HyLAW

National Policy Paper - Romania

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Status: [document prior to national workshop]

Dissemination level: [Public]

Acknowledgments:

The HyLAW project has received funding from the Fuel Cells and Hydrogen 2 Joint Undertaking under grant agreement No 737977. This Joint Undertaking receives support from the European Union's Horizon 2020 research and innovation programme, Hydrogen Europe and Hydrogen Europe Research.

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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, interviews 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 recommendations on how to remove these barriers.

1.2 Policy Summary at National level

The energy sources and transport infrastructure, in Romania, is a consequence of the past development of the ex-socialist centrally planned economy and industry. Romania's domestic energy production from coal, lignite, oil, gas and hydropower, covers about 70% of the energy needs [i].
The Romanian authorities have not yet adopted any program dedicated to hydrogen and fuel cell that would specify objectives and assignments, integrate and coordinate the individual activities. A hydrogen strategy for Romania must consider the geopolitical factors that affect it, its state of economic development and the social awareness for a hydrogen economy. The hydrogen roadmap would set the direction for the changes, could feature future stages in a logical succession, and its timeframe.
The hydrogen is used mainly by the chemical industry, in refineries and for ammonia production and its production has so far been dominated by reforming of hydrocarbons.
In Romania were identified 13 industrial producers of hydrogen [ii]. The hydrogen market comprises two main players: captive producers which produce hydrogen for their direct customers or their own use and by-product hydrogen resulting from chemical processes, chlor-alkali industry. The hydrogen storage is normally associated with its production. Moreover, Romania was partner in HyUnder project which studied the potential of hydrogen underground storage in salt caverns for seasonal period of time.
Hydrogen mobility is not a new subject for scientific community: there were realized studies, demonstrations and even vehicle prototypes. In the mobility sector the hydrogen is recognized as an alternative fuel by the recently adopted national legislation and policy framework, 2017-2018. The high purchase prices for vehicles and the lacking hydrogen refueling infrastructure, which is also associated with high capital and operational costs, are the main economic barriers. The public fleet vehicles can play a significant role in the market introduction phase and creating the initial demand for hydrogen refueling stations.
The current legal framework and supporting mechanisms are insufficient to stimulate the fuel cell and electrolysers integration in electricity market. Strong political support and appropriate financial incentives can drive the large-scale deployment of hydrogen and electrolysers utilization for the efficient energy consumption, storage, re-electrification and grid balancing. The hydrogen (large-scale) injection in the natural gas are in the same situation, and it is a relatively new approach. The hydrogen from renewable sources and grid balancing can play an important and integrant role for energy efficiency, security and decarbonization.

There are four Romanian institutes which have participated in five FCH JU financed projects. There are found a little more than 100 works - articles and reviews, in the field of fuel cell and hydrogen energy covering the hydrogen subject areas such as: engineering, materials science, chemistry and chemical engineering, energy, environmental science and mathematics, since 2000.

2. Production of Hydrogen, permitting requirements and process for building and operating a hydrogen production facility

This application deals with hydrogen production, as either (i) centralised or (ii) localised (i.e. the production of hydrogen for a given application on the same location, eliminating the need to transport the hydrogen outside a facility). Currently, the main means of the hydrogen production in Romania is steam methane reforming and by-product in chlor-alkali plants and is mostly used at the place of production, being called "captive."

The existing regulatory and legal-administrative processes (LAPs) aim to:

- identify the actual legislation and practices;
- compare production processes, identify similitudes, differences and best practices;
- address recommendations for improvement of current legislation and policies at European and national level.

2.1. Overview and assessment of current legal framework

The hydrogen production facility must be located in an area with industrial activities, according to urbanism plans. These specific requirements is realised on the bases of certifications and authorisations issued by: for "fire safety and emergency situations"- Inspectorate for Emergency Situations ISU (Inspectoratul pentru Situații de Urgență); for "pressurised vessels"- ISCIR State Inspection for Control of Boilers, Pressure Vessels and Hoisting (Inspecția de Stat pentru Controlul Cazanelor, Recipientelor sub Presiune și Instalațiilor de Ridicat – ISCIR); and for "explosion prevention inspection" - Technical Inspection Body - INSEMEX COV. The urbanism plan and necessity for an urbanism certificate should be analysed before the project planning.

In Romania were identified 13 industrial producers of hydrogen[iii]. The hydrogen market comprises two main players: captive producers which produce hydrogen for their direct customers or their own use and by-product hydrogen resulting from chemical processes, chlor-alkali industry.

