HyLAW

National Policy Paper - Finland

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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. Hydrogen Europe is an umbrella association, based in Brussels, representing the European industry, research, and national and regional associations in the hydrogen and fuel cell sector.

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 some of these barriers.

1.2 Policy Summary at National level

Among the 18 HyLAW partner countries and within the tripartite classification to 1) front runners, 2) fast followers or 3) emerging countries in hydrogen technology deployment, Finland is considered a fast-follower. Finland has a proactive history on the field. Both research organizations and companies have been active in developing fuel cell applications and utilization of hydrogen. A national research program (2007-2013) enabled several research and development projects among public and private actors, technology development from component to application level, demonstrations and valuable networking among international stakeholders.

A national hydrogen roadmap was published in 2013.[1] It is mainly based on opinions and views of researchers and experts working at VTT Technical Research Centre of Finland Ltd. Since the research program, hydrogen and fuel cells development work has continued within universities, research centers and companies. Participation in, as well as coordination of EU projects funded by Fuel Cells and Hydrogen Joint Undertaking has been active.

At the moment companies like fuel cell stack manufacturer Elcogen Ltd, fuel cell system integrator, Wärtsilä spin-off Convion Ltd and gas producer Woikoski Ltd are working on the field of fuel cells and/or hydrogen utilization. Several research projects are underway, e.g. marine application of a new fuel cell powertrain validation in demanding arctic conditions (MARANDA) and liquid hydrogen "batteries" for storing renewable energy (LOHCNESS).

Utilization of hydrogen and fuel cells applications could be significantly increased as hydrogen production is abundant in Finland. In addition to dedicated hydrogen production units, hydrogen is produced as a side product in chemical, forest and steel industries. To demonstrate the utilization of this resource, VTT Technical Research Centre of Finland Ltd has developed and validated a 50 kW fuel cell unit in industrial environment.[2]

Despite the pioneering companies and active research work, both the hydrogen vehicle fleet and the refueling infrastructure, as well as the utilization of side product hydrogen are still in its infancy in Finland. The deployment of hydrogen technology is comparably slow both in the Nordic and in the European context.

[1] Kauranen et al., *Vetytiekartta - Vetyenergian mahdollisuudet Suomelle*, VTT-R-02257-13, 2013

[2] Ihonen et al., *Operational experiences of PEMFC pilot plant using low grade hydrogen from sodium chlorate production process*, International Journal of Hydrogen Energy, Volume 42, Issue 44, 2 November 2017, Pages 27269-27283 https://www.sciencedirect.com/science/article/pii/S0360319917336844

2. Hydrogen refueling stations

2.1. Overview and assessment of current legal framework

The Alternative Fuels Infrastructure Directive[3] (AFID) establishes a common framework of measures for the deployment of alternative fuels infrastructure in the European Union. It aims to minimize dependence on oil and to mitigate the environmental impact of transport.

This Directive defines 'alternative fuels' as fuels or power sources which serve, at least partly, as a substitute for fossil oil sources in the energy supply to transport and which have the potential to contribute to its decarbonisation and enhance the environmental performance of the transport sector.

The Alternative Fuels Infrastructure Directive sets out minimum requirements for the building-up of alternative fuels infrastructure, including recharging points for electric vehicles and refueling points for natural gas and hydrogen, as well as common technical specifications for such recharging and refueling points, and user information requirements.

According to AFID Member States, who in their national policy frameworks choose to develop hydrogen infrastructure accessible to the public, shall ensure that, by the end of 2025 an appropriate number of hydrogen refuelling stations are available.

On January 2017, the Government adopted Finland's national programme for a distribution network for alternative transport fuels for 2017–2030. The programme sets national targets for the use of different transport fuels, the numbers of cars using alternative fuels as well as a distribution network for alternative fuels. The programme is part of the national implementation of the Alternative Fuels Infrastructure Directive. The Act on the distribution of alternative fuels for transport (Laki liikenteessä käytettävien vaihtoehtoisten polttoaineiden jakelusta, 478/2017) came into force August 1, 2017.

