

HANDOVER
PORTAL MANAGEMENT DOCUMENT
NON-CONFIDENTIAL - July 2022



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Executive Summary

To ensure a correct service transfer in relation to the IT operation and maintenance of the Fuel Cells and Hydrogen Observatory (www.fchobservatory.eu) to Clean Hydrogen JU, a specific Handover - Portal Management document has been developed by Inycom.

This document includes a thorough description of each section and menu that compose the portal. Additionally, to this overview at a user level, this document details the different functionalities offered in the portal's backend, which can be accessed through credentials according to the role assigned to each person. Furthermore, all the IT developments implemented in the portal (such as Tableau interactive charts or pure Drupal developments) are described, as well as the credentials and users who have access to the portal and their role.

TABLE OF CONTENTS

<i>Executive Summary</i>	2
CHAPTER 1: PORTAL MANAGEMENT AND STRUCTURE.....	5
1. Homepage	5
2. Observatory menu.....	6
2.1 Technology and market	7
2.2 Patents.....	23
2.3 Publications.....	25
2.4 Financial support.....	27
2.5 Policy and RCS.....	28
2.6 Education and Training	40
3. Reports.....	44
4. News and events	46
5. About Us.....	47
CHAPTER 2: BACK-END MANAGEMENT GUIDE	48
1. Credentials.....	48
2. Use of the back-end – Content managers	49
2.1 Review National Policies survey.....	49
2.2 Admin News and Events	49
2.3 Admin Reports.....	50
2.4 Admin EU policies	51
2.5 Admin EU policies item.....	52
2.6 File repository.....	52
2.7 Feedback results	53
CHAPTER 3: IT MANAGEMENT GUIDE.....	54
1. Update and management of dynamic analysis charts	54
1.1 FCHO.twbx (FCHO)	54
1.2 Technology and Market - Size of FC Market.....	54
1.3 Technology and Market – Registered FCEVs.....	56
1.4 Publications.....	58
1.5 Technology and Market – Cumulative data	60
1.6 Patents.....	60
1.7 Technology and Market – Hydrogen Supply Capacity	61
1.8 Technology and Market – Hydrogen Demand.....	62

1.9	Technology and Market – LCOH	62
1.10	FCHO.twbx(FCHO).....	63
	IMPORTANT CONSIDERATIONS.....	63
2.	Data content configuration.....	64
2.1	Standards menu.....	64
2.2	Hydrogen Pipelines.....	65
2.3	Education and Training – Education materials	66
2.4	Education and Training – Training programmes	67
2.5	Company Directory	68
3.	HRS API Export	69
4.	Maintenance schedule.....	72
5.	Portal configuration	79

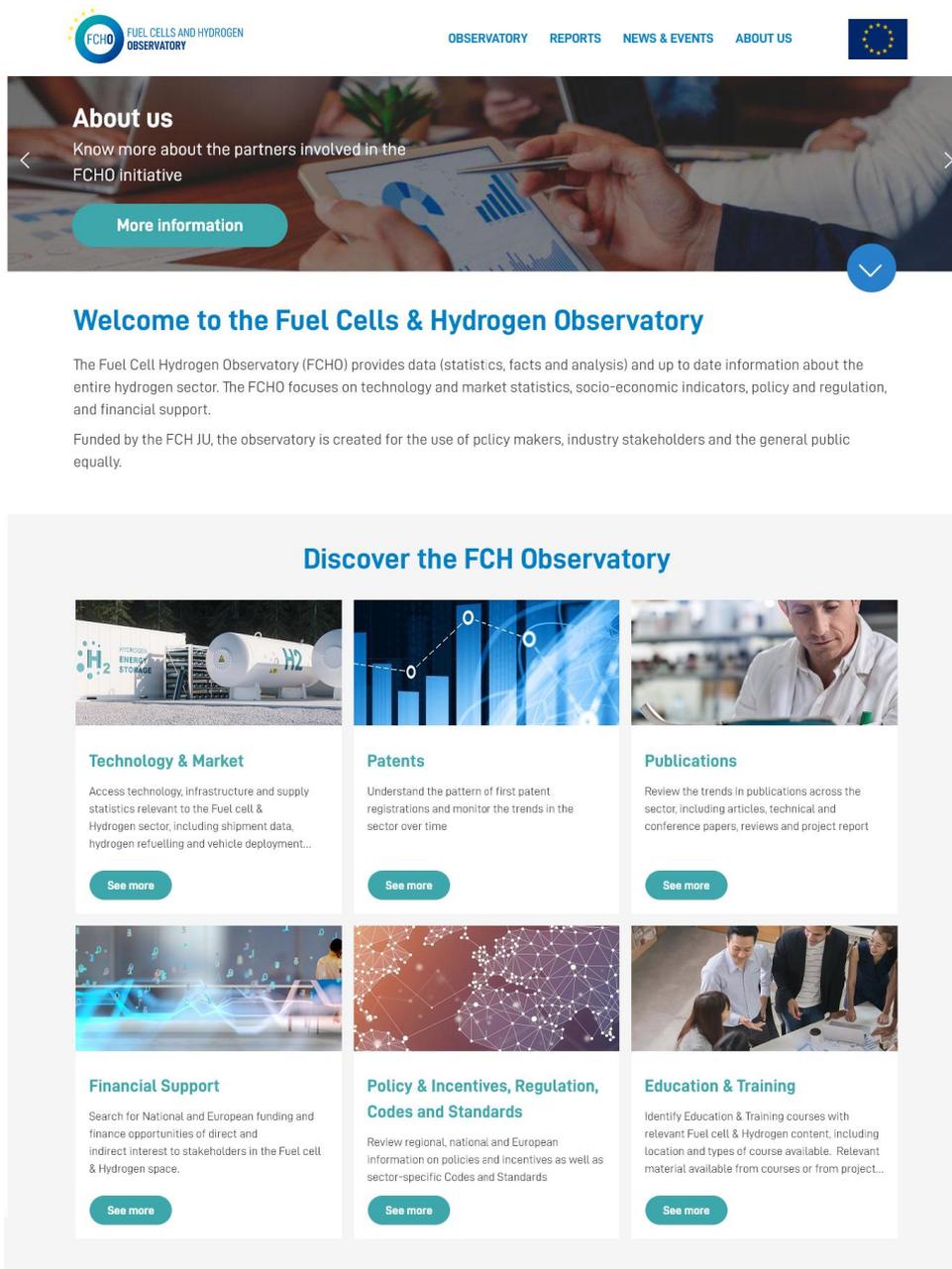
CHAPTER 1: PORTAL MANAGEMENT AND STRUCTURE

This chapter will show the different sections that the public portal contains, explaining in detail each part of the page as well as the material necessary to update each of the functionalities shown in the different menus.

1. Homepage

URL: <https://www.fchobservatory.eu/>

The current portal homepage is the following:



The screenshot shows the homepage of the Fuel Cells and Hydrogen Observatory (FCHO). At the top, there is a navigation bar with the FCHO logo, the text 'FUEL CELLS AND HYDROGEN OBSERVATORY', and menu items: 'OBSERVATORY', 'REPORTS', 'NEWS & EVENTS', and 'ABOUT US'. A European Union flag is also present. Below the navigation bar is a large banner image with the text 'About us' and 'Know more about the partners involved in the FCHO initiative'. A 'More information' button is visible. Below the banner is a heading 'Welcome to the Fuel Cells & Hydrogen Observatory' followed by a paragraph describing the observatory's mission and funding. Below this is a section titled 'Discover the FCH Observatory' which contains six cards, each with a title, a brief description, and a 'See more' button:

- Technology & Market**: Access technology, infrastructure and supply statistics relevant to the Fuel cell & Hydrogen sector, including shipment data, hydrogen refuelling and vehicle deployment...
- Patents**: Understand the pattern of first patent registrations and monitor the trends in the sector over time
- Publications**: Review the trends in publications across the sector, including articles, technical and conference papers, reviews and project report
- Financial Support**: Search for National and European funding and finance opportunities of direct and indirect interest to stakeholders in the Fuel cell & Hydrogen space.
- Policy & Incentives, Regulation, Codes and Standards**: Review regional, national and European information on policies and incentives as well as sector-specific Codes and Standards
- Education & Training**: Identify Education & Training courses with relevant Fuel cell & Hydrogen content, including location and types of course available. Relevant material available from courses or from project...

The homepage introduces the portal and presents all the sections that can be found on it.

All the text included in the homepage are provided by E4Tech. In addition to this, the latest news and posts in the social media account can be seen:

Latest news

Busworld 2021 is cancelled! New dates: 7-12 OCT 2023

2023-10-07



The next edition of Busworld Europe will take place in Brussels from 7 to 12 October 2023, when the event will also be celebrating its 50th birthday!!

[Read more](#)

SAVE THE DATE(S)! EUROPEAN HYDROGEN WEEK TO TAKE PLACE ON 29 NOV. – 3 DEC. 2021

2021-11-29



[Read more](#)

Zero Emission Bus Conference 2021

2021-11-17



"NEW DATES" ZERO EMISSION BUS CONFERENCE 2021 #ZEB2021 will take place on 17-18 November 2021 in Paris, France.

Join the zero-emission bus conversation in Paris where we will again bring together manufacturers, operators, policy makers and industry to discuss decarbonisation of public transport.

[Read more](#)

Tweets by @FCHObservatory

Fuel Cells & Hydrogen Observatory (FCHO) @FCHObservatory
#FCHO update: the #National #Policies chapter has been updated with the latest data!

Learn more about the national rules and policies which impact the deployment of #hydrogen #technologies.

Check it out bit.ly/3vxBxW8#fuelcell

National policies



Aug 26, 2021

Fuel Cells & Hydrogen Observatory (FCHO) @FCHObservatory
The #Policy & Incentives and Regulation, Codes and #Standards module of #FCHO provides an overview of the most relevant policies, rules and standards that directly or indirectly affect the development and deployment of #hydrogen technologies.

Visit bit.ly/3gahSX3



Embed View on Twitter

The latest news shown in the homepage are a preview of the *News & Events* menu explained later on in this document. Besides this, the latest FCHO tweets are displayed on the right side. Lastly, in the footer, there are several links to small sections as well as the link to all the social media accounts (all of them managed by E4Tech). The small sections are the following:

- Data protection: text produced by Inycom as IT provider and approved by the Clean Hydrogen JU.
- Legal notice: text produced by Inycom as IT provider and approved by the Clean Hydrogen JU.
- Glossary: text produced by E4Tech including all the Acronyms showed throughout the portal.
- Contact: text provided by E4Tech and Clean Hydrogen JU.

2. Observatory menu

URL: <https://www.fchobservatory.eu/observatory>

This menu contains the main up to date information, analysis and statistics on the fuel cells and hydrogen sector. The observatory menu consists of 6 main sections: Technology and market, Patents, Publications, Financial support, Policy, Regulation, Codes and Standards and lastly, Education and Training.

The observatory homepage is as follows:

- Technology and Market ▾
- Patents
- Publications
- Financial support
- Policy and RCS ▾
- Education and Training ▾

Observatory



Technology and market

Access technology, infrastructure and supply statistics relevant to the Fuel cell and Hydrogen sector, including shipment data, hydrogen refuelling and vehicle deployment data as well as supply and demand information related to industrial hydrogen



Patents

Understand the pattern of first-patent registrations and monitor the historical trends in fuel cells and hydrogen technologies over time. The FCHO Patent publication is published in this section on an annual basis.



Publications

Review the trends in publications across the sector, including articles, technical and conference papers, reviews and project reports.



Financial support

Search for National and European funding and finance opportunities of direct and indirect interest to stakeholders in the Fuel cell and Hydrogen space.



Policy, Regulation, Codes and Standards

Identify regional, national and European information on policies and incentives relevant to Fuel Cells and Hydrogen. Sector specific Codes and Standards are available to view and are searchable in this section along with appropriate links for detailed information.



Education and training

Identify Education and Training courses with relevant Fuel cell and Hydrogen content, including location and types of course available. Relevant material available from courses or from projects is referenced.



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Each section of this menu can be accessed through the menu on the left or by clicking on the titles of the paragraphs (each section has a short description on the content displayed). The texts are provided by E4Tech.

2.1 Technology and market

URL: <https://www.fchobservatory.eu/observatory/technology-and-market>

The introductory page of this section is as follows:



Technology and Market	▼
Patents	
Publications	
Financial support	
Policy and RCS	▼
Education and Training	▼

Technology and market

The Technology & Market module of the FCHO includes statistics relating to a wide variety of fuel cell and hydrogen applications deployed today and is intended to provide insight into how the industry is developing. The data is sourced directly from industry players and relevant associations within the sector.

In addition, this module currently includes data on the size of the global **fuel cell** market and a directory of FCH system and component suppliers. Data is also being gathered on the Electrolyser and FCH component markets. These additional datasets will be presented on the portal once sufficient data has been submitted to provide a representative picture.

Information on the Industrial landscape is provided including location and capacity of **Hydrogen plants**, hydrogen pipelines and an estimation of the capacity of the **industrial hydrogen market** by end use application. This section of the FCHO is updated on an annual basis following an annual data collection and validation cycle.

Hydrogen Refuelling stations deployed in Europe are mapped including station capacity and location (data sourced from the Hydrogen Refuelling Station Availability Study) and updated. The number of **Fuel Cell Electric Vehicles registered** on European roads are presented (data sourced from EAFO) which is updated quarterly.

This section of the FCHO is updated on an annual basis following an annual data collection and validation cycle.



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The introductory text of this section contains links to all the subsections included in it and is provided by E4Tech.

Size of FC Market/ Fuel cell market

URL: <https://www.fchobservatory.eu/observatory/technology-and-market/fc-market>

The fuel cell market section includes an introductory text and 4 different tabs (Application, Fuel cell type, Region of Integration and Region of Deployment) containing all the relevant data to be shown on the portal:

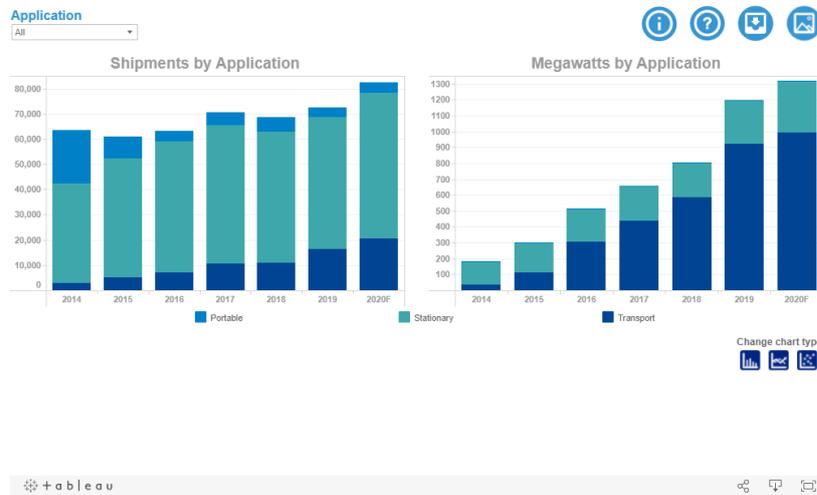
- Technology and Market ▾
- Size of FC market
- Hydrogen Supply Capacity
- Hydrogen Demand
- LCOH
- Hydrogen Pipelines
- Hydrogen Refueling Stations ▾
- Registered FCEVs
- Company directory
- Patents
- Publications
- Financial support
- Policy and RCS ▾
- Education and Training ▾

Fuel cell market

Fuel cell system shipments for each calendar year are presented both as numbers of units and [total system megawatts](#). The data are further divided and subdivided by:

- **Application:** Total system shipments are divided into Transport, Stationary and Portable applications
- **Fuel cell type:** Numbers are provided for each of the different fuel cell chemistry types
- **Region of integration:** Region where the final manufacturer – usually the system integrator – integrates the fuel cell into the [final product](#)
- **Region of deployment:** Region where the final product was shipped to for deployment

Application Fuel cell type Region of Integration Region of Deployment



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In order to show all the data in the Tableau charts, the input data file and the downloadable file are provided by E4Tech.