(a) EU legislation relevant to the production of hydrogen

- 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)
- ATEX Directive 2014/34/EU - covering equipment and protective systems intended for use in potentially explosive atmospheres
- Directive 2010/75/EU on industrial emissions (integrated pollution prevention and control) (IED)
- 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).
- 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
- 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
- Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances [CLP regulation]
- 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
- 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.
- 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.

(b) National legislation:

Law no. 50/1991 regarding the authorization of construction works
Law no. 148/2016 (15.07.2016) which comprises new provisions with respect to special construction

HG 95/2003 (Govern Decision no. 95/2003) on the control of activities presenting major-accident hazards involving dangerous substances

Law no. 64/2008 on the safe operation of pressure equipment, lifting equipment and fuel consuming appliances

Order no. 1798 of November 19, 2007 Procedure for issuing environmental permits

Law no. 137/1995 on the environmental protection
Order No. 129 of 25 August 2016 for the approval of Methodological Norms for the approval and authorization of fire safety and civil protection

Order no. 2035/16.11.2009 Technical Inspection body of INSEMEX

Law 278/2013 on Industrial Emissions
Order (MESD) No. 1798/2007 on the approval of the Procedure for the issuance of the environmental authorization

HG (Government Decision) no. 571/2016 - Approval of the categories of buildings and developments subject to the fire safety approval and / or authorization

National Standard - SREN 60079, Explosive atmospheres

2.2. Conclusions

Romania is a country which produces hydrogen from many years for different type of industrial utilization. The hydrogen is part of the industrial production of chemical inflammable and pressurised gases and it is heavily legalized. The processes of land using plan and permitting do not differ for centralised or localised hydrogen production in Romania. Also, there are not any simplified process in order to stimulate hydrogen production for both energy and mobility proposes, as new applications.

The effective deep decarbonisation of economy and industry involves the utilization of hydrogen as energy vector and request an updated and friendly legal framework that must be easily integrated by the actual, robust and bureaucratic legislation.

The energy and raw materials used to produce hydrogen is preferred to be locally ones. The local hydrogen production can support the management of the renewable energies intermittency and the same time could retain the generation value in the regional area and avoiding the external energy dependence based in fossil fuels.

2.3. Policy Recommendations

It is necessary that decision-makers to promote and help the decarbonisation of the economy, industry and social activities by aiding and stimulating the introduction of new technologies such as fuel cells and hydrogen, but not only, in order to conserve the environment.
The decision makers are invited to play an active and positive role in order to update and simplify the legislation and rules supporting of the decarbonized hydrogen production technology.
Additionally, at national and local level, the decisions makers should find ways to promote the adoption of this new technology and attract international and national investment.
Also, is important to eliminate the barriers for the production of the hydrogen in-situ, in the service and refueling stations, due to the fact that the hydrogen production is considered as industrial activity of chemical production regardless of the source of production.
On the other way, it should be establish a competent authority responsible for verifying the hydrogen production methods and its quality. It will be the first step for implementation of “Guarantee of Origin” system similar to that of the electricity to determine the carbon intensity of the generated hydrogen.

3. Hydrogen Storage, permitting requirements and process for in conventional gas tank, metallic cylinders and composite vessels

This application deals with the hydrogen storage in conventional gas tank, metallic cylinders and composite vessels. All states of hydrogen are considered: gas (under pressure at various levels of pressures), liquid, and solid (in the form of metal hydrides). As far as, stationary storage is concerned, tanks in vehicles are not covered by this application.

There is necessary to be mentioned that Romania was partner in HyUnder project, where was studied the possibility to seasonally store the hydrogen underground in salt caverns.

Two legal and administrative processes (LAPs) are investigated, 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. Governments use land-use planning to manage the land development within their jurisdictions.

- second, the permitting requirements / process, including safety distances. They correspond to a process in which an applicant fills forms to a (regulatory) agency/competent authority with required narratives, maps, etc., to ensure in advance that the proposed operation will follow the applicable standards. Permitting demands contains the legal (regulations and standards) requirements. An internal safety distance represents 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).

3.1. Overview and assessment of the current legal framework

The hydrogen storage facilities are in line with others storage equipment for fuel and compressed gases, so the terms and cost are comparable. The main authority for “pressurised vessels” is ISCIR (State Inspection for Control of Boilers, Pressure Vessels and Hoisting). The process for land use plan and permitting is the same throughout the country, but at the local level the interpretation is occasionally questionable. Others certifications and authorisations are issued by: for “fire safety and emergency situations”- Inspectorate for Emergency Situations ISU (Inspectoratul pentru Situații de Urgență) and for “explosion prevention inspection” - Technical Inspection Body - INSEMEX COV. For a hydrogen storage facility, it is necessary the following agreements: the mayor's approval, the approval of the specialized structure within the county council, the approvals and the agreements of the urban utilities providers / administrators, the approvals and the agreements of central authorities / deconcentrated services, the acts of the competent authority for environmental protection, and the neighbours' agreement.

