HyLaw - EU-level activities, conclusions and European Framework.

Alexandru Floristean

November 2018

HyLaw National Workshop – London, UK

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Grant Agreement No 737977

Hydrogen Europe and the Fuel Cell & Hydrogen Joint Undertaking

Hydrogen Europe
Industry

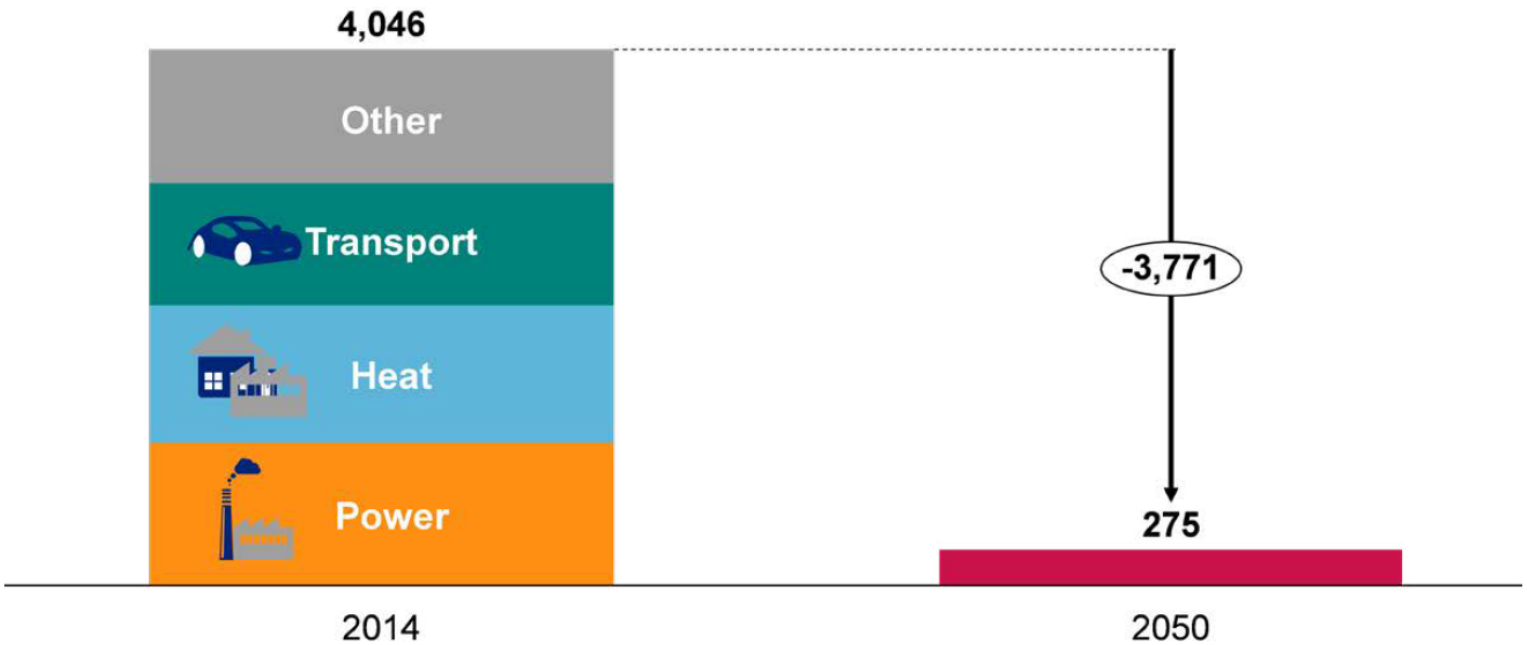
European Union represented by the European Commission

Hydrogen Europe
Research

A portfolio of clean, efficient and competitive solutions based on fuel cells and hydrogen technologies in **energy** and **transport**

The Problem

FIGURE 1 – THE SCALE OF EUROPE'S DECARBONISATION PROBLEM ($MtCO_2e$)

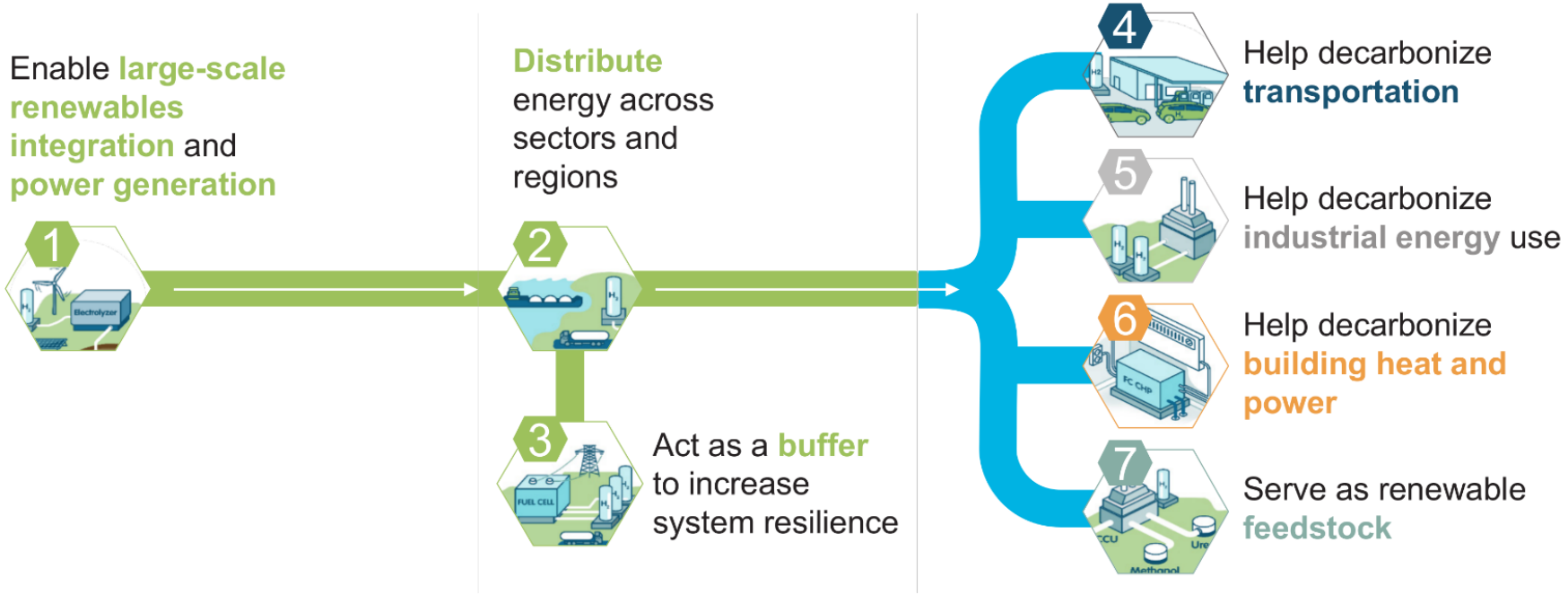


Source: 2016 National Inventory Submissions (Common Reporting Format) for EU, Norway and Switzerland.