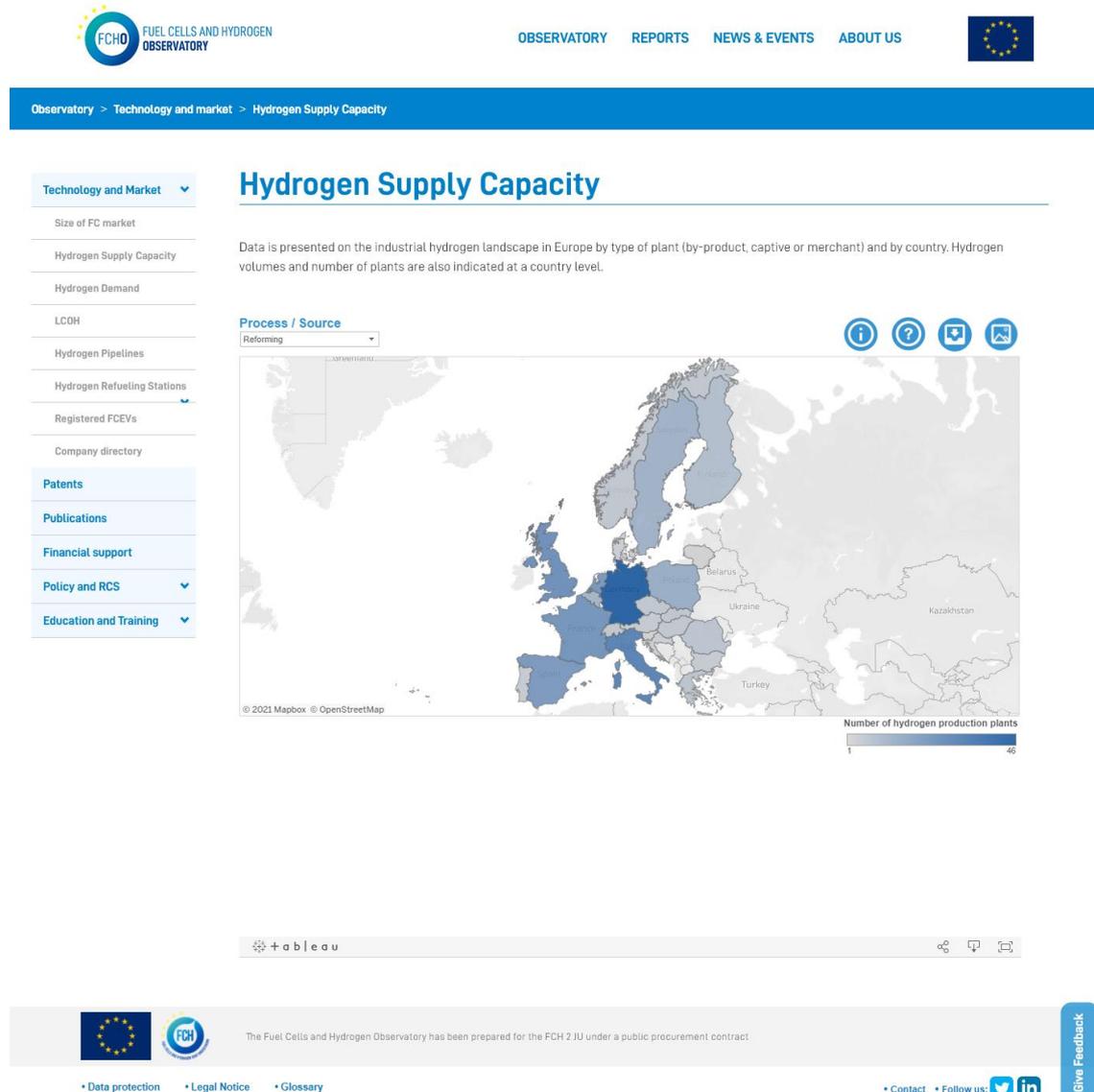
To be able to display all the information in the Tableau charts, the input data excel file has to have always the following format:

	A	B	C	D	E	F	G	H	I	J
1										
2		Data tables and charts								
3		2020f is our forecast for the full year, based on firm data from January to September.								
4		Shipments by Application								
5		1,000s units	2014	2015	2016	2017	2018	2019	2020f	
6		Portable	21,2	8,7	4,2	5,0	5,7	3,9	4,1	
7		Stationary	39,5	47,0	51,8	54,9	51,9	52,2	57,8	
8		Transport	2,9	5,2	7,2	10,6	10,9	16,4	20,5	
9		Total	63,6	60,9	63,2	70,5	68,5	72,5	82,4	
10										
11		Shipments by Region of Deployment								
12		1,000s units	2014	2015	2016	2017	2018	2019	2020f	
13		Europe	5,6	8,4	4,4	5,1	7,7	10,7	12,7	
14		N America	16,9	6,9	7,7	9,4	9,3	8,1	10,7	
15		Asia	39,3	44,6	50,6	55,3	50,9	53,5	58,8	
16		RoW	1,8	1,0	0,5	0,8	0,6	0,2	0,2	
17		Total	63,6	60,9	63,2	70,5	68,5	72,5	82,4	
18										
19		Shipments by region of System Integration								
20		1,000s units	2014	2015	2016	2017	2018	2019	2020f	
21		Europe	6,3	8,0	4,2	6,6	8,8	10,0	16,8	
22		N America	4,3	6,5	6,3	8,4	6,6	6,7	11,0	
23		Asia	53,0	46,2	52,5	55,4	53,1	55,7	54,6	
24		RoW	0,0	0,2	0,2	0,0	0,0	0,0	0,0	
25		Total	63,6	61,0	63,2	70,5	68,5	72,5	82,4	
26										
27		Shipments by Fuel Cell Type								
28		1,000s units	2014	2015	2016	2017	2018	2019	2020f	
29		PEMFC	58,4	53,5	44,5	43,7	39,7	45,7	53,6	
30		DMFC	2,5	2,1	2,3	2,8	3,7	3,7	3,8	
31		PAFC	0,0	0,1	0,1	0,2	0,2	0,3	0,3	
32		SOFC	2,7	5,2	16,2	23,7	24,9	22,8	24,7	
33		MCFC	0,1	0,0	0,0	0,0	0,0	0,0	0,0	
34		AFC	0,0	0,0	0,1	0,1	0,0	0,0	0,0	
35		Total	63,6	60,9	63,2	70,5	68,5	72,5	82,4	
36										
37		Megawatts by Application								
38		MW	2014	2015	2016	2017	2018	2019	2020f	
39		Portable	0,4	0,9	0,3	0,6	0,7	0,4	0,4	
40		Stationary	147,8	183,6	209,0	222,3	220,6	274,8	324,8	
41		Transport	37,2	113,6	307,2	435,7	584,5	921,1	993,5	
42		Total	185,4	298,1	516,5	658,6	805,8	1.196,3	1.318,7	
43										
44		Megawatts by Region of Deployment								
45		MW	2014	2015	2016	2017	2018	2019	2020f	
46		Europe	9,9	27,7	27,4	38,9	41,2	113,0	148,6	
47		N America	69,8	108,4	213,6	331,8	425,3	339,2	252,7	
48		Asia	104,5	159,7	273,8	285,8	337,9	743,9	912,4	
49		RoW	1,2	2,3	1,7	2,1	1,2	0,2	5,0	
50		Total	185,4	298,1	516,5	658,6	805,8	1.196,3	1.318,7	
51										
52		Megawatts by Region of System Integration								
53		MW	2014	2015	2016	2017	2018	2019	2020f	
54		Europe	3,1	4,8	6,7	8,2	11,0	13,8	22,8	
55		N America	137,1	171,0	188,3	215,7	179,4	167,3	176,8	
56		Asia	45,2	121,6	320,8	434,6	615,4	1010,2	1119,1	
57		RoW	0,0	0,7	0,8	0,1	0,0	0,0	0,0	
58		Total	185,4	298,1	516,5	658,6	805,8	1191,3	1318,7	
59										
60		Megawatts by Fuel Cell Type								
61		MW	2014	2015	2016	2017	2018	2019	2020f	
62		PEMFC	72,7	151,8	341,0	466,7	609,0	948,0	1029,7	
63		DMFC	0,2	0,2	0,2	0,3	0,4	0,4	0,4	
64		PAFC	3,8	24,0	56,2	81,0	86,3	130,9	132,2	
65		SOFC	38,2	53,3	62,9	85,2	84,1	106,8	147,5	
66		MCFC	70,5	68,6	55,7	24,7	25,8	10,2	8,8	
67		AFC	0,0	0,2	0,5	0,6	0,1	0,0	0,1	
68		Total	185,4	298,1	516,5	658,6	805,8	1.196,3	1.318,7	
69										

Hydrogen Supply Capacity

URL: <https://www.fchobservatory.eu/observatory/technology-and-market/hydrogen-supply-capacity>

The hydrogen Supply Capacity subsection contains an introductory text and a Tableau chart:



Hydrogen Supply Capacity

Data is presented on the industrial hydrogen landscape in Europe by type of plant (by-product, captive or merchant) and by country. Hydrogen volumes and number of plants are also indicated at a country level.

Process / Source: Reforming

Number of hydrogen production plants: 1 to 46

© 2021 Mapbox © OpenStreetMap

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In order to show all the data in the Tableau charts, the input data file and the downloadable file are provided by Hydrogen Europe.

To be able to display all the information in the Tableau charts, the input data excel file has to have always the following format:

Country	city	Production process	Address	Latitude	Longitude
Austria	Brückl	CS	Brückl, Austria	46,7480784	14,5309443
Austria	Linz	COG	Linz, Austria	48,30694	14,28583
Austria	Linz	Reforming	Linz, Austria	48,30694	14,28783
Austria	Linz	Reforming	Linz, Austria	48,30694	14,28883
Austria	Linz	Water electrolysis	Linz, Austria	48,30694	14,28983
Austria	Schwechat	Ethylene	Schwechat, Austria	48,1409268	16,4763778
Austria	Schwechat	Reforming	Schwechat, Austria	48,1409268	16,4783778
Austria	Weissenstein	Reforming	Weissenstein, Austria	46,68239	13,72339
Austria	Auersthal	Water electrolysis	Auersthal, Austria	48,3738758	16,6362003
Austria	Pilsbach	Water electrolysis	Pilsbach, Austria	48,0355843	13,6656811
Belgium	Antwerp	CS	Antwerp, Belgium	51,2194475	4,4024643
Belgium	Antwerp	Ethylene	Antwerp, Belgium	51,2194475	4,4044643
Belgium	Antwerp	Ethylene	Antwerp, Belgium	51,2194475	4,4054643
Belgium	Antwerp	Reforming	Antwerp, Belgium	51,2194475	4,4064643
Belgium	Antwerp	Reforming	Antwerp, Belgium	51,2194475	4,4074643
Belgium	Antwerp	Reforming	Antwerp, Belgium	51,2194475	4,4084643
Belgium	Antwerp	Reforming	Antwerp, Belgium	51,2194475	4,4094643
Belgium	Antwerp	Reforming	Antwerp, Belgium	51,2194475	4,4104643
Belgium	Antwerp	Reforming	Antwerp, Belgium	51,2194475	4,4114643
Belgium	Antwerp	Reforming	Antwerp, Belgium	51,2194475	4,4124643
Belgium	Antwerp	Styrene	Antwerp, Belgium	51,2194475	4,4134643
Belgium	Antwerp	Reforming	Antwerp, Belgium	51,2194475	4,4144643
Belgium	Feluy	Reforming	Feluy, Belgium	50,562207	4,250265
Belgium	Feluy	Reforming	Feluy, Belgium	50,562207	4,252265
Belgium	Jemeppe sur Sambre	CS	Jemeppe sur Sambre, Belgium	50,4630907	4,6786862
Belgium	Tertre	Reforming	Tertre, Belgium	50,4668162	3,8118542
Belgium	Tessenderlo	CS	Tessenderlo, Belgium	51,0642666	5,0881938
Belgium	Zelzate	COG	Zelzate, Belgium	51,1987114	3,8119772
Bulgaria	Burgas	Ethylene	Burgas, Bulgaria	42,5047926	27,4626361
Bulgaria	Burgas	Reforming	Burgas, Bulgaria	42,5047926	27,4646361

Hydrogen demand

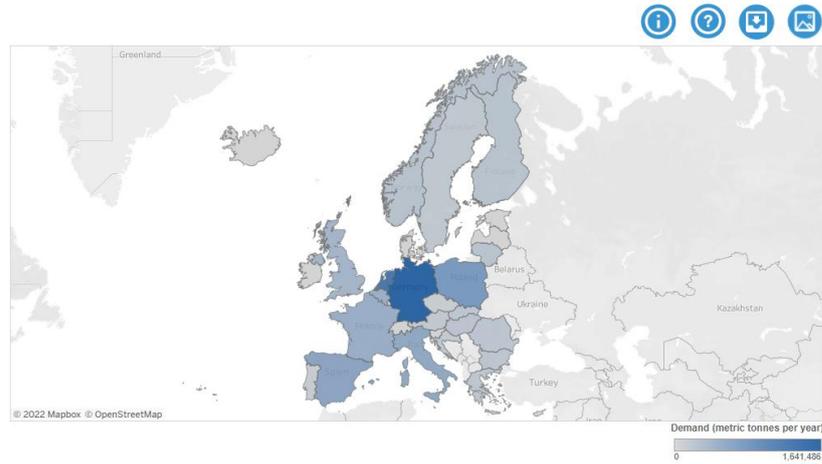
URL: <https://www.fchobservatory.eu/observatory/technology-and-market/hydrogen-demand>

The Hydrogen Demand subsection contains an introductory text and a Tableau chart:

- Technology and Market ▾
- Size of FC market
- Hydrogen Supply Capacity
- Hydrogen Demand
- LCOH
- Hydrogen Pipelines
- Hydrogen Refueling Stations ▾
- Registered FCEVs
- Company directory
- Patents
- Publications
- Financial support
- Policy and RCS ▾
- Education and Training ▾

Hydrogen Demand

Data is presented on the current hydrogen demand landscape in Europe by type of industrial end use application.



+ a b l e a u



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In order to show all the data in the Tableau charts, the input data file and the downloadable file are provided by Hydrogen Europe.
To be able to display all the information in the Tableau charts, the input data excel file has to have always the following format:

Country	Transport	Ammonia	Refinery	Methanol	H2O2	Other chemicals	Energy	Other	Total
Austria	5	72.849	61.172	0	0	4.728	0	1.595	140.348
Belgium	30	133.668	110.173	0	21.230	136.289	9.520	46.182	457.091
Bulgaria	0	86.617	85.973	0	0	0	0	14	172.603
Croatia	0	69.981	61.338	0	0	0	0	20	131.339
Cyprus	0	0	0	0	0	0	0	0	0
Czechia	0	48.789	30.215	0	2	12.850	0	97	91.953
Denmark	30	0	17.625	47	0	0	0	469	18.172
Estonia	0	0	0	0	0	0	0	1	1
Finland	0	0	143.629	0	9.751	19.155	0	36.495	209.029
France	226	200.368	199.766	1.657	0	24.169	26.630	29.347	482.163
Germany	77	428.847	683.866	175.971	13.917	77.016	29.991	231.801	1.641.486
Greece	0	22.055	142.580	0	0	0	238	7	164.880
Hungary	0	68.906	58.470	0	0	75.698	0	1.704	204.778
Iceland	3	0	0	794	0	0	0	66	863
Ireland	0	0	0	0	0	251	0	183	434
Italy	81	80.201	423.858	0	2.694	23.575	1.513	20.317	552.240
Latvia	0	0	0	0	0	0	0	7	7
Liechtenstein	0	0	0	0	0	0	0	0	0
Lithuania	0	153.587	54.429	0	0	0	0	1	208.017
Luxemburg	0	0	0	0	0	0	0	461	461
Malta	0	0	0	0	0	0	0	0	0
Netherlands	114	401.537	591.783	84.729	7.452	193.504	4.998	0	1.284.117
Norway	52	66.834	51.508	92.432	0	2.513	7.759	230	221.327
Poland	0	357.832	366.637	0	0	26.530	4.427	10.296	765.722
Portugal	0	0	97.231	0	2.063	8.061	3.380	0	110.734
Romania	0	92.765	55.821	30.926	3	0	4.808	183	184.506

Levelised Cost of Hydrogen

URL: <https://www.fchoobservatory.eu/observatory/technology-and-market/levelised-cost-of-hydrogen-grid-connected-electrolysis>

The LCOH subsection contains an introductory text and two tabs with two different Tableau charts: ‘Grid connected electrolysis’ and ‘Green hydrogen costs’:



- Technology and Market ▾
- Size of FC market
- Hydrogen Supply Capacity
- Hydrogen Demand
- LCOH
- Hydrogen Pipelines
- Hydrogen Refueling Stations ▾
- Registered FCEVs
- Company directory
- Patents
- Publications
- Financial support
- Policy and RCS ▾
- Education and Training ▾

Levelised Cost of Hydrogen

The Levelised Cost of Hydrogen (LCOH) module includes calculation of current costs of production of hydrogen via water electrolysis in the EU countries (+ UK and Norway).