Romania was partner in HyUnder project, where was studied the possibility to seasonally underground store of the hydrogen in salt caverns. The HyUnder consortium comprises 12 leading organizations from 6 different European countries (Germany, Spain, France, Romania, the Netherlands and the UK), including large companies, small medium enterprises and research institutes.

(a) EU legislation relevant to the hydrogen storage

Subjecting hydrogen storage to risk assessments, in accordance with the SEVESO (Directive 82/501/EEC, Directive 96/82/EC and Directive 2012/18/EU) and ATEX (Directive 2014/34/EU) Directives.

(b) National legislation:

Law no. 50/1991 regarding the authorization of construction works
Law no. 148/2016 (15.07.2016) which comprises new provisions with respect to special construction

Law no. 64/2008 on the safe operation of pressure equipment, lifting equipment and fuel consuming appliances

HG (Govern Decision) no. 95/2003 on the control of activities presenting major-accident hazards involving dangerous substances

HG (Gov. Decision) no. 454/2003 regarding the conditions for the placing on the market of simple pressure vessels, with further modifications and additions

HG (Gov. Decision) no. 584/2003 on establishing the conditions for the placing on the market of pressure equipment, with further modifications and additions

Order (MEC) 1610/2007 on the storage of transportable gas cylinders, liquefied or dissolved under pressure

Order No. 129 of 25 August 2016 for the approval of Methodological Norms for the approval and authorization of fire safety and civil protection

3.2. Conclusions

Romania is a country which produce hydrogen for many years from different type of industrial utilization that means experience in the area of storage, manipulation and delivery.

The hydrogen storage is assimilated, from a legal and administrative perspective, to a chemical storage of flammable and dangerous gases. The hydrogen storage facilities are in line with others storage equipment for fuel and compressed gases, so the terms and cost are comparable. Land use plans often relegate such activities to industrial zones, in accordance with the traditional view that hydrogen is an industrial gas.

The permitting process for storing hydrogen on-site, alongside the general applications requires a number of different permits and assessments for each individual application and separate process from different authorities. This not only increases the amount of time necessary to fulfil requirements, but leads to duplication of the efforts and increased compliance cost and administrative burden on project developers.

3.3. Policy Recommendations

It is necessary that the decision-makers to promote and help the decarbonisation of the economy, industry and social activities, by aiding the introduction of new technologies such as fuel cells and hydrogen, but not only, in order to conserve the environment.

There is recommended to avoid the unnecessary application of environmental impact assessments for facilities storing small amounts of hydrogen for commercial (e.g. HRS's) or personal uses (e.g. Micro-CHPs).

Incorporate H2-specific (H2 storage-specific) rules into the existing and relevant legislation in order to avoid uncertainties and un-adapted application of rules.

In order to play an active and positive role for accelerate the implementation of low carbon technologies it is necessary to minimise the duration with the permits issued and to simplify the process for the small amounts of storage and the demonstration units.

The responsible authorities must be implied into an active dialog to ensure that the storage of hydrogen, in the required quantities should be allowed in the same areas where the hydrogen consuming application is or can be located.

4. Transport and distribution of hydrogen, regulations and restrictions

This application deals with the administrative and legal requirements and procedures for the hydrogen transportation: gaseous, liquid or absorbed by special materials, in conventional gas tank, metallic cylinders and composite vessels on the road or pipe lines.

In Romania the vast majority of the hydrogen is consumed at the production site. In industrial production sites, the hydrogen is transported through the pipes. The hydrogen transport on roads and public spaces is made in metal cylinders, individually or in batteries by specialized companies.

This section analyses:

- The regulations for road transport of the hydrogen and the differences in comparison to other types of gases,
- The provisions for transporting companies, vehicle crews and transport equipment,
- The pressure and quantity requirements and limitations for hydrogen transport on road.

The aim is to identify the best practices for carriage of the hydrogen on road, highlight the regulatory barriers, restricting the transport and address recommendations for improvement of the current legislation and policies at European and national level.

4.1. Overview and assessment of the current legal framework

Hydrogen is legally classified as dangerous to transport and is included in the list of dangerous goods in Annex A to the European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR) that is an "umbrella legislation" at national level. The relevant rules are implemented in the national technical prescriptions. The barriers arise from the implementation of agreement and are both, technically and economically.