Source: Poyry point of view, fully decarbonising europe's energy system by 2050, May 2018

The Solution

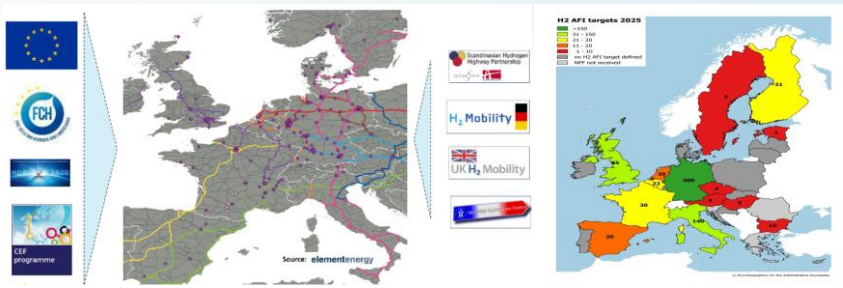
Enable the renewable energy system → Decarbonize end uses



Source: Hydrogen Council

Hydrogen for the Transport sector: Cars & LDVs

May 2018: ZEFER fleet of 180 taxis and police



2017: National plans for HRS deployment towards 2025

June 2018: ENGIE fleet of 50 hydrogen-powered Renault Kangoo Z.E. utility vehicles

H2ME: 1400 FCEVs for customers with the further deployment of 45 HRS

Hydrogen for the Transport sector: Buses

EU-funded projects

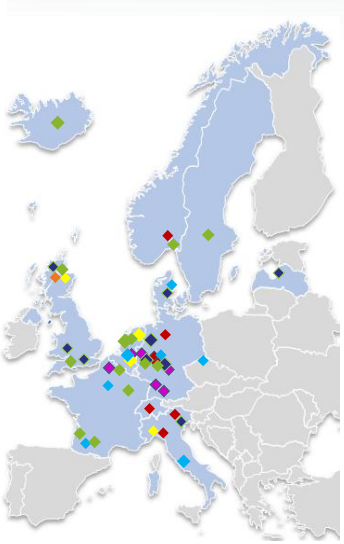
CHIC
(36 buses, plus 20 in Canada)
- ✓ Aargau, CH;
- ✓ Bolzano, IT; London, UK; Milan, IT; Oslo, NO; Cologne, DE*; Hamburg, DE*

High V.LO-City
(14 buses)
- ✓ Antwerp, BE; Aberdeen, UK; Groningen, NL; San Remo, IT

HyTransit
(6 buses)
- ✓ Aberdeen, UK

3Emotion
(21 buses)
- ✓ London, UK
- ✓ Aalborg, DK; Pau, FR; Rome, IT; South Rotterdam, NL; South Holland; Versailles, FR

National/regional-funded projects
- ✓ Karlsruhe, DE; Stuttgart, DE; Frankfurt, DE;
- ✓ Arnhem, NL; North Brabant, NL; Artois Gohelle, FR

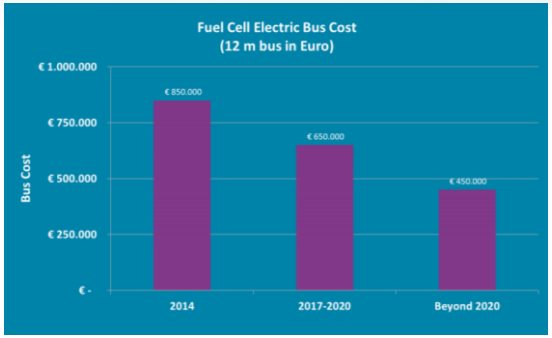


Legend

Countries with (upcoming) FC buses
- ✓ In operation
- ✓ Planned or operation ended
- * National funding

JIVE
(139 buses)
- ✓ Aberdeen, UK – 10 FC buses
- ✓ Birmingham – 20 FC buses
- ✓ Bolzano, IT – 12 FC buses
- ✓ Cologne region, DE – 30 FC buses
- ✓ Herning, DK – 10 buses
- ✓ London, UK – 26 FC buses
- ✓ Rhein-Main region, DE – 11 FC buses
- ✓ Riga, LV – 10 FC buses
- ✓ Wuppertal, DE – 10 buses

JIVE 2
(152 buses)
- ✓ UK – 20 buses
- ✓ Dundee, UK – 12 buses
- ✓ Groningen, NL – 20 buses
- ✓ North Brabant, NL – 10 buses
- ✓ South Holland, NL – 20 buses
- ✓ Auxerre, FR – 5 buses
- ✓ Pau, FR – 5 buses
- ✓ Toulouse, FR – 5 buses
- ✓ Cologne region, DE – 15 buses
- ✓ Germany – 15 buses
- ✓ Iceland – 10 buses
- ✓ Sweden – 5 buses
- ✓ Akershus, NO – 10 buses



Source: JIVE/JIVE2

Last update: April 2018

Join us at the ZEB!

Organised under the patronage of

Stadt Köln

2018 EUROPEAN
ZERO EMISSION BUS
CONFERENCE

Cologne • November 27th & 28th

Technology and policy experts will lead a two-day conference to drive forward the realisation of zero emission public transport for Europe.

