cooperation of Energy Regulators (ACER), hydrogen industry.
- Back the common assessment of the need for gas appliance modifications to accommodate safe operation with a higher hydrogen content gas and adaptto the Gas Appliance Regulation legal framework. (b) Back the common assessment of the implications for CNG vehicles with a higher hydrogen content gas. This should be conducted by EC 'notified' certification bodies - CEN and national bodies; CNG vehicle and fueling industry. The addressees are: EC member states, EC nominated safety bodies, JRC, Agency for the Cooperation of Energy Regulators (ACER), hydrogen industry.

9. Stationary Power, Fuel cells (other issues than gas grid and electricity)

Residential stationary fuel cells (also known as Fuel Cell micro-CHPs, Fuel Cell micro-cogenerations) are a highly efficient technology that uses hydrogen, biogas, natural gas or other gaseous hydrocarbons to produce heat and electricity for a single household up to small residential or commercial buildings. Stationary fuel cells are a distributed generation technology, i.e. they produce power and heat at the site of the consumers and for the purpose of their immediate supply with energy.

This application deals with the legal and administrative provisions and procedures for installation and connection of residential stationery fuel cells to the electricity and natural gas grids and to the electrical systems of the buildings, as well as with the existing support mechanisms for their broad market penetration.

This section examines

- The installation requirements for connecting residential stationery fuel cells to the electrical systems of the buildings and to the natural gas networks

- The procedures for connecting residential stationery fuel cells to the electricity grids, as well as the special requirements for additional equipment and professional qualifications of installers
- The existing financial support mechanisms for the market roll out of residential stationary fuel cells.

9.1. Overview and Assessment of Current Legal Framework

Regarding legal basis respectively standards, the following reference document is mentioned:

- Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC.

Ene.field and now PACE are the largest European projects aimed at reducing unit cost, increase stack lifetime and improve the electrical efficiency of all units, subsequently enable the mass market.

Although the ene.field-project, which demonstrated more than 1,000 stationary fuel systems for residential and commercial applications, has been completed in the meantime, the number of installed FC micro-CHP units across Europe is still very limited – in other words, the expected boost has not taken place yet. One of the reasons for the so far limited success might be that there is no common EU framework for installation of FC micro-CHP units in buildings or for their connection to the gas grids.

Regarding the qualification requirements for installers entitled to connect stationary fuel cells to the electrical systems of the buildings one can say that the installations can be performed by professionals with an appropriate qualification for work with electric devices, thus this criterion does not represent a hurdle. The same goes for the connection to the gas grids. These works must also be done by trained and qualified installers.

Since the FC micro-CHP systems must compete with well-established technologies a non-discriminatory and technology-open policy and legal frameworks at EU and national level are needed in order to support the market-uptake phase. Fuel cells working on natural gas have to be treated in the same way as any other high-efficiency micro-cogeneration unit. The same preferential treatment as for power units generating electricity from renewable sources is needed for FC micro-CHP operating on green gases incl. hydrogen in order to achieve high market penetration rates within a reasonable period of time.

9.2. Conclusions

In line with the provisions in the Energy Efficiency Directive, the member states may particularly facilitate the connection to the power grids of electricity produced from high-efficiency cogenerations from small-scale and micro-cogeneration units – which requires adoption of simple grid connection 'install and inform' procedures. In addition, the gas grid operators shall provide priority or guaranteed access to the grid, priority dispatch and guaranteed transmission and distribution of electricity from high-efficiency cogenerations.

In order to significantly increase the presence of FC micro-CHP systems on the market – which has not been achieved so far despite the undeniable advantages of the FC micro-CHP systems (high energy efficiency, smart grid capability), a supportive policy and legal framework, which can accelerate the transition of the micro-CHP sector from emerging technology to full-scale commercialisation, is needed.

The fuel cell micro-CHP systems are one of the key technologies capable to deliver greenhouse gas emission reductions, energy savings, integration of renewable energy sources and smart grid solutions, thus high deployment rates are necessary. In order to achieve such high deployment rates, simplified grid connection procedures and guaranteed access to the grid for electricity produced from high-

efficiency micro-CHP systems, as well as supportive measures for the produced electricity should be regarded as supportive.

Since the public sector constitutes an important driver to stimulate market transformation towards high-efficiency technologies, the FC micro CHP systems have to be accepted as an eligible technology in the national public procurement rules. Buildings owned by public bodies account for a considerable share of the building stock and have high visibility in public life.

9.3. Policy Recommendations

Initiate respectively support the requirement of connection to the electricity network of FC micro CHP systems as high-efficiency micro-cogeneration units. The most thereto related promising players are national policy makers and network operators.

Initiate respectively support the development and adaptation of coherent and long-term policy and legal framework for the widespread deployment of FC micro-CHP systems. This could be mainly achieved by national/regional policy makers.