Transport means any road transport operation performed by a vehicle on the territory of at least two ADR Contracting Parties, within or between the territories of EU Member States, including the activity of loading and unloading of dangerous goods, covered by Annexes A and B.

Currently for transport of compressed gaseous hydrogen for short distances and small users, are used single cylinders, multi-cylinder bundles or long cylindrical tubes, installed on trailers. Storage pressures is limited at 200 bar and a trailer can carry up a quantity relatively small: up to 550 kg depending on the number of cylinders or tubes.

(a) EU legislation relevant to the hydrogen storage

European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR).

(b) National legislation:

Law no. 31/1994 - for the accession of Romania to the European Agreement on the International Carriage of Dangerous Goods

GO (Govern Ordinance) no. 126/2011 - on transportable pressure equipment

Order (MT) no. 1892/2006 on the organization and performance of road transport and related activities

Order (MT) no. 1214/2015 for the approval of the rules on the training and professional attestation of specialized personnel in the field of road transport

Order (MT) no. 2134/2005 (RNTR 3) - for the approval of the Regulations on the approval, approval and periodic technical inspection of vehicles intended for the transport of certain dangerous goods

Order (MEC) 1610/2007 on the storage of transportable gas cylinders, liquefied or dissolved under pressure

Order (MEC) No. 998 from 2013 regarding the approval of the Technical Prescriptions PT CR 1-2013 -Tariffs

Technical regulation PT C4 / 2010 ISCIR - Stable metal containers under pressure

Technical regulation PT C5/2003 ISCIR – Technical Requirements for receptacles gas cylinders for compressed, liquefied or dissolved under pressure

4.2 Conclusions

The compressed hydrogen in metallically cylinder is a mature application. The requirements about the construction, testing, type approval and certification of the equipment for dangerous goods transportation and in particular for hydrogen are very detailed regulated and standardised in ADR, technical regulations and a number of standards.

Some issues may exist with respect to new ways of transporting hydrogen by road in composite vessels at 700 bars.

4.3 Policy Recommendations

The hydrogen is treated in the same way as other flammable gases and therefore no recommendations for change of the existing legal an administrative framework could be made.

It is recommended to develop and agree some revisions of the most relevant technical regulations concerning increase of cylinder and tube volumes and working pressures especially possibility to use composite vessels at 700 bar or more.

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

Hydrogen vehicles are clean (zero-emission) and can contribute to the decarbonisation of the transport sector and limiting global temperature rise. Hydrogen Fuel Cell Electric Vehicle (FCEV), as passenger cars could ramping up progressively important proportions from actual fleet. Hydrogen refuelling infrastructure is essential to the transport sector which allows emission-free, FCEVs to operate. This infrastructure would not only operate for cars, buses or trucks on the public roads, and it is also necessary for the refuelling of the captive fleets as forklifts and other special vehicles for material handling. Regarding the hydrogen refuelling infrastructure in Romania, several scientific studies have been made.

The Alternative Fuels Infrastructure Directive (AFID) establishes a common framework of measures for the deployment of the alternative fuels infrastructure in the EU in order to minimize oil dependence and to mitigate the environmental impact of transport and sets out minimum requirements for the building-up of alternative fuels infrastructure, including refuelling points for hydrogen.

5.1. Overview and assessment of the current legal framework

Romania has laid down in March 2017, the National Framework of Alternative Energy in Transportation. The national legislation and policy framework, adopted in March 2018, do not include any concrete number of HRS that must be developed within demonstration projects. If for other alternative there are indicated sufficient details for hydrogen refuelling infrastructure, the framework is really very generally and first measures will be taken starting with 2019.

In Romania, no dedicated legal norm has been yet developed regarding the designing, permitting, building and operating HRS. Time for building and associated permits, approvals or authorisations can be estimated through a comparation with CNG or LPG refuelling stations. Therefore, a potential operator of an HRS faces difficulties, complex processes for permitting, unreasonably high requirements resulting from the lack of experience and tailored rules, etc. In the absence of a reasonable treatment of HRS's, competent administrations would consider a potential HRS as a set of independent facilities for the production and storage of the inorganic chemical products, resulting high requirements, costs and significant prohibitions. The lack of experience of the authorities and the lack of the relevant legislation regarding HRS generate a supplementary pressure on the administrative process for obtaining the necessary permits, causing delay and extra costs.

The environmental authorities in charge with the environmental permits, who establish the environmental studies, have not been put in the situation, until now, to evaluate the differences in the various sorts of hydrogen production technologies (as electrolysis or reforming, centralised or "on site") and their applications and often impose the same restrictions.