Agenda overview

- Technological readiness
- Zero emission bus deployment
- Lessons learned
- New business and financing models
- Scaling up – going from small bus fleets to complete zero emission bus fleets

DETAILS & REGISTRATION: zebconference.com/eu

ZERO EMISSION

Hydrogen Europe

elementenergy

FCH

In partnership with EnergieAgentur.NRW & ElektroMobilität NRW

@EUZEBconference #ZEB2018

Hydrogen for the Transport sector: HDV

FCH-JU H2ME project Batt+RE

Location	France
Manufacturer	Symbio Renault
Autonomy	Tbc
Tank cap.	Tbc
Capacity	Tbc
Filling time	Tbc

ESORO COOP

Location	Switzerland
Manufacturer	ESORO
Autonomy	400 KM
Tank capacity	31 KG
Capacity	34'000 KG
Filling time	10 min

ASKO-SCANIA

Location	Norway
Manufacturer	SCANIA
Deployment	2018
Autonomy	500 km
Transport Capacity	27'000 KG

VDL - COLRUYT

Location	Belgium
Manufacturer	VDL Group
Deployment	2018
Transport Capacity	37'000 KG

FCH-JU started with FC in trucks by researching APU's (3 projects) then Range Extenders in H2ME, by end 2017 about 15 garbage trucks expect to be funded

Nicola Trucks

Toyota Truck @LA port

Kenworth FC drayage truck

Partners planning 2,000 commercial vehicles on the road in next 3 years.

Toyota and 7-eleven study to use FC

Switzerland orders 1000 hydrogen trucks

AGROLA AVIA coop coop mineraloel fenaco MIGROL MIGROS

Suddenly in the news all over the globe

World premiere: Alstom's hydrogen trains enter passenger service in Lower Saxony

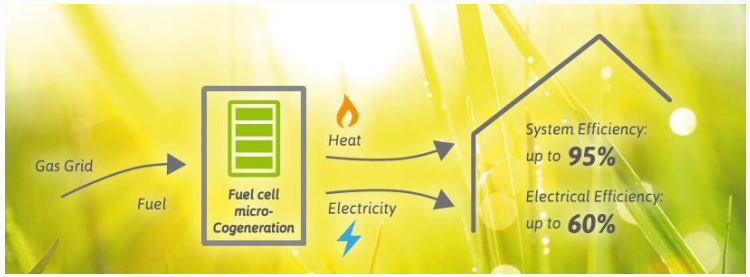
„This is a revolution for @Alstom and for the #FutureOfMobility.

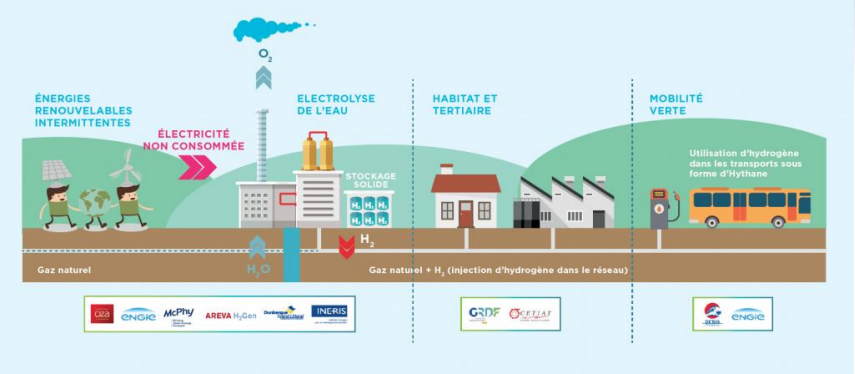
The world's first #hydrogen #fuelcell train is entering passenger service and is ready for serial production"

Henri Poupart-Lafarge, Chairman & CEO of Alstom

16 September 2018

Hydrogen for the Gas sector

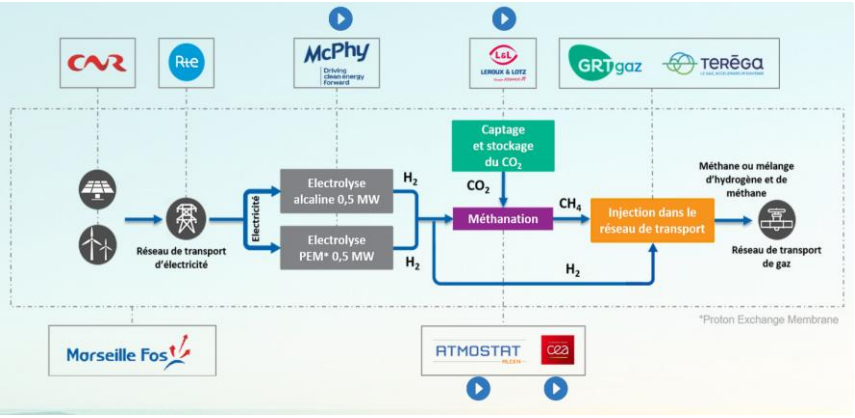




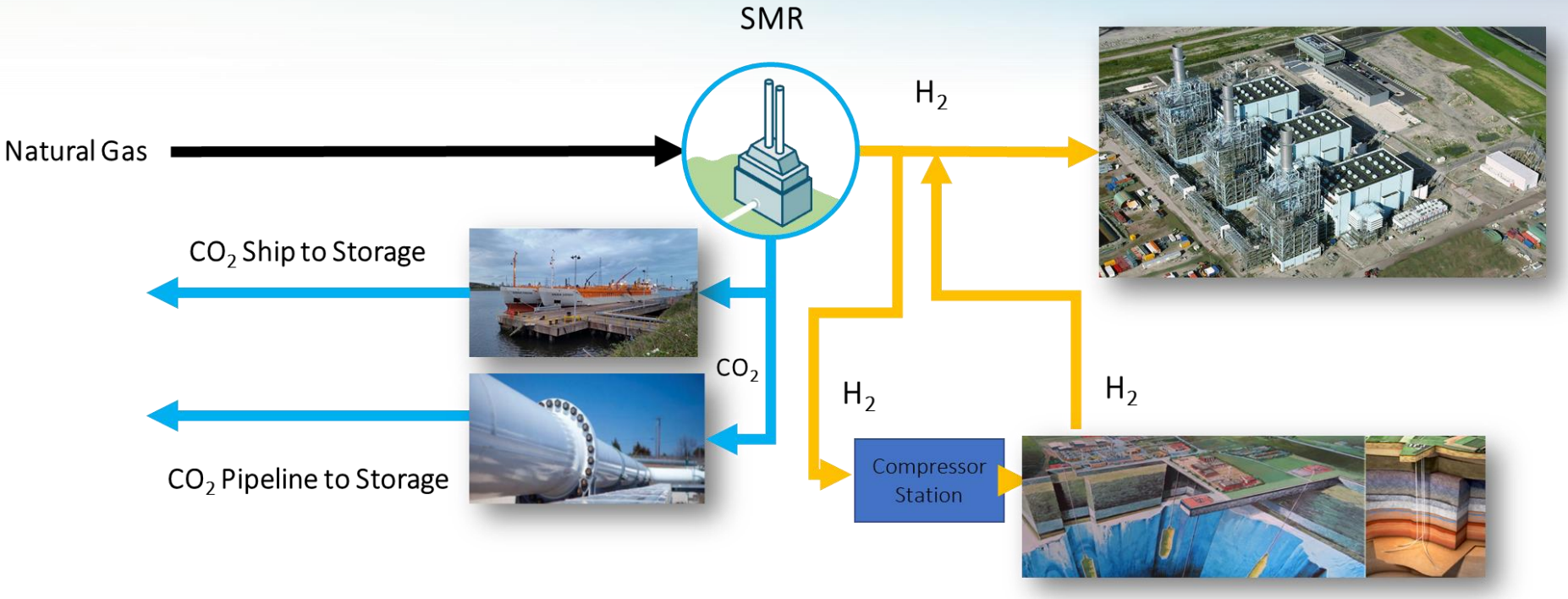
2018: Grhyd (FR)