Finland's national target[4] for road transport in 2050 is near-zero emissions. It is proposed in the programme that by 2030 all new cars sold in Finland are compatible with some type of alternative fuel, such as electricity, hydrogen, natural gas, biogas or liquid biofuels even in high concentrations. In addition to public recharging points and refueling points for liquefied natural gas (LNG) and biogas, there should be around 20 refueling points for hydrogen by 2030.

The national programme proposes that in Finland the alternative fuel distribution network will be built by energy companies and other commercial operators mainly on market terms. Existing EU and/or national aid forms of different types can be utilised in the building phase.

Municipalities are not expected to build the alternative fuels infrastructure or fund its construction. Instead, they are tasked to contribute to the planning of the infrastructure where necessary and ensure that it is linked to the rest of the transport network at the local level. The municipalities must also ensure that the areas needed for distribution infrastructure are set aside in land use planning and zoning.

2.2. Conclusions

According to the chemical legislation in Finland, hydrogen refuelling stations are under the supervision of rescue authorities (pelastuslaitos) assuming that the amount of hydrogen stored in them does not exceed the limit of 2000 kg set by Finnish Safety and Chemicals Agency (Tukes).

In order to ease the building of the hydrogen refueling stations and to support the rescue authorities the permission processes have to be clarified and harmonized in Finland. This concerns also the topic of building permission related to land use and building legislation (maankäyttö- ja rakennuslaista tulevat rakennuslupaa koskevat asiat). The safety distances have to be set nationally.

2.3. Policy Recommendations

Finnish Safety and Chemicals Agency (Tukes) is recommended to outline a safety procedure for the building and operation of a hydrogen refueling station in order to smoothen the process from case-specific special permissions.

[3] Directive 2014/94/EU of the European Parliament and of the Council of 22 October 2014 on the deployment of alternative fuels infrastructure (AFID)

[4] https://www.lvm.fi/en/-/national-programme-for-a-distribution-network-for-alternative-transport-fuels-921442

3. Hydrogen safety

3.1. Overview and assessment of current legal framework

Production, storage and use of hydrogen has traditionally been a large-scale industrial activity and its safety is governed by EU-legislation and by Finnish national legislation and rules. Council Directive 96/82/EC on the control of major-accident hazards involving dangerous substances (Seveso III Directive) lays down rules for the prevention of major accidents which might result from certain industrial activities and the limitation of their consequences for human health and the environment. The requirements of Seveso Directive have been implemented into Finnish national legislation. In addition to those requirements there are national requirements concerning e.g. the permitting and notification procedure of industrial handling and storage of dangerous chemicals.

Depending on the amount of produced or stored hydrogen either the Finnish Safety and Chemicals Agency (Tukes) or the local rescue authorities is the competent authority for the permitting or notification procedure. The Finnish Safety and Chemicals Agency is the leading chemical safety authority in Finland and they are responsible for guiding and unifying the chemical safety supervision of local rescue authorities.

Production and use of hydrogen has a long industrial history. The chemical and physical properties of hydrogen are well known in industry and in large-scale production and storage of hydrogen the preparedness to hazardous situations fulfils the high safety standards. Much less experience exists of e.g. use of hydrogen in fuel cell vehicles, in back-up power applications, the use of fuel cells in household electricity and / or heat production, hydrogen refuelling stations etc. The amount of hydrogen in these applications is of course considerably smaller than the quantities used in the industry. Even the lowest notification level of hydrogen (100 kg) may not be exceeded. However ensuring safety of small, consumer-scale use of hydrogen fuel cell applications is still of utmost importance. In wider context it is part of chemical safety, paralleled by the consumer-scale use of liquefied petroleum gas or by the use of natural gas and biogas in vehicles.

For the hydrogen fuel cell applications to become more common, their users and the supervisory safety authorities have to have a clear understanding about the permission processes and safety requirements. It is essential that these requirements are similar throughout the country. For example, installment of hydrogen fuel cells for telecom back-up power has been done in Finland already, but the local fire and rescue authorities have approached the cases differently depending on the place.