Looking at the actual situation, and in the absence of a national network of HRS or a programme to promote and sustain its development, the hydrogen mobility stakeholders do not see Romania as a potential market to invest, develop and sell their technology.

5.2 Conclusions

The hydrogen mobility is an important and integrant part for the transport decarbonisation.

In the case of hydrogen, the energy used to produce the fuel must come from local renewable energies, favouring the management of the intermittency of these sources, and the same time retaining the value generation in the regional area of influence and avoiding the external energy dependence based in fossil fuels.

For any of these solutions to work, an appropriate legislation is needed to facilitate the deployment of the required infrastructure. In order to promote the installation of HRS, the concept of hydrogen as an energy vector should be promoted at the level of the administration authorities. The legal and administrative processes for development a clear and ambitious legislation will help the national companies that intend to implement and use these technologies.

Concerning HRS authorization and building procedures it is possible to raise the risk that legislation applicable to hydrogen production or hydrogen storage would be strictly interpreted and applied "mutatis mutandis" thus limiting considerably the zones where some HRSs (especially those with on-site production or with high storage capacity) can be located.

5.3 Policy Recommendations

The policy recommendations include hydrogen infrastructure specific targets in the national policy framework. The absence of national policy frameworks which include hydrogen refuelling points accessible to the public severely limits, the development of a transport system which enables the unrestricted use of hydrogen-powered motor vehicles, including fuel cell vehicles as a means to a decarbonized transport sector.

In the context of strengthen and secure funding for HRS in the national alternative fuels plan, there are necessary actions for establish of these objectives and then for materialise them.

Important, all stakeholders must understand that hydrogen mobility have to develop concomitantly, progressively and commercially viable, both HRS infrastructure and FCEV fleet.

The development of the specific legislation for HRS will establish the technical requirements at the national level, limit the uncertainty of the administration and clarify the necessary permits for their construction and commissioning.

It is need to assure that HRS are treated in the same way as a conventional refuelling stations from the perspective on land-use-plans, allowing HRS to make use of existing refuelling infrastructure.

The decision makers are invited to learn from advanced implementers and to sustain the public transport and municipalities as nucleation point for the hydrogen mobility.

The public bodies are invited to establish a competent authority (new one, or existent one) responsible for verifying the technical quality and certification of HRS, safety and properly maintenance of the station, the refuelling procedures for hydrogen as fuel and especially the guarantee of origin system for green hydrogen.

6. Hydrogen vehicles: Cars, Buses, Trucks

A hydrogen powered vehicle is a vehicle that uses hydrogen as its "on board" fuel for motive power. Such vehicles convert the chemical energy of hydrogen to a 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.

Hydrogen vehicles are clean, zero-emission vehicles and can contribute to the decarbonisation of the transport sector and limiting global temperature rise. Hydrogen vehicles, but especially or even primarily Hydrogen Fuel Cell Electric Vehicle (FCEV) passenger cars, could ramping up progressively important proportions from actual fleet. Hydrogen refuelling infrastructure is essential to the transport sector which allows emission-free, FCEVs to operate.

Regarding the hydrogen fleet in Romania, there were realised a very limited numbers of prototypes and only two models of commercial vehicles were exposed and drive-tested. So, in these conditions cannot be discussed about a fleet due to only about a limited number of demonstrations.

The restrictions for hydrogen vehicles when using public road infrastructure may be imposed in the relation to the on-board storage at high pressure. However, it must be stated that no substantial restrictions for hydrogen powered vehicles using high pressure hydrogen storage of the public transport network are identified.

The Alternative Fuels Infrastructure Directive (AFID), which clearly establishes a common framework of measures for the deployment of the alternative fuels infrastructure in the EU in order to minimize dependence on oil and to mitigate the environmental impact of transport and sets out minimum requirements for the building-up of alternative fuels infrastructure, will definitely play a role in speeding up the spread of hydrogen vehicles in Romania.

6.1 Overview and assessment of the current legal framework

Romania has laid down the law for installation of infrastructure related to the alternative fuels that transpose AFID, Law no. 34 of March 27, 2017, and national policy framework, adopted in March 2018. Both of them, the national legislation and policy framework, do not include any concrete number of hydrogen vehicles that must be developed within demonstration projects. If for other alternative, there are indicated sufficient details for hydrogen mobility and fleet the framework is really very generally and first measures will be taken starting with 2019. These efforts were also strengthened by Law no. 37/2018 on the promotion of ecological transport.

In Romania, no dedicated legal norm has been yet developed regarding the hydrogen electrical vehicle (bus, FCEV, motorcycles, etc.). Due to the absence of the hydrogen powered vehicles in use, the potential restrictions on the transportation of hydrogen powered vehicles with ferry or train are rather unknown, also parking in closed and no vented spaces.