2018: Jupiter1000 (FR)

Leeds (UK)
100% H2 by 2035
85TWh
17-18M tCO2/yr



Hydrogen for the Power sector



Source: Equinor, 2018

Hydrogen for the Refining sector

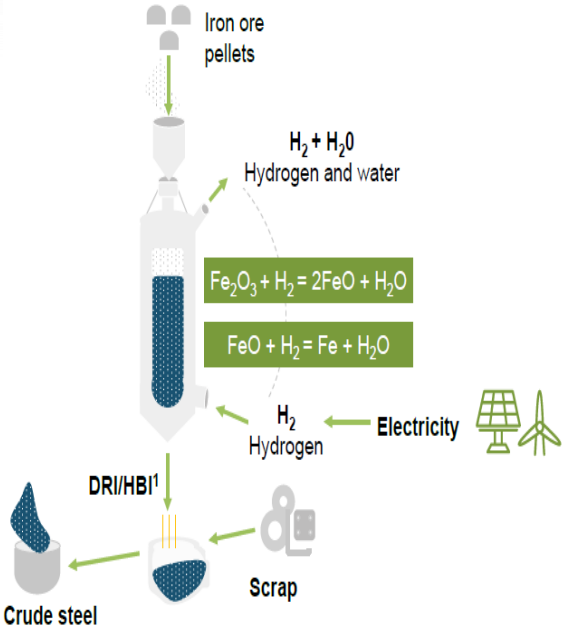
REFHYNE
CLEAN REFINERY HYDROGEN FOR EUROPE

One of the largest hydrogen electrolysis plant at Rhineland refinery, Germany.

4 t H2/day (1% of demand)

With a peak capacity of 10 megawatts the hydrogen will be used for the processing and upgrading of products at the refinery's Wesseling site as well as testing the technology and exploring application in other sectors.

Hydrogen for the Steel sector



see also:

HYBRIT: SSAB & others (Sweden)

SALCOS: Salzgitter & others (Germany)

H2FUTURE Project: Green Hydrogen for Steel Industry

H2FUTURE
Green Hydrogen

- **6 MW Siemens PEM electrolyser system** at the voestalpine steel plant in Linz, Austria
- **Industrial integration of renewable hydrogen production** in the steelmaking process
- **26-month demonstration** of the electrolyser system, in particular
  - Prequalification for power reserve markets (primary, secondary and tertiary control)
  - Integration of the electrolyser system into the steelworks operation
  - Commercial operation on the power reserve and spot markets
  - Quasi-commercial operation with revenue streams from both hydrogen and power
- **Accompanying analysis** of different operation modes, impact in the steel and fertilizer industries

http://www.h2future-project.eu

Market through legislation – Example:

<u>Renewable Energy Directive 2021-2030</u>:

- Mandatory targets:
  - RED II: Gross final consumption 32% renewable by 2030
  - RED II: Transport sector 14% renewable by 2030

*"Renewable liquid and gaseous transport fuels of non-biological origin shall also be taken into account when these are used as **intermediate product** for the production of conventional fuels."*

Shell's Rhineland Refinery, REFHYNE project

- 10 GW of electrolysis (8760 h) ~27 GW (3000 h)

Sources: Morgan Stanley, Global Hydrogen – A US$2.5 trillion industry? (July 2018)
LBST/Hinico, Short term and long term opportunities to leverage synergies between the electricity and transport sectors through power-to-hydrogen (2016).

EU Legislative framework for Hydrogen

A positive regulatory framework for hydrogen requires 2 elements

1. Positive legislation which acknowledges and supports the role of hydrogen
   ➡ Hydrogen Europe's advocacy work

2. Removing barriers that will hinder the deployment
   ➡ HyLAW project

Legal & administrative processes hamper the uptake of FCH technologies

Today: Increasing deployment and appetite for fuel cells and hydrogen (FCH) technologies across Europe: more products better performance, reduced cost.

BUT :

- Existing regulatory legal framework e.g. planning, safety, installation, operation – often only reflect conventional technology and is therefore insufficient
  - Non adapted measures - additional costs and time, resource intensive…
    - For ex. lengthy and costly permitting requirements to install a hydrogen refuelling station in most European countries

This represents a barrier to scale up fuel cell and hydrogen deployment

HyLaw Objectives

Policy	Market
Identify regulatory barriers (and best practices) and advocate for better regulation to support the uptake of fuel cell and hydrogen technologies	**Describe legal and administrative processes** which apply when deploying key Hydrogen technologies (coherent, user friendly, online database)

Analytical documents
Policy Papers (Recommendations)

User friendly database

Scope

- 55 Legal and administrative processes
- 20 hydrogen applications
- 8 categories

Categories of applications
1. Production of hydrogen
2. Storage of hydrogen
3. Transport and distribution of hydrogen
4. Hydrogen as a fuel and refueling infrastructure for mobility purposes
5. Vehicles
6. Electricity grid issues
7. Gas grid issues
8. Stationary power; fuel cells (other issues than gas grid and electricity)

Geographical coverage

- HyLaw's covered 17 EU Countries + Norway.