3.2. Conclusions

There is a long experience of industrial use of hydrogen in Finland, but only limited experience of small-scale use of hydrogen.

Condition for the hydrogen fuel cells to enter the market is that the requirements for different permissions and notifications are clear, uniform and of reasonably dimensioned according the application. As the hydrogen fuel cells become more popular, safety authorities and fire and rescue personnel needs consistent guidelines on for example how to estimate the notifications of small-scale use of hydrogen and how to act in a fuel cell car accident.

The task of outlining and writing such guidelines is a new challenge for the national safety authorities. In addition, the spread of fuel cell applications and the energy use of hydrogen creates also a need for safety communication to consumers and to the general public, similarly as has been done with natural gas and with liquefied petroleum gas.

3.3. Policy Recommendations

Ministry of Economic Affairs and Employment of Finland is recommended to lay down a hydrogen regulation. Based on that, Finnish Safety and Chemicals Agency (Tukes) could prepare for the growing use of hydrogen by composing a “Safe use of hydrogen” guidebook. Nation-wide safety guidelines concerning the installment, use and accident prevention of hydrogen using fuel cell systems are required in order to harmonise the local case-specific interpretations of the requirements.

4. Ships and boats

4.1. Overview and assessment of current legal framework

International maritime sector

The Commitment by the International Maritime Organization (IMO) to reduce CO_2 50 % by 2050 and the rules on other emissions such as sulphur (0.1-0.5 % limits) requires the maritime sector to look at hydrogen or hydrogen-based fuels, along with other low emission alternative fuels to power the world shipping industry of the future. The EU and its Member States have a strong preference for a **global approach** led by the International Maritime Organization (IMO) as this will be most effective.

Use of hydrogen fuel cells for maritime applications associates with many different regulatory and administrative issues, e.g.

- The design and type approval of hydrogen fuel cells vessels
- The procedures surrounding individual vehicle registration
- The requirements for landing and bunkering installation
- The requirements for operation and maintenance
- The rules surrounding on-board transport of hydrogen.

In the context of design and type approval of hydrogen fuel cell vessels, there is a very clear and highly damaging **regulatory gap.**[5]

At the international level, (i.e. under the scope of IMO), the international code for safety of ships using gases or other low-flash point fuels (IGF Code)[6] contains mandatory provisions for arrangement; installation; control and monitoring; equipment and systems using low flashpoint fuels. As hydrogen has a flashpoint below 60 °C, the IGF code generally applies. Nevertheless, **fuel cells in general and hydrogen as a fuel and are not specifically addressed in the IGF code**, whereas natural gas as fuel is specifically covered.

The regulatory gap applies to both propulsion (main or auxiliary) as well as to the use in heating, cooling and other power generation purposes. Continued work has been agreed under the IGF Code working group. This includes agreeing on the definition of the fuel cell system (n.b. natural gas fuel cells), however this does not include hydrogen powered fuel cells, which are not currently not on the agenda of the IMO.

In the absence of specific provisions, according to the IGF code, the use of other low flashpoint fuels including hydrogen can be **approved based on alternative design**[7]. The alternative design is the process by which safety, reliability and dependability of the systems must be demonstrated to be equivalent to that achieved with new and comparable conventional oil-fuelled main and auxiliary machinery. The equivalence of the alternative design shall be demonstrated by a risk-based approach as specified in SOLAS regulation II-1/55 and approved by National Maritime Authorities.

However, the current procedure, i.e. the alternative design, for design and type approval of hydrogen fuel cell vessels is not the solution to mass deployment. The procedure for approval of alternative design is lengthy, costly, unpredictable and subject to individual (subjective) interpretation.

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[5] The European Commission submitted a paper (CCC 4/INF.15, 7 July 2017), reports on the final results of a study commissioned by the European Maritime Safety Agency (EMSA) on the use of fuel cells in shipping and contains a regulatory gap analysis and a Safety Assessment on different concept fuel cell installations for both passenger and cargo ships.