There is available a program to reduce greenhouse gas emissions in transport by promoting energy-efficient road transport vehicles. There are some mechanisms to sustain procurement of electrical vehicles, but referring to FCEV the mechanism is in fact blocked by the absence of the refuelling infrastructure. Also, for the specific of the automotive Romanian market the cost of FCEV is really prohibitive.

The Romanian legislation referring vehicles is in line with EU one, and national acts transpose the European agreements and directives. The responsible authority for approval individual and smaller series of vehicle registration is Romanian Automotive Register.

National legislation:

EC-Type approval (Chapter III - VII of Directive 2007/46/EC)

Order MT no. 25/2016 and technical regulation RNTR-2

Order MTCT 2132/2005 and technical regulation RNTR-7 (Individual approval).

Gov. Ordinance no. 40/2011 on the promotion of clean and energy-efficient road transport vehicles.

Order no. 594 of 9 June 2006 approving the Attestation Certificate regarding the obligations to the Environment Fund.

Law no. 37/2018 on the promotion of ecological transport.

6.2 Conclusions

The hydrogen mobility is an important and integrant part for the transport decarbonisation. For urban agglomerations the hydrogen vehicles also contribute to a clean air and indirectly to avoid a lot of healthy problems and indirect cost for society.

In the case of hydrogen fuel for vehicles, the energy used to produce the fuel must come from local renewable energies, favouring the management of the intermittency of these sources, and the same time retaining the value generation in the regional area of influence and avoiding the external energy dependence based on fossil fuels.

For any of these solutions to work, an appropriate legislation is needed to facilitate the deployment of both hydrogen fleet and infrastructure. The promotion of the hydrogen vehicles is very necessary. The concept of hydrogen as an energy vector is known by the administration and the authorities and furthermore.

A clear and proactive legislation in this regard can paves the way to establish a suitable development of hydrogen mobility and to facilitate easily incorporate of the individual and commercial FCEV fleets.

6.3 Policy Recommendations

The policy frameworks and other similar acts must include specific numbers and ambitions for hydrogen vehicles. The absence of specific volumes for hydrogen vehicles in national policy frameworks severely limits hydrogen mobility, the development and integration in the transport system and implicitly its decarbonization.

The strengthen and secure funding for hydrogen vehicle, especially for public transport in municipalities, can play the role of nucleation centres for hydrogen mobility.

Important: all stakeholders must understand that hydrogen mobility imply a concomitantly, progressively and commercially viable develop of both HRS infrastructure and hydrogen fleet.

There is necessary the adoption of the specific legislation for hydrogen vehicles that constitute technical requirements at the national level, limit the uncertainty of the administration and clarify the necessary permits for both infrastructure and fleet develop, commissioning and assign.

The decision makers are invited to learn from advanced implementers and to sustain the public transport and municipalities as the nucleation point for the hydrogen mobility.

The public bodies are invited to establish a competent authority (new one, or existent one), responsible for verifying the technical quality and certification of hydrogen vehicles and safety, and properly maintenance and the guarantee of origin implementation for green hydrogen used by fleet.

7. Electrolysers, electricity grid issues: connecting, power-to-gas and electricity balancing

The hydrogen production via electrolysis requires open and fair access to the electricity grid.

The production of hydrogen from water using electrolysers and electricity, preferable renewable, has no legal obstacles or discrimination. The barriers are arising in connection with the technical and legal framework absence for hydrogen production, via electrolyses, for energy storage, re-electrification or grid balancing.

At the EU level, the electricity from a renewable source feds in part to the electrolyser and the balance to a grid connection. The regulatory framework covering the European electricity grid and transmission/distribution networks has transitioned to a liberalized market system and opened the electricity sector to market competition over the past 20+ years. In particular, it has removed market and legal barriers to network access and ensured the inclusion of electrolyser, hydrogen and fuel cell technologies in the electricity sector.

A "power-to-gas" or P2G facility would typically include an electrolyser directly connected to the e-grid or directly connected to a renewable energy system (wind, solar) to draw electricity for electrolyser operation to generate hydrogen. The hydrogen can be temporarily stored and then supplied to fuel cells, ICE turbines or other power-electric generation system, or injected into the gas grid. P2G is a relatively recent technology approach and has limited legal recognition and may be constrained within the current EC legal context.

Electricity grid balancing, or load balancing, is an ancillary service required by the transmission or distribution system operator (TSO / DSO) to enable the integrity and stability of the transmission or distribution system, as well as the power quality (frequency and voltage), to be maintained within set network limits and which would typically be part of regulated (mandatory) network requirement.