The calculations have been divided into two distinct scenarios:

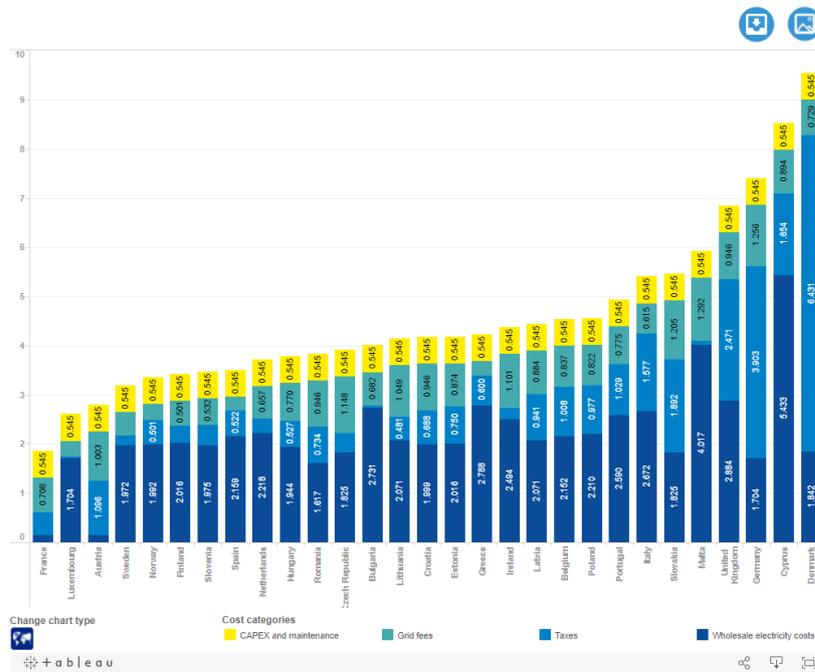
1. Production costs of renewable hydrogen, covering three potential sources of renewable energy - PV, onshore wind and offshore wind (where possible), directly connected to the electrolyser (without grid connection).
2. Production costs of hydrogen produced via water electrolysis powered with electricity sourced from the national power grid.

A more detailed description of assumptions and approach taken to LCOH estimation is available in the downloadable dataset.

Please note that the data does not show actual hydrogen production costs from operational water electrolysis plants in Europe but is a best estimate of what production costs could be expected to be achieved given current costs of multi-MW state-of-the-art electrolysis system and current electricity costs.

This data was compiled in April 2021 and will be updated annually.

Grid connected electrolysis Green hydrogen costs



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In order to show all the data in the Tableau charts, the input data file and the downloadable file are provided by Hydrogen Europe. To be able to display all the information in the Tableau charts, the input data excel file has to have always the following format:

For 'Grid connected electrolysis' chart:

1. Scenario 1 - Grid connected electrolysis						
	Wholesale electricity costs	Taxes	Grid fees	CAPEX and maintenance	Total	
France	0,15	0,45	0,71	0,54	1,86	
Luxembourg	1,70	0,04	0,33	0,54	2,61	
Austria	0,15	1,10	1,00	0,54	2,79	
Sweden	1,97	0,20	0,48	0,54	3,19	
Norway	1,99	0,50	0,32	0,54	3,36	
Finland	2,02	0,36	0,50	0,54	3,42	
Slovenia	1,98	0,42	0,53	0,54	3,47	
Spain	2,16	0,52	0,28	0,54	3,51	
Netherlands	2,22	0,30	0,66	0,54	3,72	
Hungary	1,94	0,53	0,77	0,54	3,79	
Romania	1,62	0,73	0,95	0,54	3,84	
Czechia	1,83	0,40	1,15	0,54	3,92	

For 'Green hydrogen costs' chart:

1. Scenario 2 - Renewable hydrogen with direct connection to RES									
Country	PV CF_avg	PV CF_top	PV CF	Onshore	Onshore v	Onshore w	Offshore v	Offshore w	
Belgium	6,562420135	5,430284758	5,174233	7,047623	5,445286533	3,687887876	6,027545806	5,686829635	
Bulgaria	5,157134872	4,121707495	4,004352	8,299938	5,88639629	5,069572978	8,219493596	7,782109078	
Czechia	6,262733313	5,389159731	5,262415	5,88642	4,901899396	4,328087737			
Denmark	6,911788497	5,382265027	5,129591	3,777409	3,218677261	3,032536204	6,027557503	5,384100654	
Germany	7,49319349	5,462336418	4,934442	6,713728	5,445083643	3,513174435	6,414099936	5,57438392	
Estonia	8,236976463	5,701427148	5,701427	5,069573	4,204076109	4,204064504	6,147069844	5,792048992	
Ireland	8,386735911	6,200121334	5,998736	3,155541	2,84385823	2,814666143	5,384100654		
Greece	4,362360346	3,351438972	2,953233	6,411688	3,981045583	2,814670918	9,588732628	6,705885431	
Spain	4,282416538	3,397651499	2,899525	2,578598	4,68632928	3,795899316	9,077808229	6,098645295	
France	5,708188265	4,427678122	3,387328	5,445287	4,328087737	3,359051301	6,705885431	5,913036479	
Croatia	5,843085365	4,137434681	3,960325	7,047658	5,069590369	4,204076109	11,47625568	9,588732628	
Italy	5,300615794	3,857976942	3,297288	8,299992	5,140203093	4,054641358	11,03830474	8,219493596	
Cyprus	4,342657298	2,933439881	2,93344	8,828831	6,137103289	6,137103289	13,04052899	11,03830474	
Latvia	7,978814371	5,659719168	5,659719	4,984218	4,076225173	4,076225173	6,147057632	5,813611709	
Lithuania	7,851566119	5,687056274	5,687056	4,745793	4,098064326	4,098064326	6,147033209	6,062872527	

Hydrogen pipelines

URL: <https://www.fchoobservatory.eu/observatory/technology-and-market/hydrogen-pipelines>

The Hydrogen pipelines subsection contains an introductory text and a Tableau chart:

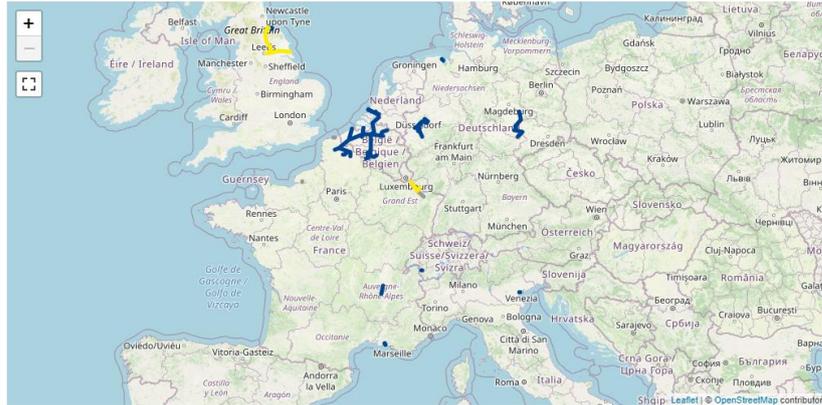


- Technology and Market ▾
- Size of FC market
- Hydrogen Supply Capacity
- Hydrogen Demand
- LCOH
- Hydrogen Pipelines
- Hydrogen Refueling Stations ▾
- Registered FCEVs
- Company directory
- Patents
- Publications
- Financial support
- Policy and RCS ▾
- Education and Training ▾

Hydrogen Pipelines

The map displays key data on the number and type of hydrogen pipelines in Europe. Pipelines displayed in blue are operational, pipelines displayed in yellow are planned or under evaluation, pipelines displayed in grey need further investigation. More information will be added to the pipeline data when available.

Note: N/A means information not available at this point in time.



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In order to show all the data in the Leaflet chart, the input data file and the downloadable file are provided by Hydrogen Europe.

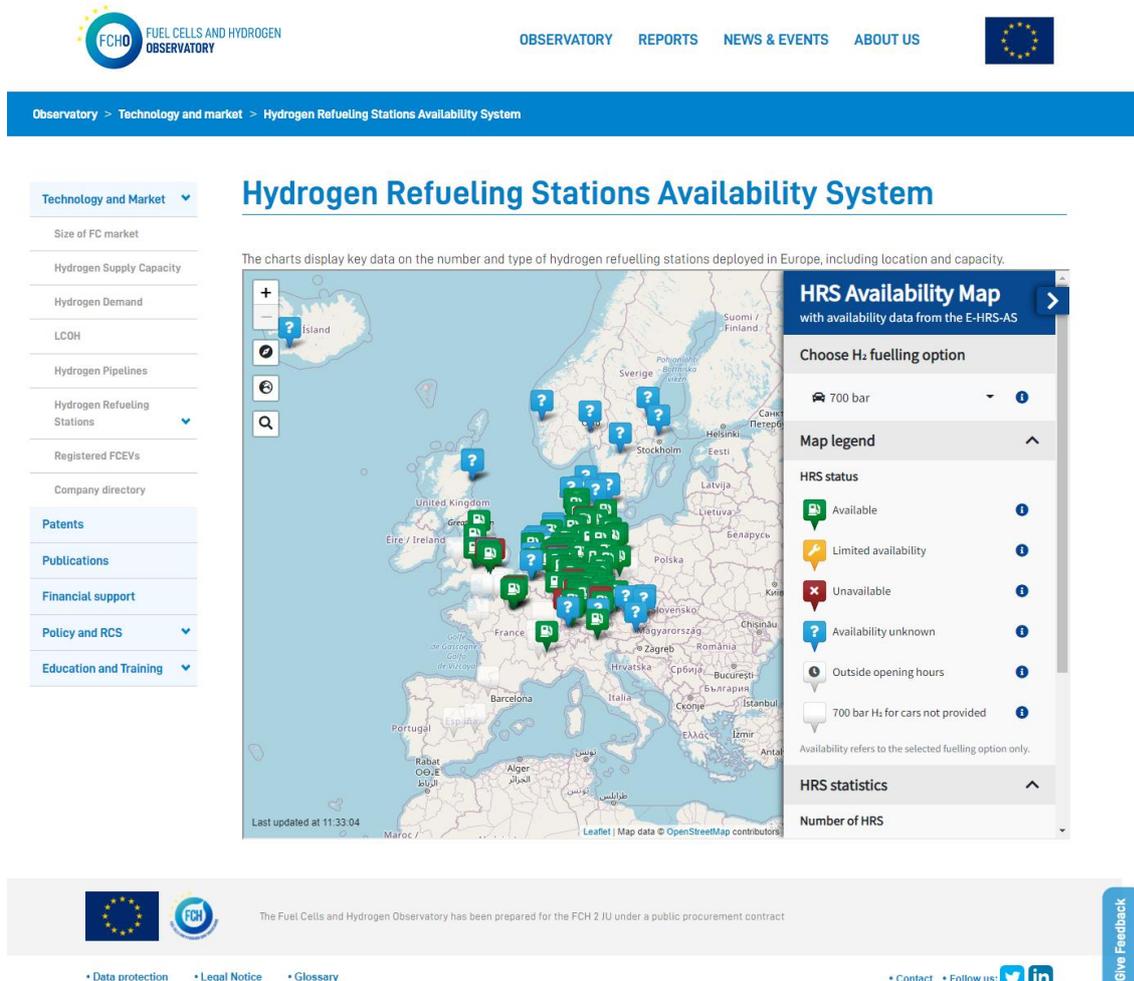
To be able to display all the information in the chart, the input data excel file has to have always the following format:

Reference	Owner	Length km	End-users	Typology	Capacity m3/h	Diameter mm	Pressure bar	Material	Status	Source
1	Air Liquide	964	Chemicals, Petrochemicals	Dedicated	N/A	N/A	100	N/A	In operation	[1]
2	Air Liquide	240	Chemicals, Petrochemicals	Dedicated	28.500	N/A	N/A	N/A	In operation	[1]
3	Air Liquide	14	Chemicals	Dedicated	N/A	N/A	N/A	N/A	N/A	[1]
4	Air Liquide	37	Chemicals, Petrochemicals	Dedicated	N/A	N/A	N/A	N/A	N/A	[1]
5	GRT Gaz	70	Mobility	Retrofit	20.000	N/A	N/A	N/A	Planned	[2]
6	Air Liquide	57	Chemicals	Dedicated	N/A	N/A	N/A	N/A	In operation	[3]
7	Air Liquide	5	Chemicals	Dedicated	N/A	N/A	N/A	N/A	In operation	[1]
8	Air Liquide	5	Petrochemicals	Dedicated	N/A	N/A	N/A	N/A	N/A	[1]
9	Air Liquide	2	Chemicals	Dedicated	N/A	N/A	N/A	N/A	In operation	[1]
10	Air Liquide	6	Petrochemicals	Dedicated	N/A	N/A	N/A	N/A	In operation	[1]
11	Linde	135	Chemicals, Petrochemicals	Dedicated	N/A	N/A	N/A	N/A	In operation	[1]
12	Linde	17	Chemicals	Dedicated	N/A	N/A		50	N/A	In operation
13	Air Products	5	Chemicals	Dedicated	N/A	N/A	N/A	N/A	In operation	[1]
14	Air Products	50	Chemicals, Petrochemicals	Dedicated	N/A	N/A	N/A	N/A	In operation	[1]
15	Air Products	2	Chemicals	Dedicated	N/A	N/A	N/A	N/A	In operation	[1]
16	Borealis	18	Chemicals	Dedicated	2000	50-250		28	N/A	In operation
17	Ineos	12	Chemicals	Dedicated	N/A	N/A	N/A	N/A	In operation	[1]
18	H21 Leeds	65	Residential	Dedicated	N/A	N/A	N/A	N/A	Planned	[4]
19	H21 Leeds	120	Residential	Dedicated	N/A	N/A	N/A	N/A	Planned	[4]

Hydrogen Refuelling Stations – Availability System

URL: <https://www.fchobservatory.eu/index.php/observatory/technology-and-market/hydrogen-refueling-stations-availability-system>

The Hydrogen refuelling Stations – Availability System subsection contains an introductory text and an iframe embedding the HRS Availability Map from <https://h2-map.eu/>.



The screenshot shows the 'Hydrogen Refueling Stations Availability System' page on the FCHO website. The page has a blue header with the FCHO logo and navigation links: OBSERVATORY, REPORTS, NEWS & EVENTS, ABOUT US, and the European Union flag. Below the header is a blue navigation bar with the breadcrumb: Observatory > Technology and market > Hydrogen Refueling Stations Availability System.

The main content area is titled 'Hydrogen Refueling Stations Availability System'. It includes a sidebar on the left with a 'Technology and Market' dropdown menu and various links like 'Size of FC market', 'Hydrogen Supply Capacity', 'Hydrogen Demand', 'LCOH', 'Hydrogen Pipelines', 'Hydrogen Refueling Stations', 'Registered FCEVs', and 'Company directory'. There are also links for 'Patents', 'Publications', 'Financial support', 'Policy and RCS', and 'Education and Training'.

The main content area features a map of Europe with various colored markers representing HRS status. A sidebar on the right is titled 'HRS Availability Map with availability data from the E-HRS-AS'. It includes a 'Choose H₂ fuelling option' dropdown set to '700 bar'. Below that is a 'Map legend' section with the following items:

- Available (Green icon)
- Limited availability (Yellow icon)
- Unavailable (Red icon)
- Availability unknown (Blue question mark icon)
- Outside opening hours (Grey icon)
- 700 bar H₂ for cars not provided (White icon)

Below the legend is an 'HRS statistics' section with a 'Number of HRS' dropdown.