- 23 Partners contributed to the work, providing details on the legal and administrative processes applicable in their countries

HyLaw – Online Database preview

- Database is online on www.hylaw.eu/database

HyLAW Online Database

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Database

Production of hydrogen | Centralised (Electrolysis, Steam-Meth | Please select a LAP

Database | Compare LAPs | Legislation

The HyLaw database is structured along the nine categories which can be seen below. Within each category, a number of relevant hydrogen applications and different legal and administrative processes (LAP's) are covered. These can be selected from the drop-down menu found below. Once selecting the category, application, legal and administrative process (LAP) and the country you are interested in, you will be directed to a page displaying the data collected in the course of the project.

Production of hydrogen

Centralised (Electrolysis, Steam-Methane reforming, and H2 liquification)

This application concerns 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

- Land use plan (zone prohibition)
- Permitting process (include former LAP: emission regulation)
- Permtting requirements (include LAP: safety-distances)

Localised (Electrolysis, Steam-Methane reforming, and H2 liquification)

Stationary Storage

Transport and distribution of hydrogen

Hydrogen as a fuel and refueling infrastructure for mobility purposes

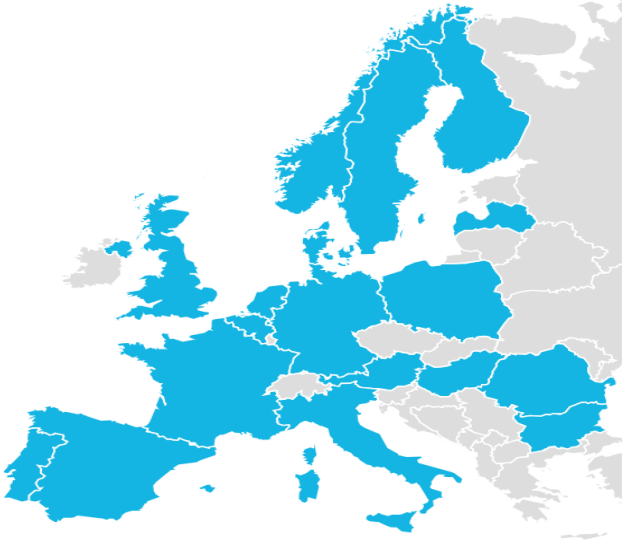
Vehicles

Electricity grid issues for electrolysers

Gas grid issues

Stationary power; fuel cells

Introduction of green hydrogen in Industry



HyLaw – Online Database preview

HyLAW Online Database

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Home / Database / Production of hydrogen / Centralised (Electrolysis, Steam-Methane reforming, and H2 liquification) / Land use plan (zone prohibition)

Land use plan (zone prohibition)

Production of hydrogen | Centralised (Electrolysis, Steam-Meth | Land use plan (zone prohibition)

Database | Compare LAPs | Legislation

Land use plan (zone prohibition)

This LAP refers to the land use plan and analyses the legal requirements for building a centralised hydrogen production facility (including potential zone prohibition), identifies the authority responsible for delivering the land use permit, gives an estimate of the time needed to change the land use plan, and finally highlights if the permit process is uniform throughout the country.

Germany

Expand all answers

a - What are the main regulations/requirements regarding land use plans for building a hydrogen production facility (e.g. permitting regime, agreement)?

b - Are there specific requirements or zone prohibitions for building a hydrogen production facility in the land use plans?

Which is the authority responsible for delivering the land use permit ?

The preparatory and legally binding land use plans are developed and adopted by the municipalities in the framework of national legislation.)

Is there a uniform permit process at local level throughout a country? (uniform interpretation?)

If needed, what is required and how much time does it take to change the land use plan?

Is it a barrier?	No
Assessment Severity	0
Assessment	The LAP is important for identifying the types of land use plans and their requirements resp. prohibitions for building of an industrial hydrogen production plant.

Show National legislation

Show EU legislation

Show Glossary

Show Pan-European Assessment

View Legislation Table

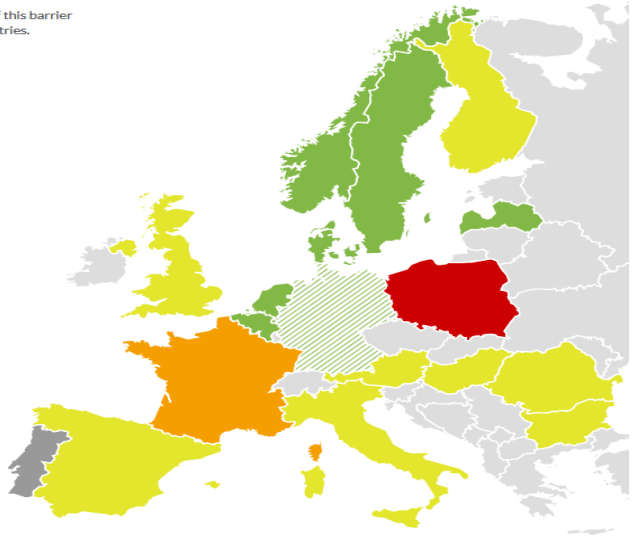
PDF Export | Excel Export

The information is correct | There are errors ...

Submit a suggestion for improvements

This map depicts the severity of this barrier across the HyLaw Partner countries.

- No barrier
- Low
- Medium
- High
- Data not available
- Selected countries



HyLaw – Online Database preview

France

Expand all answers

: What are the main requirements with their applicable regulations for building an HRS (e.g. permitting regime, agreement) apart from the land use planning

What are the main requirements with their applicable regulations for building an HRS (e.g. permitting regime, agreement) apart from the land use planning? Please list them including: a - environmental assessment (e.g.: emissions (IED), noise, etc.)

b - risk assessment

c - technical, including internal/external safety distances safety requirements

d - Personnel safety requirements

e - others

Is it allowed to install and HRS inside for example for forklifts? Is there any additional requirements when you install the HRS inside? If yes, what are the legal requirement? Did they hamper you to install them inside? What are the main requirements with their applicable regulations for building an HRS (e.g. permitting regime, agreement) apart from the land use planning? Please list them including:

Is it a barrier?	Yes
Type of Barrier	Regulatory gap, Structural barrier
Assessment Severity	2
Assessment	As there is no specific regulation for H2 HRS, there are no standard safety distances witch can be predetermined during the planning phase. The regulatory gap for H2 HRS has different major consequences: – there is no standardised approach by the administration for the interpretation of the applicable regulation; – every new HRS project is treated on a case by case basis; – there is a "planning risk" for the operator; – the authorisation procedure could be long for HRS with on–site production (12 to 16 month).