The current legal framework and supporting mechanisms are insufficient to stimulate the electrolysers' integration in the electricity market. Strong political support and appropriate financial incentives can drive the large-scale deployment of hydrogen and electrolysers utilization for energy storage, re-electrification or grid balancing.

7.1 Overview and assessment of the current legal framework

There are only scientific and theoretic discussions regarding this, but there is not any practical initiative on this subject.

The main EU Legislation framework impacting grid access in general and thereby electrolyser access has been introduced via three 'energy packages':

- The first, Directive 96/92/EC (concerning common rules for the internal market in electricity, promoted the independence of the transmission system operator, and laid down the rules relating to the organisation and functioning of, and access to, the wholesale electricity market);
- The second, Directive 2003/54/EC (concerning common rules for the internal market in electricity (Electricity Directive)), focused on the concepts of unbundling and third-party network access); and
- The third comprised two Directives (Directive 2009/72/EC and Directive 2009/73/EC) and three Regulations (Regulation (EC) No 714/2009; 715/2009 and 713/2009) to further open up the gas and electricity markets in the European Union with the separation of companies' generation and sale operations from their transmission networks (and thereby independent distribution networks).

National legislation:

Energy law no. 123/2012.
Order ANRE (Romanian Energy Regulatory Authority) no. 59/2013 about the Connection Regulation.

Order ANRE (Romanian Energy Regulatory Authority) no. 102/2015 about Technical Solutions on connection to grid.

7.2 Conclusions

The hydrogen production water electrolysis is not a new subject in Romania, and at this moment important quantities of hydrogen are produced from brine (salt and water) electrolysis in chlor-alkali plants and in very small quantities from water electrolysis for glass industry facilities.

The production of hydrogen from water using electrolysers and electricity, preferable renewable, has no legal obstacles or discrimination, but there is no legal framework referring to hydrogen utilization for energy storage, re-electrification or grid balancing.

Supportive national framework and financial incentives can accelerate the hydrogen penetration in electricity market. There is need various financial and non-financial incentives to push the deployment and integration of hydrogen in electricity sector.

7.3 Policy Recommendations

There is need to complete the actual energy policy framework and other similar acts in order to include specific projects and political ambitions for hydrogen utilization for energy storage, re-electrification or grid balancing. The absence of hydrogen from energy national policy frameworks severely limits energy security, renewables' expanding and decarbonisation.

The strengthen and secure funding for renewable energy storage can play the role of hydrogen for energy proposes. Important: all stakeholders must understand that hydrogen as energy vector must be concomitantly developed with the renewable sector.

There is necessary initiation of the specific technical solutions and demonstrative project involving ANRE and the players from energy market, which further contribute to the establishment of the legal basis for ancillary services, power-to-gas plants and related energy storage facilities.

The decision makers are invited to learn from advanced implementers and to sustain the hydrogen integration in electricity market.

8. Hydrogen and Gas Grid issues

The scientific and technical community increasingly recognized that the injection of hydrogen from renewable sources in the natural gas network would effectively the transport and storage capacities of the existing gas network infrastructure for indirect electricity transport, for energy storage and for meeting decarbonisation targets. There are two semi-distinct subjects of discussion: (1) injection of hydrogen at transmission and distribution level (for energy storage and enhancing sustainably), and (2) methanisation and injection of SNG at transmission / distribution level.

The gas networks are traditionally managed against safety, system technical integrity and gas quality parameters, for natural gas. Hydrogen as an energy storage vector and use of hydrogen in support of decarbonisation targets is not widely recognized at the grid level and there are widely diverging limits to the level of hydrogen permitted in national gas grid networks – and no consistent or coherent policy and regulatory framework to allow connection / injection of hydrogen to the grid.

The current legal framework and supporting mechanisms are insufficient to stimulate the hydrogen injection in the gas grid. Strong political support and appropriate financial incentives can drive the large-scale injection of the hydrogen from renewable sources in the natural gas.

8.1 Overview and assessment of the current legal framework

There is no authority/legal entity for the permission of the hydrogen connection/injection in the gas grid. In Romania there are only scientific and theoretic discussions regarding the hydrogen injection from renewable sources in the natural gas network, but there is not any legal initiative on this subject.

The injection of hydrogen in gas grid must include a number of issues referring to:

- 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.

At the national level there is only one industrial company that produce hydrogen as by-product and burn it on-site within mixture with natural gas.

From EU point of view, the national gas grids and transmission/distribution networks have been liberalized and opened to market competition over the past years. Directive 2009/73/EC and three Regulations (EC No 714/2009; 715/2009 and 713/2009) provides for access to gas (and electricity) markets and clear procedures applicable to granting authorisation for transmission, distribution, supply and storage of natural gas and, in principle, allowing network access for hydrogen injection.