The footer contains the European Union logo, the FCHO logo, and the text: 'The Fuel Cells and Hydrogen Observatory has been prepared for the FCH 2 JU under a public procurement contract'. There are also links for 'Data protection', 'Legal Notice', 'Glossary', 'Contact', and 'Follow us' (Twitter and LinkedIn icons). A 'Give Feedback' button is located in the bottom right corner.

Hydrogen Refuelling Stations – Cumulative Data

URL: <https://www.fchobservatory.eu/observatory/technology-and-market/hydrogen-refueling-stations/cumulative-data>

The HRS – Cumulative data subsection contains an introductory text and two tabs with two different Tableau charts: 'Deployment by year' and 'Deployment by country':

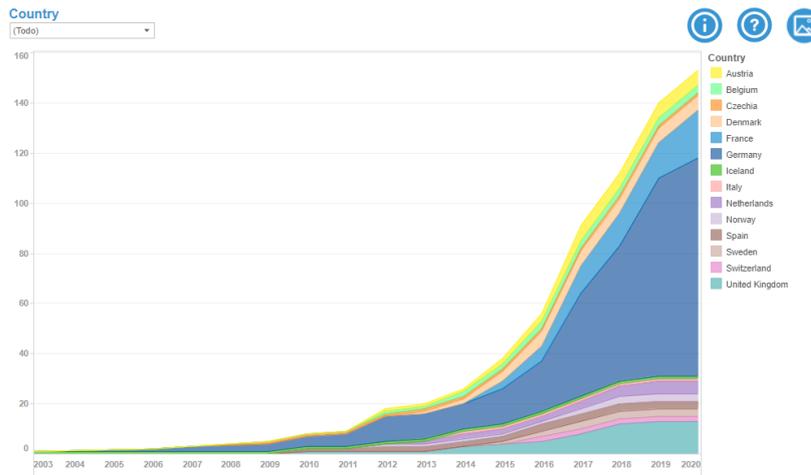


- Technology and Market ▾
- Size of FC market
- Hydrogen Supply Capacity
- Hydrogen Demand
- LCOH
- Hydrogen Pipelines
- Hydrogen Refueling Stations ▾
- Availability System
- Cumulative data
- Registered FCEVs
- Company directory
- Patents
- Publications
- Financial support
- Policy and RCS ▾
- Education and Training ▾

Cumulative data on installed HRS

The map depicts the historical deployment of HRS in Europe by country and by year. A country by country comparison of the data can also be displayed by selecting the alternative chart view. The capability of the HRS stations to dispense hydrogen at different pressures is also captured in this section.

[Deployment by year](#)
[Deployment by country](#)



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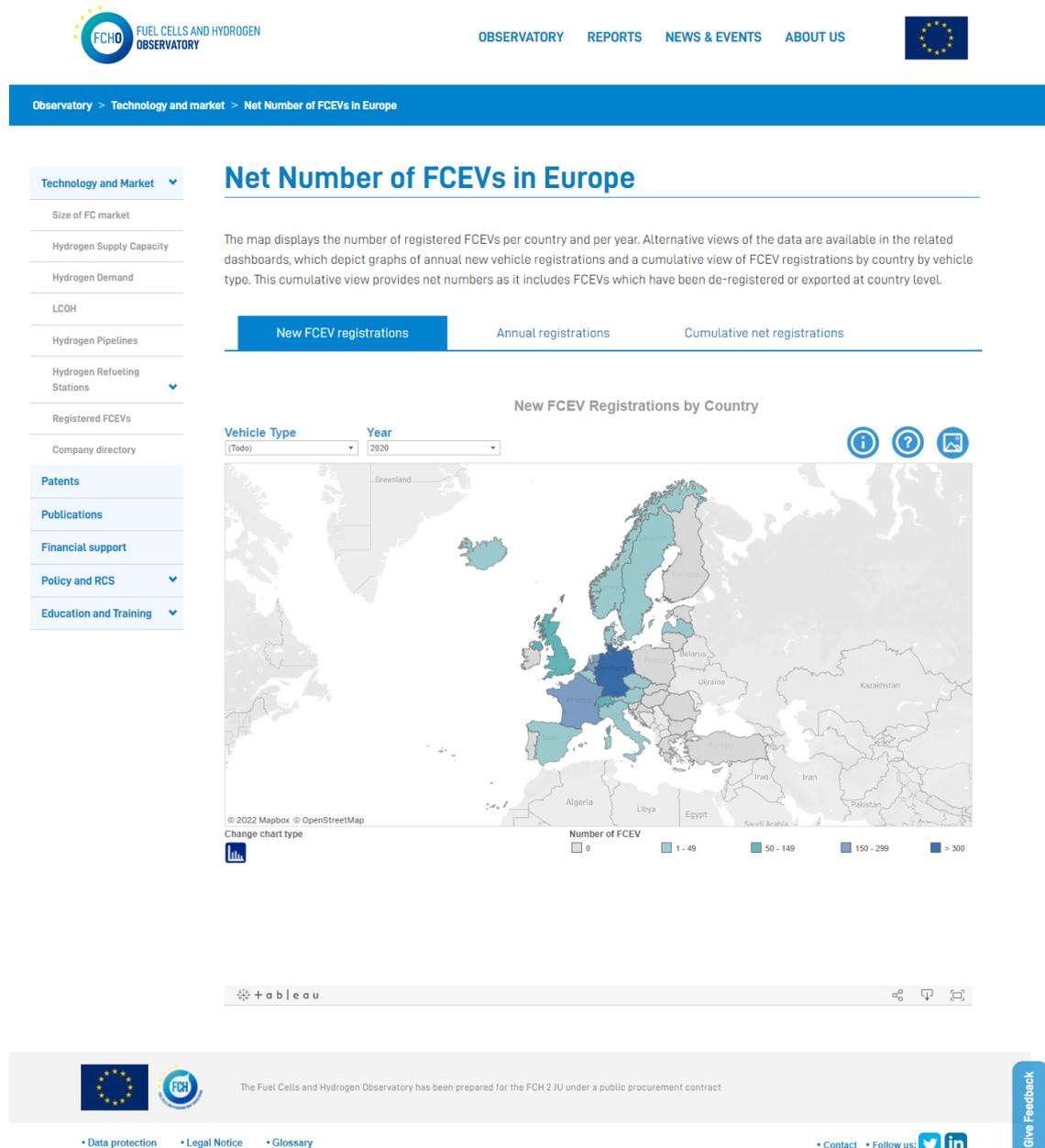
In order to show all the data in the Tableau charts, the input data file is provided by E4Tech. To be able to display all the information in the Tableau charts, the input data excel file has to have always the following format:

HRS ID	name	HRS operator	site op	HRS ow	techn	funder	street address	postal code	city	country	timezone	geolocation
AJMFY	Kolding	Danish Hydrogen Fuel A/S	Danish H	NEL			Vejlevej 361	6000	Kolding	Denmark	Europe/Copenhagen	9.464995000000
AQAIW	Wuppertal	H2 Mobility	Shell	H2 Mobil	Linde AG	BMVI	Schmiedestraße 91	42279	Wuppertal	Germany	Europe/Berlin	7.252654999999
AVYHA	Geisingen	H2 Mobility	Shell	H2 Mobil	Linde AG	BMVI	Bodenseestraße 19 B	78187	Geisingen	Germany	Europe/Berlin	8.668062999999
AYCTA	Leipzig	H2 Mobility	TOTAL	H2 Mobil	Linde AG	FCH JU	Poststr. 3	4158	Leipzig	Germany	Europe/Berlin	12.3079, 51.413
BADJR	Stuttgart Flughafen	H2 Mobility	OMV	H2 Mobil	Linde AG	BMVI	Flughafenstraße 70	70629	Echterdingen	Germany	Europe/Berlin	9.198637999999
BAFGD	Laatzten	H2 Mobility	Shell	H2 Mobil	Air Liquid	FCH JU	Karlsruher Str. 12	30880	Laatzten	Germany	Europe/Berlin	9.796929999999
BAXXC	Karlsruhe Erlachseeweg	H2 Mobility	TOTAL	H2 Mobil	Linde AG	BMVI	Erlachseeweg 10	76227	Karlsruhe	Germany	Europe/Berlin	8.4474428, 48.9
BJDSK	Hamburg Großmoorbog	H2 Mobility	Shell	H2 Mobil	Air Liquid	Connectri	Großmoorbogen 1	21079	Hamburg	Germany	Europe/Berlin	10.01128, 53.46
BKDAI	Lyon Port Edouard Herr	Engie	Engie	McPhy			28 Rue de Dijon	69007	Lyon	France	Europe/Paris	4.835269003224
BKMQY	Port Talbot	University of South Wales	University of South Wales	Baglan			SA12 7AX		Port Talbot	United Ki	Europe/London	-3.822169999999
BQDWS	Lohfelden	H2 Mobility	Shell	H2 Mobil	Air Liquid	Connectri	Alexander-von-Hum	34253	Lohfelden	Germany	Europe/Berlin	9.527152999999
BHWT	Arnhem	PitPoint		HyGear			Westervoortsedijk 7	6827 AV	Arnhem	Netherlan	Europe/Amsterdam	5.946620396358
CCEYN	Trondheim Tiller	ASKO		NEL			Østre Rosten 106	7075	Tiller	Norway	Europe/Oslo	10.372929, 63.3
CISLW	Kamen	H2 Mobility	Air Liquid	H2 Mobil	Air Liquid	BMVI	Schattweg 8	59174	Kamen	Germany	Europe/Berlin	7.676097, 51.57
CQPYL	Bayreuth	H2 Mobility	Shell	H2 Mobil	Air Liquid	FCH JU	Christian-Ritter-von-	95448	Bayreuth	Germany	Europe/Berlin	11.61072962236
CURZP	Hannover Industrieweg	H2 Mobility	Linde AG	Linde AG	Linde AG	BMVI	Industrieweg 30	30179	Hannover	Germany	Europe/Berlin	9.726884999999
CYQMT	Rostock	H2 Mobility	TOTAL	H2 Mobil	NEL	BMVI	Tessiner Str. 98	18055	Rostock	Germany	Europe/Berlin	12.189182999999
DHCB	Berlin Heerstraße	H2 Mobility	TOTAL	H2 Mobil	Linde AG	BMVI	Heerstraße 35-37	13593	Berlin	Germany	Europe/Berlin	13.260463999999
DJAIJ	Paris Pont de l'Alma	Air Liquide	Air Liquid	Air Liquid			Place de l'Alma	75008	Paris	France	Europe/Paris	2.302083364298
DUWIV	Neratovice	Veolia Transport		Linde AG			Ke Spolane 1457	27711	Neratovice	Czechia	Europe/Prague	14.515554, 50.2

Registered FCEVs

URL: <https://www.fchobservatory.eu/index.php/observatory/technology-and-market/net-number-of-fcevs>

The Registered FCEVs subsection contains an introductory text and three tabs with three different Tableau charts: ‘New FCV registrations’, ‘Annual registrations’ and ‘Cumulative net registrations’:



Net Number of FCEVs in Europe

The map displays the number of registered FCEVs per country and per year. Alternative views of the data are available in the related dashboards, which depict graphs of annual new vehicle registrations and a cumulative view of FCEV registrations by country by vehicle type. This cumulative view provides net numbers as it includes FCEVs which have been de-registered or exported at country level.

[New FCEV registrations](#)
[Annual registrations](#)
[Cumulative net registrations](#)

New FCEV Registrations by Country

Vehicle Type: (Toda) | Year: 2020

Number of FCEV: 0, 1 - 49, 50 - 149, 150 - 299, > 300

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[Follow us: !\[\]\(e6f4eb997f58f048f04b158ca2c219b7_img.jpg\) !\[\]\(77ecbadd823fee663d4583d8e3e9ff65_img.jpg\)](#)
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In order to show all the data in the Tableau charts, the input data file is provided by E4Tech. To be able to display all the information in the Tableau charts, the input data excel file has to have always the following format:

Country	2008						2009						2010						2011					
	L	L6=L7	M1	N1	N2+N3	M2+M3	L	L6=L7	M1	N1	N2+N3	M2+M3	L	L6=L7	M1	N1	N2+N3	M2+M3	L	L6=L7	M1	N1		
Europe	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
European Union	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Austria																								
Belgium																								
Bulgaria																								
Croatia																								
Cyprus																								
Czech Republic																								
Denmark																								
Estonia																								
Finland																								
France																								
Germany																								
Greece																								
Hungary																								
Iceland																								
Ireland																								
Italy																								
Latvia																								
Lithuania																								

Company directory

URL: <https://www.fchobservatory.eu/observatory/technology-and-market/company-directory>

The Company directory subsection contains an introductory text, a free search filter, a category selector, an Open Street map together with the list of companies:

- Technology and Market ▾
- Size of FC market
- Hydrogen Supply Capacity
- Hydrogen Demand
- LCOH
- Hydrogen Pipelines
- Hydrogen Refueling Stations ▾
- Registered FCEVs
- Company directory
- Patents
- Publications
- Financial support
- Policy and RCS ▾
- Education and Training ▾

Company directory

The company directory includes a list of FCH-related product and service providers in Europe. The entries are currently concentrated on actors that provide fuel cell systems and components. On-going FCHO activities will grow both the technical and geographic coverage of the directory. The directory can be searched by keyword on the company name or on any field in the company address (street address, city name, country). Alternately, the selectors can be used to filter the directory based on the products or services that the companies offer. There can be up to 5 levels of selectors depending on which is chosen. Click apply to see a list of companies that offer the selected product or service.

Category selector

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Aquis

Rue de la Coutouvrenière 19, 1204 Geneva, Switzerland

Switzerland

[View more](#)

ABB

Affolternstrasse 44, CH-8050 Zurich, Switzerland

Switzerland

[View more](#)

Abengoa Innovacion

Campus Palmas Altasc/ Energia Solar n1, E-41014 Seville, Spain

Spain

[View more](#)

By clicking on the map pins or on the 'View more' in the list, a detailed profile of the selected company is shown:



- Technology and Market ▾
- Patents
- Publications
- Financial support
- Policy and RCS ▾
- Education and Training ▾

Adelan

Unit 10 Weekin Works, 112-116, Park Hill Road, Birmingham, B17 9HD

United Kingdom of Great Britain and Northern Ireland

<http://adelan.co.uk/>

Activities:

Product offering >Fuel cell stack, module or system >Fuel cell system

Product offering >Fuel cell stack, module or system >Fuel cell chemistry >SOFC

Product offering >Fuel cell stack, module or system >Portable

Product offering >Stack components & materials >Products for solid oxide cells >Solid oxide cell or half cell



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In order to show all the data in the charts, the list and the detailed profiles, the input data file is provided by E4Tech.