Show National legislation

Show EU legislation

Show Glossary

Show Pan-European Assessment

View Legislation Table

PDF Export | Excel Export

The information is correct | There are errors ...

Submit a suggestion for improvements

Questions and Answers:

- A starting point to understand the process and requirements
- Future work (possible follow-up) could go deeper or answer additional questions

Assessment:

- Project partners *tried* to assess whether the process represents a barrier for industry
- Somewhat subjective, but reasoning is explained for each country and on pan-European level (see below)

Applicable Legislation (National and EU, incl. standards) as well as links to the legal acts where available

Glossary (to explain terms used) and **Pan European Assessment** (to explain the severity of assessment)

Export and other display functionalities

Stakeholder feedback (multiple functionalities, including editing)

HyLAW: Analytical Reports

- D4.1: Detailed **cross-country analysis:** For each process
  - Presentation of the problem
  - Assessment of root causes
  - Recommendations
- D 4.2: **List of legal barriers**, prioritized by degree of severity (Estimated November)
- D 4.4. **List of the most relevant EU legislation**

www.hylaw.eu/info-centre

D4.1 - Cross-country analysis - examples

Table 9: Comparative list of incentives on hydrogen cars / buses in the partner countries

	Access to specific lanes	Free/ reduced fee parking	Tax incentives	Registration fee reduction	Toll charges exemption	Public proc. Rules	Others
Austria	✗	✗	✓	✗	✗	✗	✗
Belgium	✗	✗	✓	✓	✓	✗	✓
Bulgaria	✓	✓	✓	✓	✗	✓	✗ (✓)
Denmark	✗	✓	✓	✓	✗	✓	✗
Finland	✗	✓	✗ (✓)	✗	✗	✗	✗
France	✓	✓	✓	✓	✓	✓	✗
Germany	✓	✓	✓	✗	✗	✓	✓
Hungary	✗	✗	✗	✗	✗	✗	✗
Italy	✗	✗	✗	✗	✗	✗	✗
Latvia	✓	✓	✓	✓	✗	✗	✗
Netherlands	✗	✗	✓	✗	✗	✗	✗
Norway	✓	✓	✓	✓	✓	✗ (✓)	✓
Poland	✗	✗	✗	✗	✗	✗	✗
Portugal	✗	✓	✓	✗	✗	✗	✗
Romania	✗	✗	✗	✗	✗	✓	✗ (✓)
Spain	✓	✗ (✓)	✓	✓	✓	✗	✓
Sweden	✗	✗	✓	✗	✗	✗	✓
UK	✗ (✓)	✗ (✓)	?	✓	✓	✓	✓

D4.1 - Cross-country analysis - examples

When considering the process of permitting the construction and operation of a HRS, there are very few countries where the regulations are specifically designed to regulate HRSs, the most advanced being Germany, Denmark, the UK and the Netherlands. Specific Regulations (AMPG) in France are also under development

Where explicit requirements exist, they invariably require a risk assessment to be carried out covering safety risks associated with fire and explosion, health risks and environmental risks. The risk assessments should also identify the control measures to be put in place to provide an adequate level of public safety for the proposed installations. The risk assessment should include an assessment of major accident hazards presented by the delivery, storage and dispensing of hydrogen at the site and identify controls and contingency plans.

Where specific regulations for hydrogen fuelling stations don't exist, it is expected that authorities will draw on both the permitting process of conventional refuelling stations as well as the regulations applicable for (industrial) H2 storage and for H2 production. This method of working generates requirements well beyond those applicable to conventional stations and the permitting process carries some "regulatory risks" for the operator, as the interpretation and demands from the regional administrative authority can be different from one region to another. By contrast, the requirements for conventional fuel storage at refuelling station are very similar in all EU countries. The lack of experience for potential HRS operators as well as public authorities coupled with the lack of guidelines and instructions for local authorities can cause delays and extra costs and may lead to divergent interpretations from case-to-case, further complicating the obligations of HRS operators.

Recommendations:

Recommendation: Develop approval guidelines for HRS
Justification: When considering the process for permitting the construction and operation of a HRS, there are very few countries where there is a specific administrative guidance detailing the process to be followed. Without much experience and guidance, local authorities are left to interpret which requirements apply and which would not when considering permitting a HRS on a case-by-case basis. This causes extra work and delays for both operators and for authorities and carries regulatory risks for the HRS operator. The lack of experience of both operators as well as public authorities on building up HRS infrastructure, coupled with the lack of guidelines and instructions for local authorities cause delays and extra costs and may lead divergent interpretations from case-to-case, further complicating the obligations of the HRS operators.
Description: Approval guidelines for HRSs should be developed to support smooth procedural implementation by both local authorities as well as HRS operators. They should be developed in close cooperation (and endorsed by) competent authorities. From a procedural point of view, the approval guidelines for HRSs should present the step-by-step processes which should be followed by HRS operators to get all the necessary permits and approvals. From a substantive point of view, the approval guidelines should clarify which legal obligations (e.g. permits, requirements, etc.) apply to HRSs where storage of hydrogen is below certain applicable thresholds (varying across countries) and which apply to those with on-site production (e.g. via electrolysis)
Who: National / Regional and Local authorities

HyLAW: Policy Papers

- **Policy papers:** Key messages and recommendations
  - National Policy Papers for each country
  - Horizontal (for each application) policy papers (estimated November)
  - EU Policy paper (Estimated November)

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The HyLaw consortium has analysed the applicable legal and administrative processes in all the countries covered and has produced a set of analytical reports which seek to shed more light on the sources of regulatory barriers and the impact they have on the timely delivery of hydrogen technologies. We are happy to make them publicly available below:

National policy papers

Building on the content of the database, National policy present the state of play of the Hydrogen Regulatory environment in each country and detail country specific recommendations.