EU Legislation affecting hydrogen on the Gas Grid:

- 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,

- 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.

8.2 Conclusions

The hydrogen injection into the gas grid is still a relatively new approach and implies activities that are mainly at the proof of concept / demonstration stage. As such, there is no framework for managing the safety aspects of a hydrogen public facility and its operation, and for the injection and blends at transmission and distribution levels.

The actual legal and economical context is considered as a barrier referring to the hydrogen injection from renewable sources in the natural gas network, with a high or the highest level of severity on the basis of there being a legal gap. These aspects are considered as a barrier to the activity with a high or very high level of severity.

On the other hand, the hydrogen methanation and its injection into gas grid has no so many supporters in Romania. In fact, here is not only impossible to inject hydrogen into the gas network, this also applies to biomethane or synthetic methane.

8.3 Policy Recommendations

There is need to create a complete new legal and regulatory framework referring to the possibility of injection and accommodate safe operation of the hydrogen, synthetic methane (and biomethane) in national gas grid. The new framework must clarify the relevant technical solutions and gas quality issues.

There is necessary to review the safety requirements and corresponding legal frameworks for safety compliance to allow injection and increase hydrogen public gas networks.

Also, is need to have the assessment for gas appliance modification to accommodate safe operation with a higher hydrogen content in the national grid.

9. Fuel cells as Stationary Power

The residential stationary fuel cells (also known as Fuel Cell micro-CHPs, Fuel Cell micro-cogenerations) represent 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. The stationary fuel cells are distributed generation technology, i.e. they produce power and heat at the consumers' site and for the purpose to immediate supply with energy. The produced electricity can be used to cover the customers own demand or injected into the electricity grid and sold. The Micro-CHP is defined by the Energy Efficiency Directive as a cogeneration unit with a maximum capacity below 50 kW, however the fuel cell units with a maximum capacity up to 5kW are sufficient for single homes or small residential or commercial buildings.

At the present, a very small number of stationary FC micro-CHP units have been installed in Europe (about 2000). With the exception of the experimental demonstrative units, in Romania there are no stationary FC micro-CHP units installed. The practical experience is quite insufficient and therefore some issues related to a greater number of stationary fuel cells systems exporting electricity to the public grids cannot be foreseen and estimated today.

In order to facilitate the market penetration of stationary fuel cells stable and supportive national policies are needed. The current regulations and financial mechanisms are insufficient to stimulate the market, even if this technology is mature and integrable on the market. Strong political support and appropriate financial incentives can drive the large-scale deployment of the stationary fuel cells.

9.1 Overview and assessment of the current legal framework

In the case of a new user, the installation of the fuel cell must be performed by an authorised electrician/company. For connection to the electricity distribution network, it is necessary to obtain an approval for the technical connection (ATR - Avizul Tehnic de Racordare). The connection to the electric system is made on demand by the electricity distributor / supplier.

Despite the undeniable advantages of the FC micro-CHP systems (high energy efficiency, smart grid capability) these are non-existent on the Romanian market and, moreover, the knowledge about them existence is limited so far.

At this moment (2018) in Romania is a new law referring to possibility to inject electricity into the grid (Law. 184/2018 for the approval of Government Emergency Ordinance no. 24/2017 regarding the amendment and completion of the Law no. 220/2008 establishing the system for promoting the production of energy from renewable energy sources and amending some normative acts). The law does not exclude any equipment for the production and electricity supply, but there are no yet technical solutions and normative.

From a regulatory point of view, things become a more complex because there are two regulations for stationary fuel cells that use natural gas, regulations applicable to the electricity and gas grids.

9.2 Conclusions

In general, the stationary fuel cells enjoy the same treatment as any other electrical or heating appliances working on electricity and gas in regards to networks connection.

The electricity production by prosumers is a very new approach and implies activities that are mainly at the proof of concept / demonstration stage. As such, there is no framework for managing the safety aspects of grid operation, and the financial support scheme is still unattractive.

The actual legal and economical context is considered a barrier referring to the injection of electricity produced by fuel cells, with a high or the highest level of severity on the basis of there being a regulatory gap and novelty of the law.

9.3 Policy Recommendations

There is need to facilitate the connection to the electricity network of FC micro CHP systems as high-efficiency micro-cogeneration units.

It is necessary to develop a long-term coherent policy and legal framework for the widespread deployment of FC micro-CHP systems.

10. Appendix

10.1 Table of figures

10.2 References

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