To be able to display all the information in the Tableau charts, the input data excel file has to have always the following format:

Instructions for FCHDB ID (FCHDB)		Check which one is the actual company website (Y, Z, AA)																				Empty	F				
Column in FCHDB	E	AP	M	N	Y	V	AW	AS	AT	AU	CB1	CB2a	CB2b	CB2c	CB2d	CB2e	CB2f	CB3	CB4	CB5	CB6	CB7	CB8	CB9	AB	BB	
Field code in DCP	FCHDB	Site address	Latitude	Longitude	General information										Site specific information												
Category summary	Company ID	Company name (one field)			General information										Site specific information												
Category layer 1	Company profile	Company name	Company name	Company name	Company name	Company name	Company name	Company name	Company name	Company name	Company name	Company name	Company name	Company name	Company name	Company name	Company name	Company name	Company name	Company name	Company name	Company name	Company name	Company name	Company name	Company name	Company profile
Category layer 2	General information	General information	General information	General information	Sites	Sites	Sites	Sites	Sites	Sites	Sites	Sites	Sites	Sites	Sites	Sites	Sites	Sites	Sites	Sites	Sites	Sites	Sites	Sites	Sites	Sites	Sites
Category layer 3	Short name	Complete	Web site	Company	SME	Site name	Activity	Activity	Activity	Activity	Activity	Activity	Activity	Activity	Activity	Activity	Activity	Activity	Activity								
Category layer 4	Headqu	Engine	R&D	Manuf	Service	Other	Site Em	Site cor	Address	Address	Postal	City	Country														
Category layer 5	Full tree position (concatenated)	Company profile - G	Compa	Compa	Compa	Compa	Compa	Compa	Compa	Compa	Compa	Compa	Compa	Compa	Compa	Compa	Compa	Compa	Compa	Compa	Compa	Compa	Compa	Compa	Compa	Compa	Company profile - Sites - S
Category layer 6	Unit in DCP (if applicable)	Text	Text	Text	Text	Y/N	Text	Y/N	Y/N	Y/N	Text	Text (validated list)															
	Show on portal	direct	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	
Field code portal co	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
6	Stadiou Str.,	38,297	21,822	Advent Energy																						Greece	
7	Unit 714 Dunsfol	51,119	-0,531	AFC Energy																						United Kingdom of Great Br	
9	75 Quai d'Orsay,	48,862	2,3047	Air Liquide																						France	
13	Parque Empresar	39,003	-1,819	Ajusa																						Spain	
14	Velperweg 76, 66	51,987	5,9305	AkzoNobel																						Netherlands	
27	2 rue Clémencier	45,221	5,6612	Air Liquide Advancec																						France	
30	Basepoint	50,981	-1,463	Bac2																						United Kingdom of Great Br	
33	Carl-Bosch-Straß	49,496	8,433	BASF																						Germany	
34	Ausschläger Elbd	53,529	10,064	BDR Thermana (Sener																						Germany	
35	Passage du Card	46,797	7,1479	Swiss Hydrogen																						Switzerland	
37	Königsrasse 274	46,928	7,4157	Hydac / Bien																						Switzerland	
40	Borrit NV, Lamm	51,145	4,9168	Borrit																						Belgium	
41	Wernerstraße 51	48,817	9,1654	Bosch Thermotechni																						Germany	
42	Zutphensestraat	52,198	6,0538	Bredenoord																						Netherlands	
43	Neudorf 14, 9466	47,258	9,4974	BRUSA																						Switzerland	
49	Lilla Frescativä	59,366	18,052	Cellkraft																						Sweden	
53	Viking House, Fo	51,069	-0,316	Ceres Power																						United Kingdom of Great Br	

2.2 Patents

URL: <https://www.fchobservatory.eu/index.php/observatory/patents>

The Patents section includes an introductory text and 2 different tabs 'Patents by country' and 'Patents by technology' containing all the relevant data to be shown on the portal:



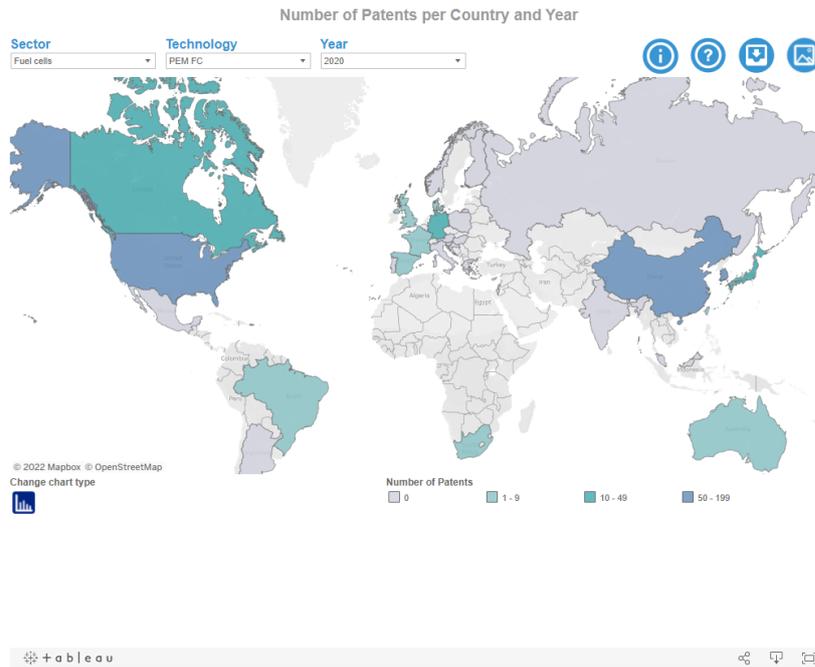
- Technology and Market ▾
- Patents
- Publications
- Financial support
- Policy and RCS ▾
- Education and Training ▾

Total patent registrations

The data presented shows the number of patent registrations in Europe over time. The data can be viewed by fuel cell or hydrogen sector, by technology type and by country. An alternative view of this data is available which shows a side by side country comparison. The related dashboard shows the trend in patent registrations over time.

Patents by country

Patents by technology



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In order to show all the data in the Tableau charts, the input data file is provided by E4Tech. To be able to display all the information in the Tableau charts, the input data excel file has to have always the following format:

Sector	Technology	Country Name	2014	2015	2016	2017	2018	2019	2020
Fuel cells	DAFC/DMFC & DMFC	Australia	3			1			
Fuel cells	DAFC/DMFC & DMFC	Brazil	1	8	4	2			
Fuel cells	DAFC/DMFC & DMFC	Canada	13	9	8	5	3	3	3
Fuel cells	DAFC/DMFC & DMFC	China	69	48	73	61	101	56	87
Fuel cells	DAFC/DMFC & DMFC	Germany	8	9	5	4	3	4	3
Fuel cells	DAFC/DMFC & DMFC	Denmark	3	2			2	3	
Fuel cells	DAFC/DMFC & DMFC	Eurasia	1	1					
Fuel cells	DAFC/DMFC & DMFC	Europe	51	37	22	26	29	17	7
Fuel cells	DAFC/DMFC & DMFC	Spain	1	2	1	4	5	2	1
Fuel cells	DAFC/DMFC & DMFC	Finland		1	2				
Fuel cells	DAFC/DMFC & DMFC	France	1	1	2				
Fuel cells	DAFC/DMFC & DMFC	United Kingdom	2	5			2		
Fuel cells	DAFC/DMFC & DMFC	Hong Kong	2		2				
Fuel cells	DAFC/DMFC & DMFC	Hungary						1	
Fuel cells	DAFC/DMFC & DMFC	Israel				1			
Fuel cells	DAFC/DMFC & DMFC	India		1					
Fuel cells	DAFC/DMFC & DMFC	Japan	160	66	36	30	23	12	9
Fuel cells	DAFC/DMFC & DMFC	Korea	75	35	26	27	32	17	17
Fuel cells	DAFC/DMFC & DMFC	Luxembourg				1			
Fuel cells	DAFC/DMFC & DMFC	Mexico			1				
Fuel cells	DAFC/DMFC & DMFC	Malaysia	1		1				
Fuel cells	DAFC/DMFC & DMFC	Poland					1		
Fuel cells	DAFC/DMFC & DMFC	Russia	1	4				1	
Fuel cells	DAFC/DMFC & DMFC	Turkey						1	
Fuel cells	DAFC/DMFC & DMFC	Taiwan	15	7	6	4	1	1	
Fuel cells	DAFC/DMFC & DMFC	United States of Ame	128	93	62	44	35	30	31
Fuel cells	DAFC/DMFC & DMFC	Patent Cooperation T	17	10	6	16	11	6	15
Fuel cells	DAFC/DMFC & DMFC	South Africa	2		1				
Fuel cells	MCFC	Argentina				1			
Fuel cells	MCFC	Austria				1	2	3	
Fuel cells	MCFC	Australia	1	11	3	9	3	2	
Fuel cells	MCFC	Brazil				8		1	
Fuel cells	MCFC	Canada	8	11	2	7	10	9	1

2.3 Publications

URL: <https://www.fchobservatory.eu/observatory/publications>

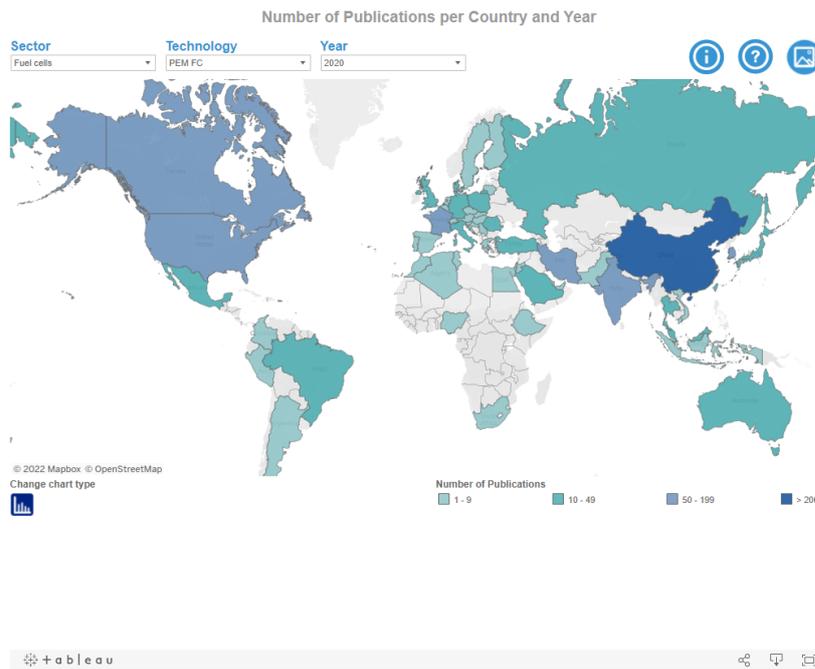
The Publications section includes an introductory text and 3 different tabs ‘Publications by country’, ‘Publications by technology’ and ‘Publications in EU28’ containing all the relevant data to be shown on the portal:

- Technology and Market ▾
- Patents
- Publications**
- Financial support
- Policy and RCS ▾
- Education and Training ▾

Publications

The publication data is mapped and shows the number of publications by both the fuel cell and hydrogen production sectors, by technology type and year of publication. The alternative chart shows a country by country comparison using the same criteria. Alternative dashboards are also available to view, depicting the trend in publications over time.

- Publications by country**
- Publications by technology
- Publications in EU28



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In order to show all the data in the Tableau charts, the input data files are provided by E4Tech. To be able to display all the information in the Tableau charts, the input data excel files to be provided are the following:

- AlkalineElectrolysers_Organisations
- AlkalinesFC_Organisations
- H2_non_electrolysis_Organisations
- Onboard_Storage_Organisations
- PEM_electrolysers_Organisations
- PEM_FC_Organisations
- SolidOxide_Organisations
- SolidOxideElectrolysers_Organisations

Then, all the files listed below have to merged in the masters publications aggregated file with the following format:

Selector 1	Selector 2	ID	class	Authors	Countries	Organisation Title	Year
Fuel cells	Alkaline FC	S_2-s2.0-848	conf	[Jallouli R., K	[Tunisia]	[National En Energy mana	2012
Fuel cells	Alkaline FC	S_2-s2.0-850	boch	[Rajalakshmi	[India]	[Indian Instit Research Ad	2017
Fuel cells	Alkaline FC	S_2-s2.0-850	conf	[Jyothy K.R.,	[India]	[JNTU] Simulation s	2017
Fuel cells	Alkaline FC	S_2-s2.0-850	article	[Tarasenko A	[Russian Fed	[Russian Aca Fuel Cell Bas	2018
Fuel cells	Alkaline FC	S_2-s2.0-850	article	[Bi Y., Pan Z.,	[China]	[Hong Kong I Performance	2019
Fuel cells	Alkaline FC	S_2-s2.0-850	review	[Yu H., Xie F.	[China]	[Chinese Acc Recent progr	2019
Fuel cells	Alkaline FC	pat_fam_323	patent	[BLATOV DM	[Russian Fed	[SHUBINA V/ Method and	2002
Fuel cells	Alkaline FC	pat_fam_365	patent	[NOR JIRI]	[Canada]	[ASTRIS EN II ALKALINE FU	2004
Fuel cells	Alkaline FC	pat_fam_395	patent	[MORI YUKIN	[]	[] FUEL CELL PC	2006
Fuel cells	Alkaline FC	S_2-s2.0-000	article	[Matsuno Y.,	[Japan]	[MITI, Univer Improvemer	1997
Fuel cells	Alkaline FC	S_2-s2.0-000	article	[Tzedilkin A.	[Russian Fed	[Ural Electro Investigator	1997
Fuel cells	Alkaline FC	S_2-s2.0-000	article	[Eroglu I., Tu	[Turkey]	[Middle East An investiga	1997
Fuel cells	Alkaline FC	S_2-s2.0-000	article	[Lavers W., L	[United King	[Royal Institi Cost engine	1997
Fuel cells	Alkaline FC	S_2-s2.0-000	article	[Lee J.-S., Sh	[South Kore	[Hanyang Un Hydrogen ox	1998
Fuel cells	Alkaline FC	S_2-s2.0-003	article	[Matsuno Y.,	[Japan]	[University c Characteristi	1996
Fuel cells	Alkaline FC	S_2-s2.0-003	article	[Green R.K.,	[New Zealan	[University c Co2 removal	1996
Fuel cells	Alkaline FC	S_2-s2.0-003	article	[Gultekin S.,	[Saudi Arabi	[King Fahd U Deactivation	1996
Fuel cells	Alkaline FC	S_2-s2.0-003	article	[Gulzow E.]	[Germany]	[German Aer Alkaline fue	1996
Fuel cells	Alkaline FC	S_2-s2.0-003	article	[Kiros Y.]	[Sweden]	[Royal Institi Electrocataly	1996
Fuel cells	Alkaline FC	S_2-s2.0-003	article	[Gultekin S.,	[Saudi Arabi	[King Fahd U Steady state	1996
Fuel cells	Alkaline FC	S_2-s2.0-003	article	[Leysen R., A	[]	[] Zirfon®: A ne	1996
Fuel cells	Alkaline FC	S_2-s2.0-003	article	[Gultekin S.,	[Saudi Arabi	[King Fahd U Preparation	1997
Fuel cells	Alkaline FC	S_2-s2.0-003	article	[Mori M., We	[Japan]	[Central Resi Compatibilit	1997
Fuel cells	Alkaline FC	S_2-s2.0-003	article	[Green R., Al	[New Zealan	[University c Carbon dioxi	1998
Fuel cells	Alkaline FC	S_2-s2.0-003	article	[Kazemein M	[Iran]	[Sharif Unive Mass balanc	1998
Fuel cells	Alkaline FC	S_2-s2.0-003	article	[Brillas E., Ce	[United Stat	[Carbuos M Electrogener	1998
Fuel cells	Alkaline FC	S_2-s2.0-003	article	[Spaepen S.,	[United Stat	[ZEVCO Inc] Alkaline fue	1999
Fuel cells	Alkaline FC	S_2-s2.0-003	article	[Schwartz S.,	[Sweden, In	[Royal Institi Electrode R&	1999
Fuel cells	Alkaline FC	S_2-s2.0-003	article	[Daniel-Ivad	[Canada, Au	[Battery Tech Intermittent	1999
Fuel cells	Alkaline FC	S_2-s2.0-003	article	[Yi S.-C., Jo J.	[South Kore	[Hanyang Un Computator	1999
Fuel cells	Alkaline FC	S_2-s2.0-003	article	[Xu R.G., Pan	[China]	[Zhejiang Un Electrochem	1999
Fuel cells	Alkaline FC	S_2-s2.0-003	article	[Mori M., Ya	[Japan]	[Central Resi Lanthanum s	1999
Fuel cells	Alkaline FC	S_2-s2.0-003	article	[Xing B., Savi	[Canada]	[École Polyte Hydrogen/o	2000
Fuel cells	Alkaline FC	S_2-s2.0-003	article	[Schwartz S.,	[Sweden]	[Roy. Inst. T. Long-term h	2000
Fuel cells	Alkaline FC	S_2-s2.0-003	article	[Gsellmann J	[Austria, Uni	[Electric Aut Alkaline fue	2000

2.4 Financial support

URL: <https://www.fchobservatory.eu/index.php/observatory/financial-support>

The Financial support section includes an explanatory text and a link to the Hydrogen Public Funding Compass:



- Technology and Market ▾
- Patents
- Publications
- Financial support
- Policy and RCS ▾
- Education and Training ▾

Financial support

The Financial support module of the FCHO provides stakeholders with valuable information regarding EU funding programs managed centrally by the EU or by regional authorities. The module also covers national programs and financial tools.