Austria	Germany	Poland
Belgium	Hungary (HU)	Portugal
Bulgaria	Italy	Romania
Denmark (EN) (DK)	Latvia	Spain (EN) (ES)
Finland	Netherlands	Sweden
France	Norway	United Kingdom

EU policy paper

Analytical reports and other deliverables

HyLaw Workshops: Disseminating results and recommendations

- All planned events: www.HyLaw.eu/events
- Contact organizer if interested in participating, you are welcome!

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EU Workshop

A HyLaw EU workshop is scheduled to take place in Brussels on the **6th of December 2018** – for details, contact Alexandru Floristean: a.floristean@hydrogeneurope.eu.

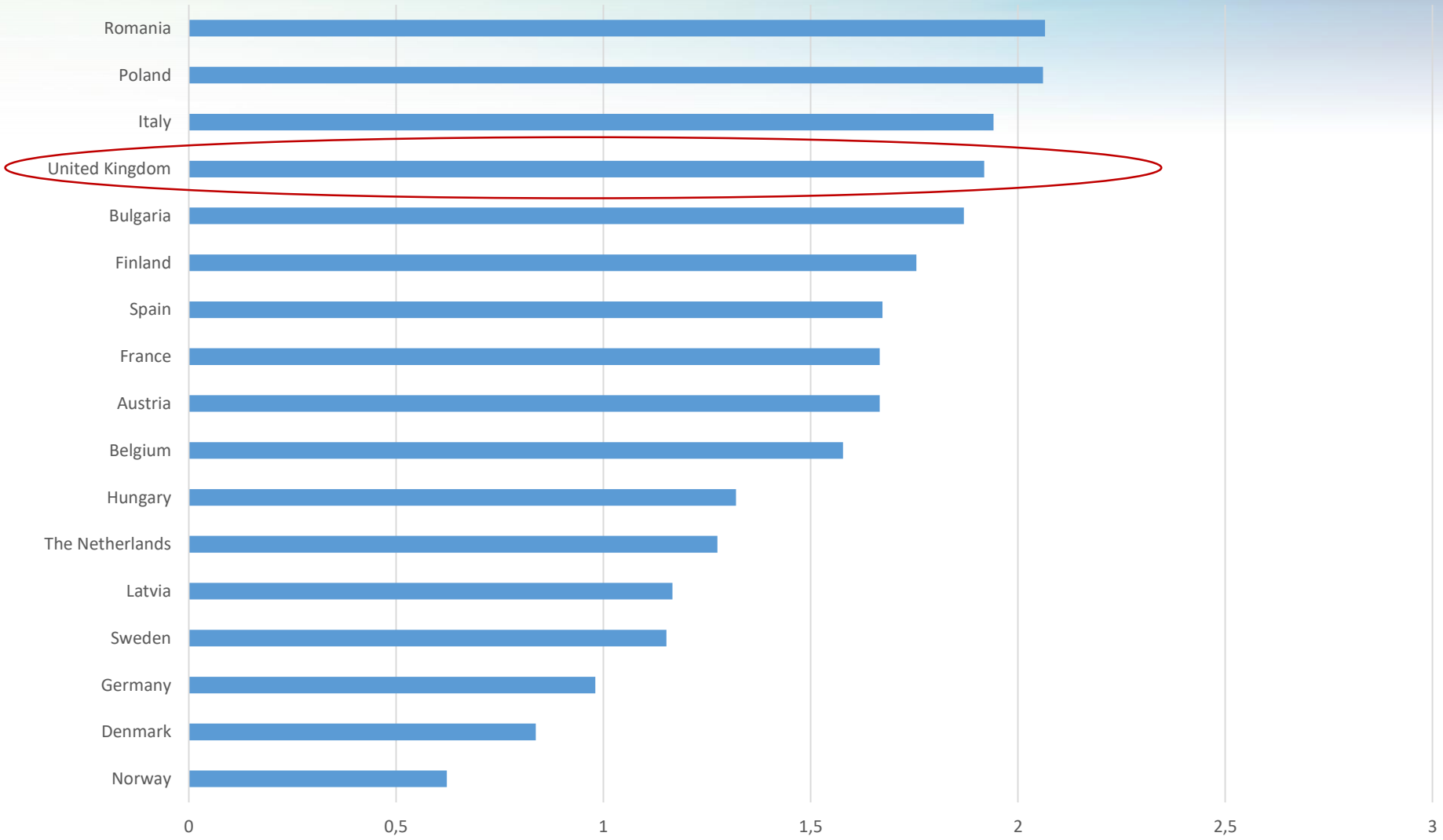
Country	City	Location	Date	Contact Person	Contact Email
EU	Brussels	Hydrogen Europe, Avenue de la Toison d' Or 56- 60	06/12/2018	Alexandru Floristean	a.floristean@hydrogeneurope.eu