[6] Resolution MSC.391(95) (adopted on 11 June 2015)

[7] IGF code chapter 2; 2.3.2 "*Fuels, appliances and arrangements of low-flashpoint fuel systems may either: .1 deviate from those set out in this Code, or .2 be designed for use of a fuel not specifically addressed in this Code. Such fuels, appliances and arrangements can be used provided that these meet the intent of the goal and functional requirements concerned and provide an equivalent level of safety of the relevant chapters"*

2.3.3 *"The equivalence of the alternative design shall be demonstrated as specified in SOLAS regulation II- 1/55 and approved by the Administration. However, the Administration shall not allow operational methods or procedures to be applied as an alternative to a particular fitting, material, appliance, apparatus, item of equipment, or type thereof which is prescribed by this Code*."

Vessels operating on inland waterways

CESNI, European committee for drawings up standards in the field of inland navigation, was established in June 2015 as the European Committee of the Central Commission for the Navigation of the Rhine (CCNR). Special inland vessels are to be approved and periodically surveyed by a class society e.g. inland vessels carrying dangerous goods, passenger vessels, ferries, high speed crafts. Currently, for Fuel Cells and Hydrogen apply

- European Standard for Transport on inland navigation vessels elaborated by CESNI, ES-TRIN provides general provision for low-flashpoint fuels (Ch. 30; Appendix 8)
- EU Directive 2016/1629/EU provides the possibility for recommendations by the CESNI WG in order to issue special permits for new technologies
- The equivalence of safety shall be demonstrated by a risk assessment

The legal situation of type approval of inland vessels containing hydrogen as a fuel and hydrogen fuel cells for propulsion or auxiliary power appears to be similar to that described in the previous section on maritime vessels. No specific rules exist for type approval of such vessels. Absence of clear and transparent rules for hydrogen fuel cell vessels operating in inland waterways sets the requirement for individual risk assessment in order to prove equivalence of safety, a process that is expected to be lengthy and costly.

4.2. Conclusions

The absence of specific rules for the type approval of hydrogen fuel cell vessels is a **major obstacle for the commercial deployment of hydrogen and fuel cells (HFC) in the maritime and inland navigation sectors**. The alternative design process is currently the only means for approval of HFC vessels for maritime use. This process implies much higher cost, regulatory uncertainty and delays (estimation of more than one extra year for approval[8], as compared with other, more established technologies).

In the absence of specific rules, the deep decarbonization of the maritime sector, as agreed by the EU Marine Directive (70% reduction of GHG emissions by 2050) and the IMO (50% reduction of GHG emission by 2050) is in serious danger of becoming unattainable, as LNG and LPG technologies cannot achieve such a deep reduction in GHG on their own.

Considering an average lifetime of 30 years of vessels, the deployment of HFC vessels needs to take off, at an accelerated pace, from 2020 in order to meet the demand for new, greener, vessels and have a chance to realistically meet the commitments made. However, given the extremely lengthy procedures at IMO level and the absence of any on-going procedure to negotiate codes covering hydrogen fuel cells, a specific international regulation for the sector is years away.

A concerted effort is necessary by all regulatory actors involved to put the matter on the agenda of the IMO and establish codes and regulations in time for commercial deployment of the technologies. Similarly, the development of specific rules allowing for the type approval of hydrogen and HFC vessels for inland transport in EU waterways is needed in order for this sector to develop.

4.3. Policy Recommendation

Efforts to develop a specific safety code covering hydrogen fuel cell vessels should be accelerated. All relevant stakeholders should come together for a concerted effort to put the topic on the agenda of the IMO and aim for the adoption of an international code as soon as possible.

We address Ministry of Transport and Communications and Ministry of the Environment as well as the maritime authorities Finnish Transport Agency and Finnish Transport Safety Agency to bring the message to EMSA, IMO and CESNI (for inland navigation) to **develop specific rules for the type approval of hydrogen and hydrogen fuel cells vessels**. This recommendation is given also by other HyLAW partners to their respective maritime authorities.

[8] Estimation based on the experience of the MARANDA project