Due to the end of the sub-contract for the artificial intelligence tool used in the past for the financial support module, the readers of this webpage are referred to the [Hydrogen Public Funding Compass](#) by the European Clean Hydrogen Alliance. The Hydrogen Public Funding Compass is an online guide for stakeholders to identify public funding sources for hydrogen projects. It is designed as a single entry point for stakeholders to access information on the most important public funding programmes and funds for renewable and low carbon hydrogen.



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2.5 Policy and RCS

URL: <https://www.fchobservatory.eu/observatory/policy-and-rcs>

The introductory page of this section is as follows:



- Technology and Market ▾
- Patents
- Publications
- Financial support
- Policy and RCS ▾
- Education and Training ▾

Policy and RCS

The Policy & Incentives and Regulation, Codes and Standards module of the FCHO provides users with a comprehensive overview of the most relevant policies, rules and standards that directly or indirectly affect the development and deployment of the hydrogen technologies covered by the FCHO. This section of the portal is updated on an annual basis.



EU policies and legislation

This section includes detailed information relating to regulations and directives at a European level



National policies, regulations & incentives

This part focuses at a country level and includes targets, mandates, incentives and restrictions/prohibitions



Standards

This part of the Observatory provides a user-friendly mapping of the existing published standards and standards currently in preparation or draft



Administrative and Legal requirements for compliance

Administrative and Legal requirements relevant to implementation and compliance are covered in the HyLaw database



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The Policy and RCS section contains 4 subsections:

1. EU policies and legislation

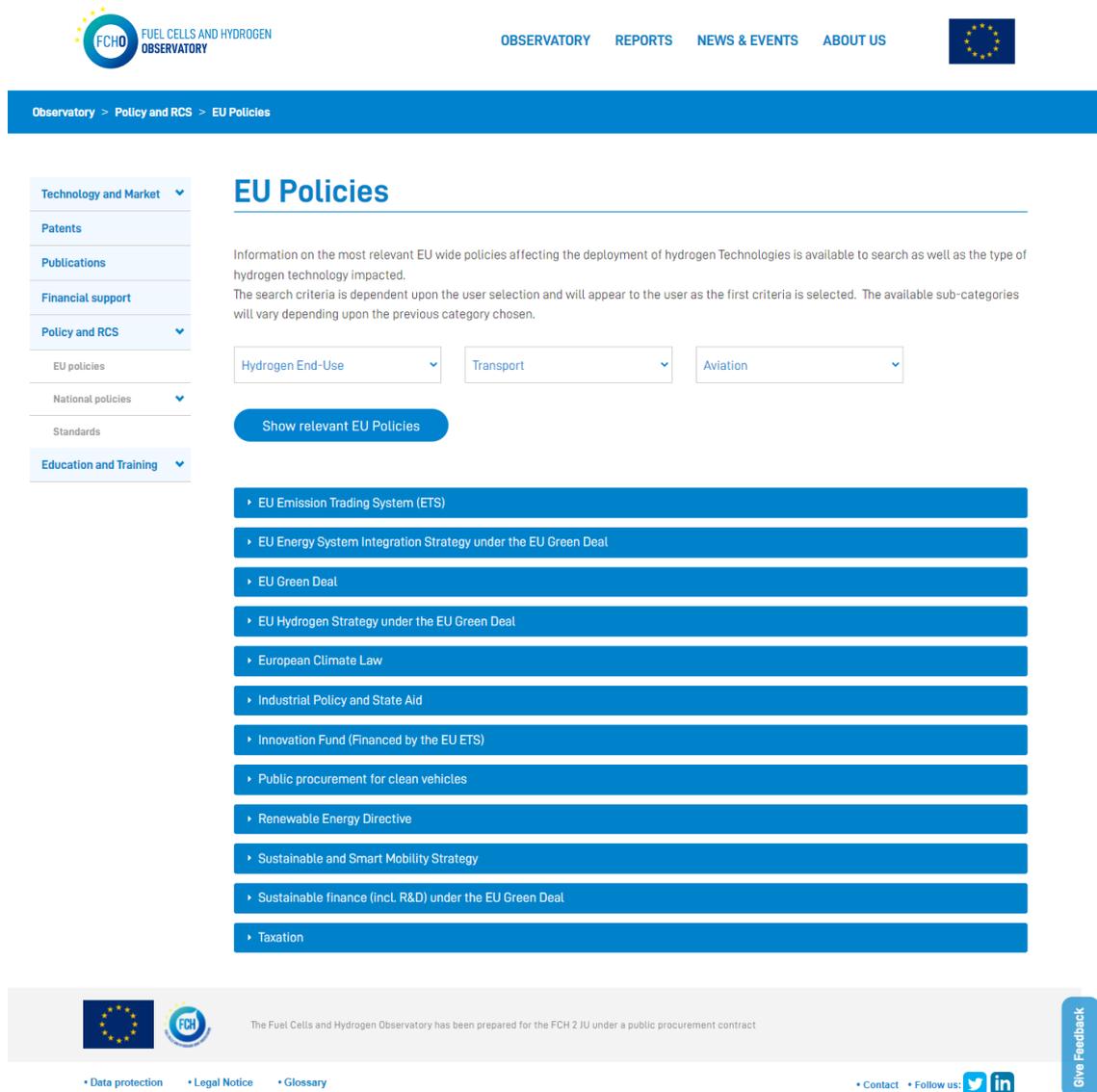
2. National policies, regulations and incentives
3. Standards
4. Administrative and Legal requirements for compliance

The introductory text, the brief text for the subsections and the images are provided by E4Tech.

EU policies and legislation

URL: <https://www.fchobservatory.eu/observatory/policy-and-rcs/eu-policies>

The EU policies and legislation subsection includes an introductory text and a Drupal development to the relevant EU policies filtered by 3 selectors depending the relevant area chosen:



Observatory > Policy and RCS > EU Policies

EU Policies

Information on the most relevant EU wide policies affecting the deployment of hydrogen Technologies is available to search as well as the type of hydrogen technology impacted. The search criteria is dependent upon the user selection and will appear to the user as the first criteria is selected. The available sub-categories will vary depending upon the previous category chosen.

Hydrogen End-Use | Transport | Aviation

Show relevant EU Policies

- EU Emission Trading System (ETS)
- EU Energy System Integration Strategy under the EU Green Deal
- EU Green Deal
- EU Hydrogen Strategy under the EU Green Deal
- European Climate Law
- Industrial Policy and State Aid
- Innovation Fund (Financed by the EU ETS)
- Public procurement for clean vehicles
- Renewable Energy Directive
- Sustainable and Smart Mobility Strategy
- Sustainable finance (incl. R&D) under the EU Green Deal
- Taxation

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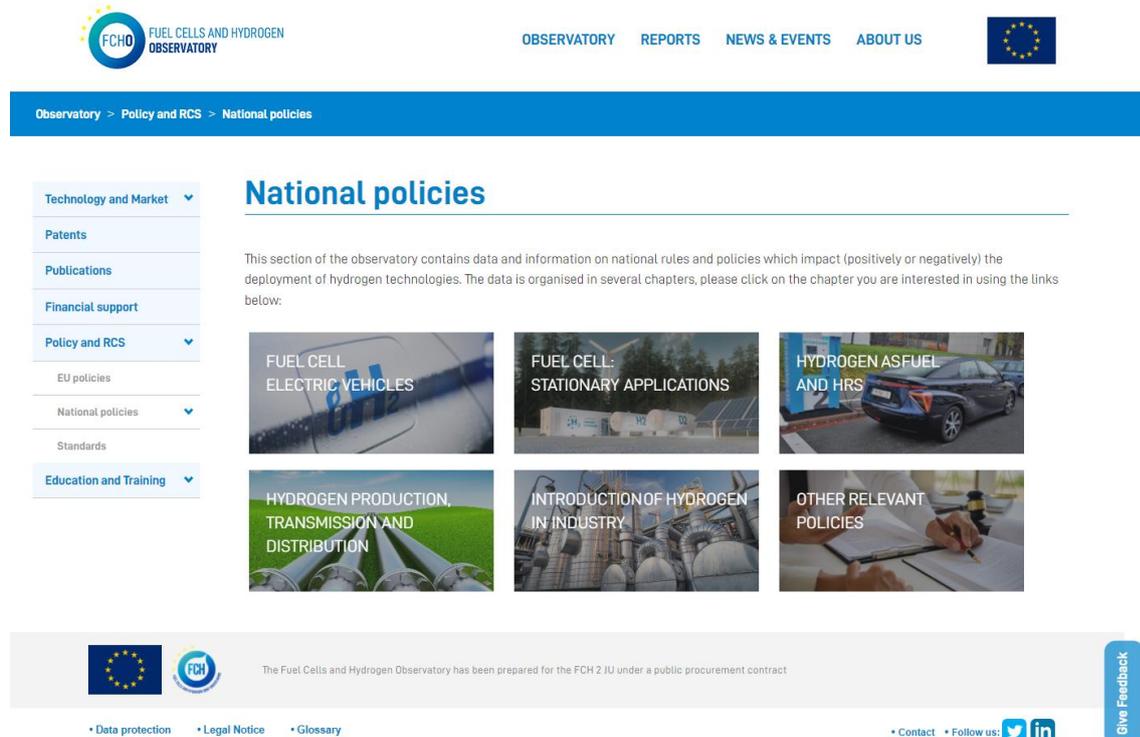
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In order to show all the data on the page and be able to filter it, the input data is introduced by the users in the backend menu.

National policies, regulations and incentives

URL: <https://www.fchobservatory.eu/observatory/Policy-and-RCS/National-policies>

The National policies subsection is divided in 6 different chapters as can be seen in the landing page below:



The screenshot shows the FCHO website's 'National policies' subsection. At the top, there is a navigation bar with the FCHO logo, the text 'FUEL CELLS AND HYDROGEN OBSERVATORY', and menu items: 'OBSERVATORY', 'REPORTS', 'NEWS & EVENTS', and 'ABOUT US'. A European Union flag is also present. Below the navigation bar is a blue breadcrumb trail: 'Observatory > Policy and RCS > National policies'. On the left side, there is a vertical menu with categories: 'Technology and Market', 'Patents', 'Publications', 'Financial support', 'Policy and RCS' (selected), 'EU policies', 'National policies' (sub-selected), 'Standards', and 'Education and Training'. The main content area is titled 'National policies' and contains an introductory paragraph: 'This section of the observatory contains data and information on national rules and policies which impact (positively or negatively) the deployment of hydrogen technologies. The data is organised in several chapters, please click on the chapter you are interested in using the links below:'. Below this text are six image-based chapter links: 'FUEL CELL ELECTRIC VEHICLES', 'FUEL CELL: STATIONARY APPLICATIONS', 'HYDROGEN AS FUEL AND HRS', 'HYDROGEN PRODUCTION, TRANSMISSION AND DISTRIBUTION', 'INTRODUCTION OF HYDROGEN IN INDUSTRY', and 'OTHER RELEVANT POLICIES'. At the bottom of the page, there is a footer with the EU flag, the FCHO logo, a disclaimer: 'The Fuel Cells and Hydrogen Observatory has been prepared for the FCH 2 JU under a public procurement contract', and a 'Give Feedback' button. There are also links for 'Data protection', 'Legal Notice', 'Glossary', 'Contact', and social media icons for Twitter and LinkedIn.

The introductory text for the landing page as well as the images are provided by E4Tech.

The six chapters forming the National policies subsections are the followings:

- Fuel cells electric vehicles (FCEVs)
- Stationary power
- Hydrogen as fuel and refueling infrastructure
- Hydrogen Production, Transmission and Distribution
- Introduction of green hydrogen in industry
- Other relevant policies

The data shown in this subsection (in all the 6 chapters) is **provided by the National representatives of the countries through the questionnaire created in the backend.**

Chapter I - FCEVs Chapter II - Stationary Power Chapter III - Hydrogen as fuel and Hydrogen Refuelling infrastructure
 Chapter IV - Hydrogen Production, Transmission and Distribution Chapter V - Introduction of Hydrogen in Industry Chapter VI - General Questions

This chapter covers policies that may prevent or support FCEVs and/or the substitution of conventional vehicles with zero-emission solutions

▶ INCENTIVES OR SUPPORT SCHEMES
 ▶ GENERAL POLICIES

Comments on survey

B I U S [List icons] Format [Source] [Image icons]

Text format: Basic HTML [About text formats ?]

This form is completed

Status: Not published, Last saved, Author

Save

- **Chapter 1. Fuel cell electric vehicles (FCEVs)**

URL: <https://www.fchobservatory.eu/observatory/policy-and-rcs/national-policies/fuel-cell-electric-vehicles-fcevs-incentives>

This National policies chapter includes an introductory text and 2 different tabs. Each Tableau chart represents one of the parts in which the chapter 1 is divided in the questionnaire: ‘Incentives or support schemes’ and ‘General policies’.

- Technology and Market ▾
- Patents
- Publications
- Financial support
- Policy and RCS ▾
- EU policies
- National policies ▾
- Fuel cell electric vehicles (FCEVs)
- Stationary power
- Hydrogen as fuel and refueling infrastructure
- Hydrogen Production, Transmission and Distribution
- Introduction of green hydrogen in industry
- Other relevant policies
- Standards
- Education and Training ▾

National policies: FCEVs

Below you will find information on policies and legislation which impact Fuel Cell Electric Vehicles (FCEV's) at national level. This data is organized according to the various FCEV applications and sub-application it applies to. While this section focuses mainly on different types of incentives or support schemes, other policies which may have an indirect impact on deployment of FCEV's (e.g. ICE Restrictions, Diesel Bans) are also covered. Finally, in this chapter you will also find a summary of countries that have a national hydrogen plan for mobility. Please use the following table in order to browse the database

Incentives
Other

Application

Passenger Cars ▾

Topic

Purchase subsidy ▾

Search

Please, use the selectors above to choose the desired options. Then, press the 'Search' button and click on one or several countries below to see results.

© 2022 Mapbox © OpenStreetMap

Passenger Cars - Non-economic incentives for FCEVs introduction

Availability: ■ Yes ■ No ■ N/A



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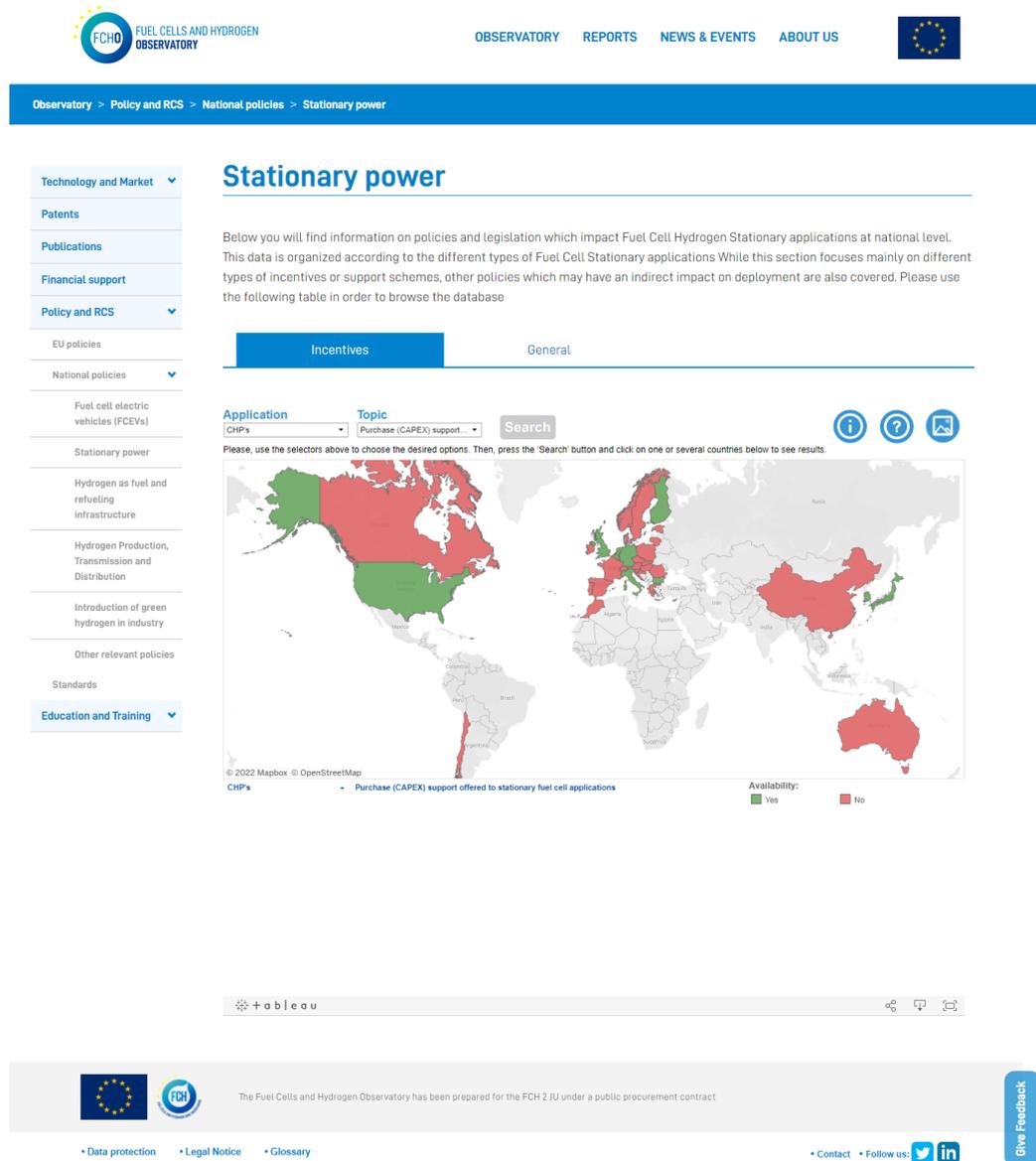
Give Feedback

The data shown in these Tableau charts is provided by the National contributors though the questionnaire in the backend.