National Workshops

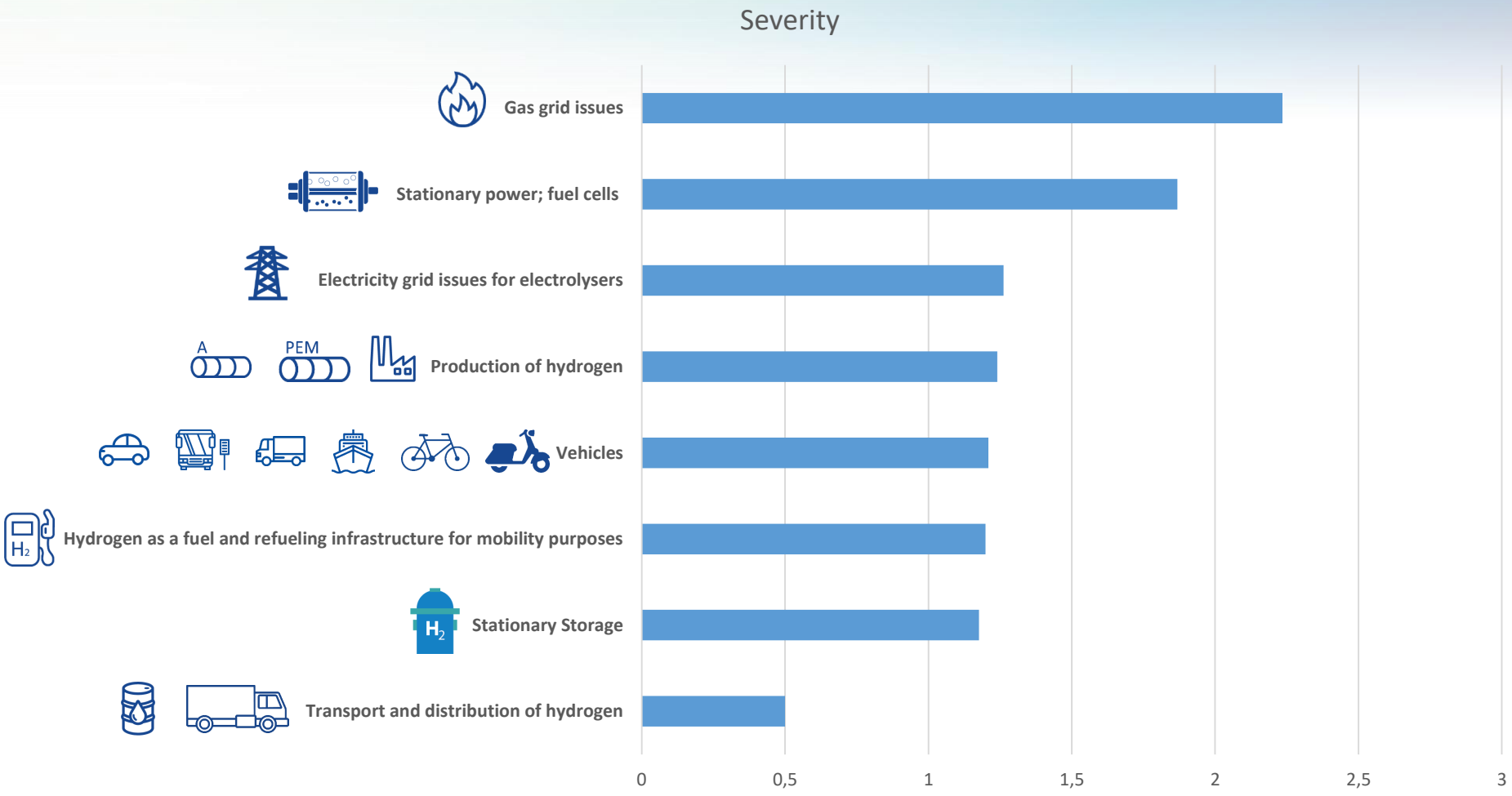
A key national workshop will be organised in each country to present the results of the HyLaw project . Please check below for a schedule of events.

Country	City	Location	Date	Contact Person	Contact Email
AT	Vienna	AEA Executive Committee	06/11/2018	Alfred Schuch	Alfred.Schuch@energyagency.at
BE	Brussels	Avenue de la Toison d' Or 56- 60	23/10/2018	Isabel Francois	isabel.francois@waterstofnet.eu
BG	Sofia	Sofia	06/11/2018	Daria Vladikova	d.vladikova@bas.bg
DK	Copenhagen	Danish Energy Association	25/09/2018	Chris Holst Preuss	TLJ@brintbranchen.dk
FI	Espoo	Dedicated Hydrogen Seminar	07/11/2018	Mikko Kotisaari	mikko.kotisaari@vtt.fi
FR	Paris	To be announced	06/11/2018	Christelle Werquin	Christelle.werquin@afhypac.org
DE	Berlin	Dedicated Workshop	08/11/2018	Dennitsa Nozharova	dennitsa.nozharova@encon-europe.de
HU	Budapest	MTA TTK building, XI.district Budapest, Magyar Tudósok krt. 2.	27/09/2018	Mayer Zoltan	mayer.zoltan@hfc-hungary.org
IT	Milan	National Forum on FC&H technologies, 2018	25/10/2018	Viviana Cigolotti	viviana.cigolotti@enea.it
LV	Riga	The Environment and Energy trade fair	19-21/10/2018	Dainis Boss	dainis@h2lv.eu
NL	The Hague	Dedicated HyLaw Workshop	09/11/2018	Remco Perotti	remco.perotti@nen.nl
NO	Oslo	Citybox, Prinsens gate 6	11/10/2018	Heidi Bull-Berg	Heidi.bull-berg@sintef.no
PL	Warshaw	HyLaw National Workshop	21/11/2018	Marcin Blesznowski	marcin.blesznowski@ien.com.pl
RO	Băile Govora, Vâlcea	Energy Storage Symposium	24-26/10/2018	Ioan Iordache	office@h2romania.ro
ES	Madrid	CDTI (Centro para el Desarrollo Tecnológico Industrial)	18/09/2018	Miguel Zarzuela	mzarzuela@hidrogenoaragon.org
SE	Stockholm	Tändstickspalatset, Västra Trädgårdsgatan 15, Stockholm	20/11/2018	Bjorn Aronsson	bjorn.aronsson@vatgas.se
UK	London	London City Hall	08/11/2018	Emma Fenton	Emma.Fenton@london.gov.uk

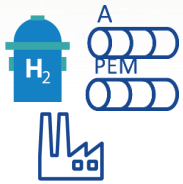
Overall assessment across countries



Severity of barriers in each category



HyLaw: Horizontal Findings – an overview



Directives designed to regulate large scale emitting chemical processes end up applying also to small scale, non-emitting processes / national permitting processes

Standards for compressed hydrogen receptacles (e.g. trailers) would need to be adapted to world with a higher demand for Hydrogen

- A guarantee of origin system for green and low carbon hydrogen at European level is essential;
- Infrastructure development encouraged at EU level / Common standards and definitions;
- Consumption of hydrogen (as a fuel) encouraged at EU level

Type approval and registration of hydrogen road vehicles appears to be quite clear and well regulated. However, significant issues for boats and ships.

HyLaw: General Findings

There is no clear and unequivocal legal position for P2G facilities recognized across both e-grid and gas grid networks

There are fundamental barriers severely constrain or prevent H2 injection in EU Gas Grids

The framework for permitting Power to Gas (P2G) plant and grid connection / injection requirements between the hydrogen supplier and the gas grid operators **should be included within relevant EU regulatory frameworks** to ensure comparable treatment across the EU.

There is no common EU framework for installation of FC micro-CHP units, however, no significant operational barriers were identified

Large Scale (industrial) stationary power fuel cells not covered by HyLaw, however, would the EU ETS apply to Solid Oxide Fuel Cells producing over 20 MW of power?

Thank you for your attention

Questions?

HyLAW
Hydrogen law

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