- **Chapter 2. Stationary power**

URL: <https://www.fchobservatory.eu/observatory/policy-and-rcs/national-policies/stationary-power-incentives>

This National policies chapter includes an introductory text and 2 different tabs. Each Tableau chart represents one of the parts in which the chapter 2 is divided in the questionnaire: ‘Incentives or support schemes’ and ‘General policies’.



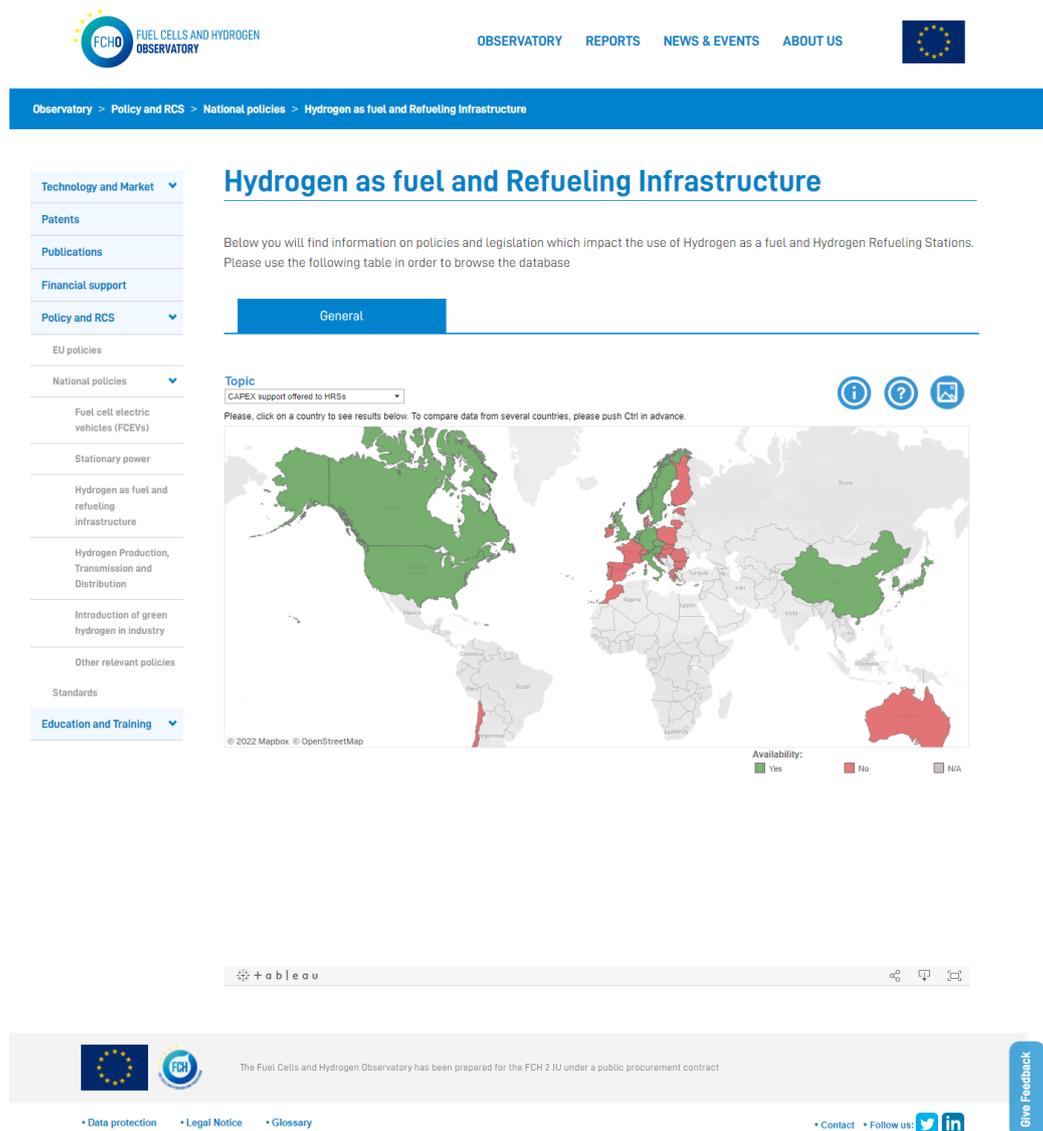
The screenshot displays the FCHO website's 'Stationary power' section. It features a navigation bar with 'OBSERVATORY', 'REPORTS', 'NEWS & EVENTS', and 'ABOUT US'. A sidebar on the left lists various categories, with 'Policy and RCS' expanded to show 'National policies'. The main content area is titled 'Stationary power' and includes an introductory paragraph. Below this is a search interface with 'Application' set to 'CHP's' and 'Topic' set to 'Purchase (CAPEX) support...'. A world map visualizes the data, with countries like the USA, Canada, and parts of Europe and Asia highlighted in red (No support), while others are green (Yes support). The Tableau logo is visible at the bottom of the map area.

The data shown in these Tableau charts is provided by the National contributors though the questionnaire in the backend.

- **Chapter 3. Hydrogen as fuel and refueling infrastructure**

URL: <https://www.fchobservatory.eu/observatory/policy-and-rcs/national-policies/hydrogen-as-fuel-and-refueling>

This National policies chapter includes an introductory text and a Tableau chart that represents the data from the chapter 3 in the questionnaire ‘Hydrogen as fuel and Refueling Infrastructure’:



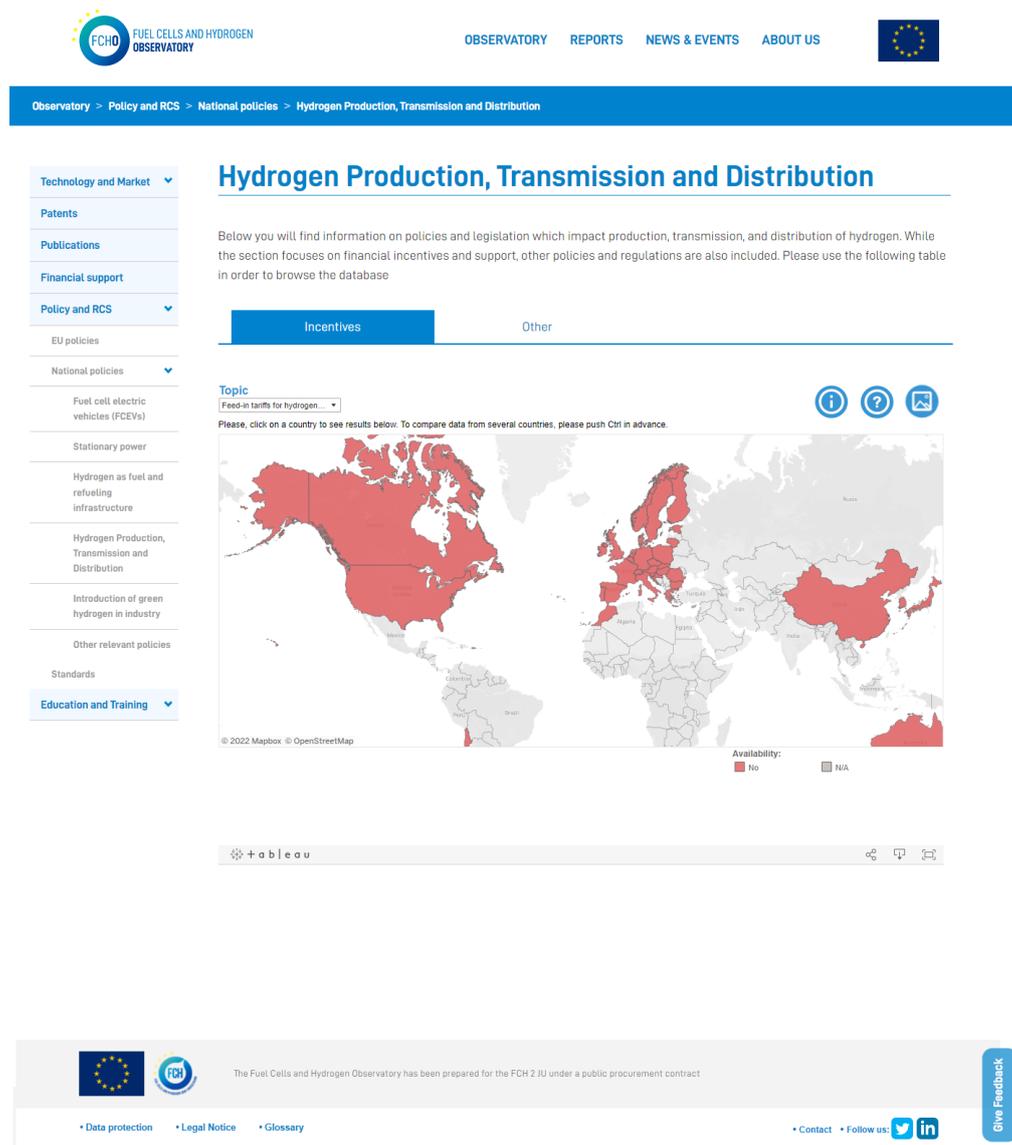
The screenshot shows the FCHO website interface. The top navigation bar includes 'OBSERVATORY', 'REPORTS', 'NEWS & EVENTS', and 'ABOUT US'. The breadcrumb trail reads: 'Observatory > Policy and RCS > National policies > Hydrogen as fuel and Refueling Infrastructure'. The left sidebar contains a 'Policy and RCS' dropdown menu with various categories like 'EU policies', 'National policies', 'Fuel cell electric vehicles (FCEVs)', etc. The main content area is titled 'Hydrogen as fuel and Refueling Infrastructure' and includes a 'General' tab. Below the tab is a world map showing the availability of CAPEX support for HRSs. The map uses a color-coded system: green for 'Yes', red for 'No', and grey for 'N/A'. Countries like Canada, the USA, and parts of Europe and Asia are green, while others like Australia and parts of Europe are red. A legend at the bottom right of the map confirms this color coding. Below the map, a Tableau chart is partially visible.

The data shown in this Tableau chart is provided by the National contributors though the questionnaire in the backend.

- **Chapter 4. Hydrogen Production, Transmission and Distribution**

URL: <https://www.fchobservatory.eu/observatory/policy-and-rcs/national-policies/hydrogen-production-transmission-and-distribution-incentives>

This National policies chapter includes an introductory text and 2 different tabs. Each Tableau chart represents one of the parts in which the chapter 4 is divided in the questionnaire: ‘Incentives or support schemes’ and ‘Other policies’.



The screenshot shows the FCHO website interface. At the top, there is a navigation bar with the FCHO logo and the text 'FUEL CELLS AND HYDROGEN OBSERVATORY'. Below this, there are links for 'OBSERVATORY', 'REPORTS', 'NEWS & EVENTS', and 'ABOUT US'. A blue banner contains the breadcrumb trail: 'Observatory > Policy and RCS > National policies > Hydrogen Production, Transmission and Distribution'.

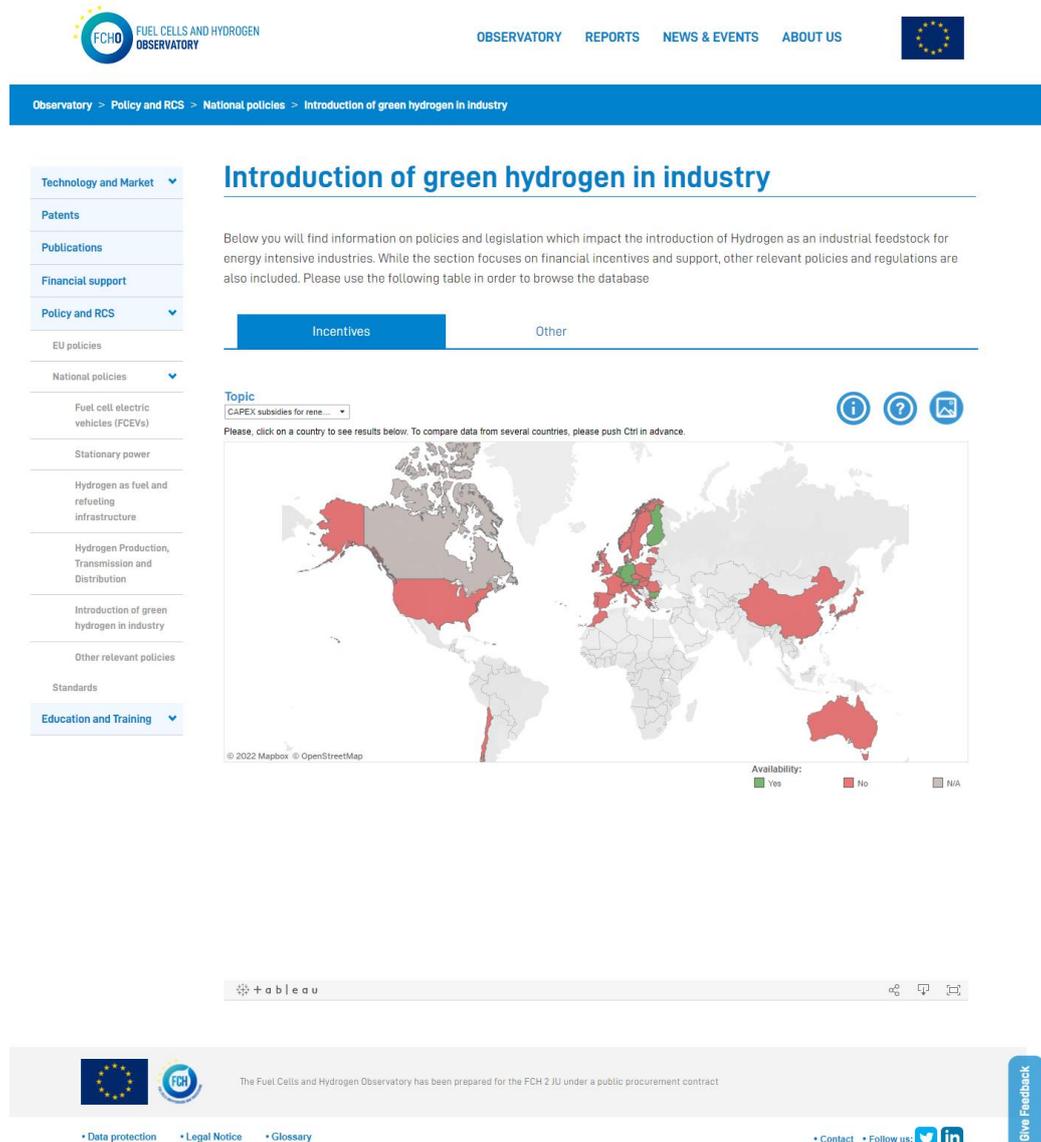
The main content area is titled 'Hydrogen Production, Transmission and Distribution'. Below the title, there is a paragraph explaining that the section focuses on financial incentives and support, with other policies and regulations also included. There are two tabs: 'Incentives' (selected) and 'Other'. Below the tabs is a 'Topic' dropdown menu set to 'Feed-in tariffs for hydrogen...'. A note says 'Please, click on a country to see results below: To compare data from several countries, please push Ctrl in advance.' Below this is a world map showing the availability of hydrogen production, transmission, and distribution. The map is color-coded by country, with red indicating 'No' and grey indicating 'N/A'. The map is powered by Mapbox and OpenStreetMap. At the bottom of the page, there is a footer with the European Union logo, the FCHO logo, and the text 'The Fuel Cells and Hydrogen Observatory has been prepared for the FCH 2 JU under a public procurement contract'. There are also links for 'Data protection', 'Legal Notice', and 'Glossary', and social media icons for 'Contact' and 'Follow us' (Twitter and LinkedIn). A 'Give Feedback' button is located in the bottom right corner.

The data shown in these Tableau charts is provided by the National contributors though the questionnaire in the backend.

- ***Chapter 5. Introduction of green hydrogen in industry***

URL: <https://www.fchoobservatory.eu/observatory/policy-and-rcs/national-policies/green-hydrogen-in-industry-incentives>

This National policies chapter includes an introductory text and 2 different tabs. Each Tableau chart represents one of the parts in which the chapter 5 is divided in the questionnaire: ‘Incentives or support schemes’ and ‘Other policies’.



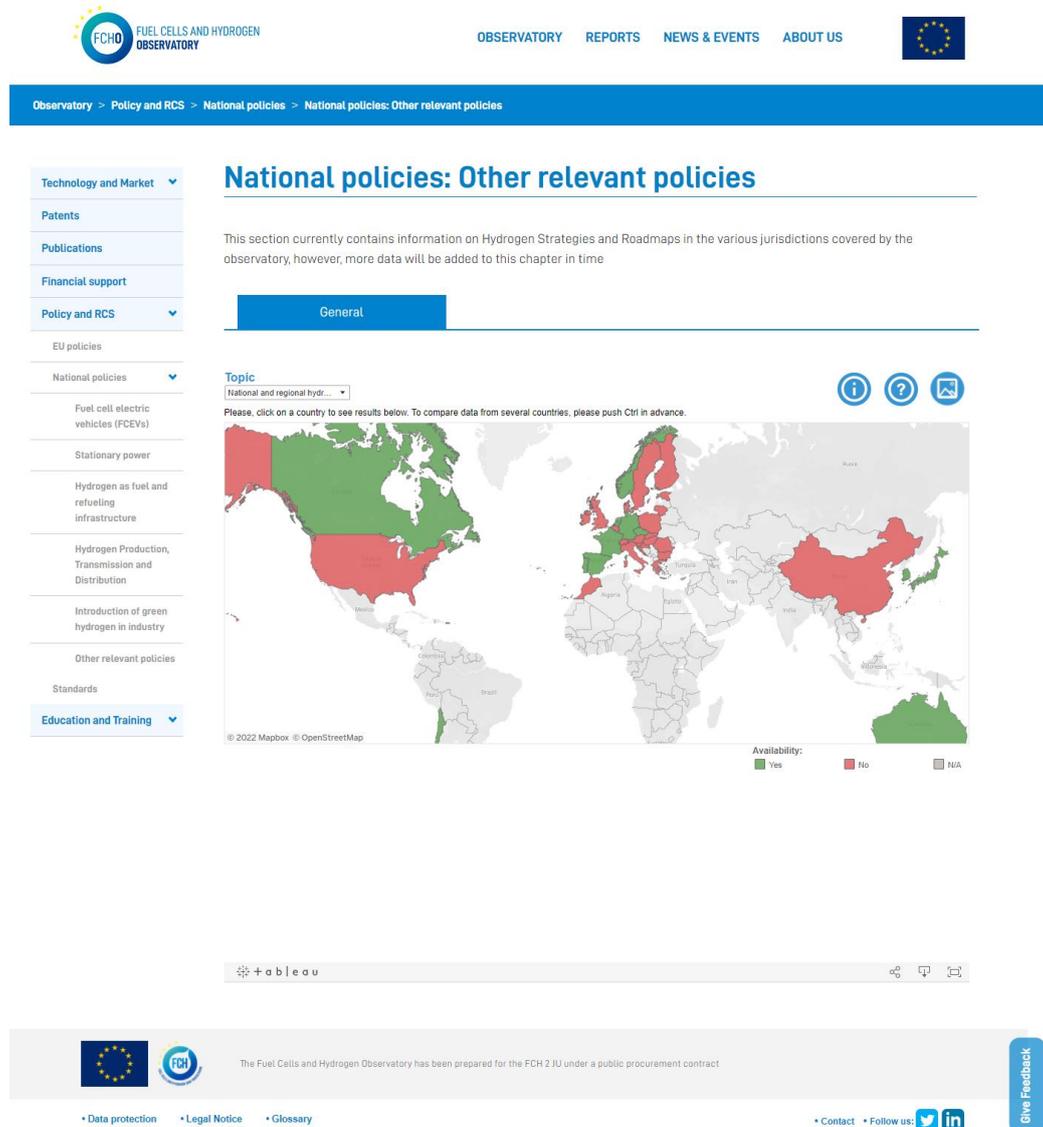
The screenshot displays the FCHO website interface. At the top, there is a navigation bar with links for 'OBSERVATORY', 'REPORTS', 'NEWS & EVENTS', and 'ABOUT US'. Below this is a breadcrumb trail: 'Observatory > Policy and RCS > National policies > Introduction of green hydrogen in industry'. The main content area is titled 'Introduction of green hydrogen in industry' and contains a paragraph explaining the focus on financial incentives and support. A Tableau chart is embedded, showing a world map where countries are colored based on the availability of CAPEX subsidies for renewable energy. The legend indicates 'Yes' (green), 'No' (red), and 'N/A' (grey). The Tableau interface also includes a 'Give Feedback' button.

The data shown in these Tableau charts is provided by the National contributors though the questionnaire in the backend.

- **Chapter 6. Other relevant policies**

URL: <https://www.fchobservatory.eu/observatory/policy-and-rcs/national-policies/other-relevant-policies>

This National policies chapter includes an introductory text and a Tableau chart that represents the data from the chapter 6 in the questionnaire ‘General questions’:



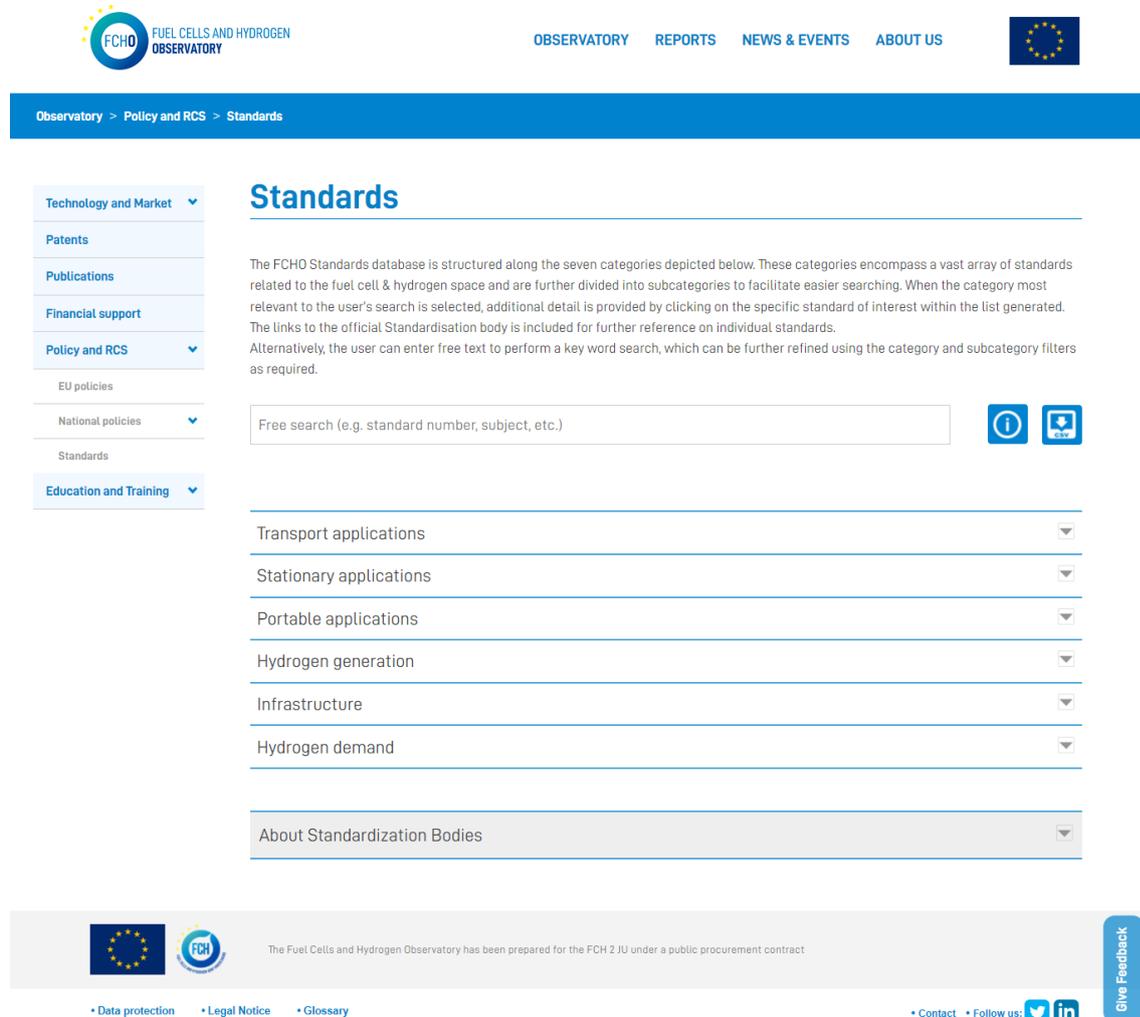
The screenshot shows the FCHO website interface. At the top, there is a navigation bar with 'OBSERVATORY', 'REPORTS', 'NEWS & EVENTS', and 'ABOUT US'. Below this is a breadcrumb trail: 'Observatory > Policy and RCS > National policies > National policies: Other relevant policies'. On the left, a sidebar menu lists various categories like 'Technology and Market', 'Patents', 'Publications', 'Financial support', 'Policy and RCS', 'EU policies', 'National policies', 'Fuel cell electric vehicles (FCEVs)', 'Stationary power', 'Hydrogen as fuel and refueling infrastructure', 'Hydrogen Production, Transmission and Distribution', 'Introduction of green hydrogen in industry', 'Other relevant policies', 'Standards', and 'Education and Training'. The main content area is titled 'National policies: Other relevant policies' and contains a text block stating: 'This section currently contains information on Hydrogen Strategies and Roadmaps in the various jurisdictions covered by the observatory, however, more data will be added to this chapter in time'. Below the text is a 'General' filter button. A world map is displayed, showing availability of hydrogen by country. A legend indicates 'Yes' (green), 'No' (red), and 'N/A' (grey). A Tableau chart interface is visible at the bottom of the map area. The footer contains logos for the European Union and FCHO, along with links for 'Data protection', 'Legal Notice', 'Glossary', 'Contact', and 'Follow us' (Twitter, LinkedIn), and a 'Give Feedback' button.

The data shown in this Tableau chart is provided by the National contributors though the questionnaire in the backend.

Standards

URL: <https://www.fchoobservatory.eu/observatory/Policy-and-RCS/Standards>

The Standards subsection contains an introductory text, a free search filter and offers the standards listed by categories. The Standards can also be downloaded in .csv format:



The screenshot shows the FCHO website's 'Standards' page. At the top, there is a navigation bar with the FCHO logo, the text 'FUEL CELLS AND HYDROGEN OBSERVATORY', and menu items: 'OBSERVATORY', 'REPORTS', 'NEWS & EVENTS', and 'ABOUT US'. A European Union flag is also present. Below the navigation bar is a breadcrumb trail: 'Observatory > Policy and RCS > Standards'.

The main content area is titled 'Standards'. It includes an introductory paragraph: 'The FCHO Standards database is structured along the seven categories depicted below. These categories encompass a vast array of standards related to the fuel cell & hydrogen space and are further divided into subcategories to facilitate easier searching. When the category most relevant to the user's search is selected, additional detail is provided by clicking on the specific standard of interest within the list generated. The links to the official Standardisation body is included for further reference on individual standards. Alternatively, the user can enter free text to perform a key word search, which can be further refined using the category and subcategory filters as required.'

Below the text is a search box with the placeholder text 'Free search (e.g. standard number, subject, etc.)' and two icons: an information icon and a download icon.

The main content area lists seven categories, each with a dropdown arrow:

- Transport applications
- Stationary applications
- Portable applications
- Hydrogen generation
- Infrastructure
- Hydrogen demand
- About Standardization Bodies

At the bottom of the page, there is a footer with the European Union flag, the FCHO logo, and the text: 'The Fuel Cells and Hydrogen Observatory has been prepared for the FCH 2 JU under a public procurement contract'. Below this are links for 'Data protection', 'Legal Notice', and 'Glossary'. On the right side, there are links for 'Contact' and 'Follow us:' with icons for Twitter and LinkedIn, and a vertical button labeled 'Give Feedback'.

When clicking on a specific standard, a pop-up profile will appear showing the detailed information about it:



In order to show all the data of the Standards in the list and the detailed profiles , the input data file is provided by E4Tech.

To be able to display all the information in the Tableau charts, the input data excel file has to have always the following format:

Category	Subcategory	Class	Subclass	Relevant Standard or Work Programme	Title
Hydrogen Demand	Other hydrogen demand			EN 13278:2013	Open fronted gas-fired in
Hydrogen Demand	Other hydrogen demand			EN 14829:2007	Independent gas-fired flu
Hydrogen Demand	Ammonia production			EN 437:2018	Test gases - Test pressure
Hydrogen Demand	HRSS			EN 437:2018	Test gases - Test pressure
Hydrogen Demand	Methanol production			EN 437:2018	Test gases - Test pressure
Hydrogen Demand	Other chemicals			EN 437:2018	Test gases - Test pressure
Hydrogen Demand	Other hydrogen demand			EN 437:2018	Test gases - Test pressure
Hydrogen Demand	Power heating and cooling			EN 437:2018	Test gases - Test pressure
Hydrogen Demand	Refineries			EN 437:2018	Test gases - Test pressure
Hydrogen Demand	Safety			EN 437:2018	Test gases - Test pressure
Hydrogen Demand	Other hydrogen demand			EN 509:1999	Decorative fuel-effect gas
Hydrogen Demand	Other hydrogen demand			EN 509:1999/A1:2003	Decorative fuel-effect gas
Hydrogen Demand	Other hydrogen demand			EN 509:1999/A2:2004	Decorative fuel-effect gas
Hydrogen Demand	Safety			IEC 60079-29-1:2016+AMD1:2020 CSV	Explosive atmospheres -
Hydrogen Demand	Safety			IEC 60079-29-2:2015	Explosive atmospheres -
Hydrogen Demand	Safety			ISO/TR 15916:2015	Basic considerations for
Hydrogen generation	Quality and control			EN 16726:2015+A1:2018	Gas infrastructure - Qual
Hydrogen generation	Electrolysers	AEL		EN 17124:2018	Hydrogen fuel - Product s
Hydrogen generation	Electrolysers	Other		EN 17124:2018	Hydrogen fuel - Product s
Hydrogen generation	Electrolysers	PEMEL		EN 17124:2018	Hydrogen fuel - Product s

Administrative and Legal requirements for compliance

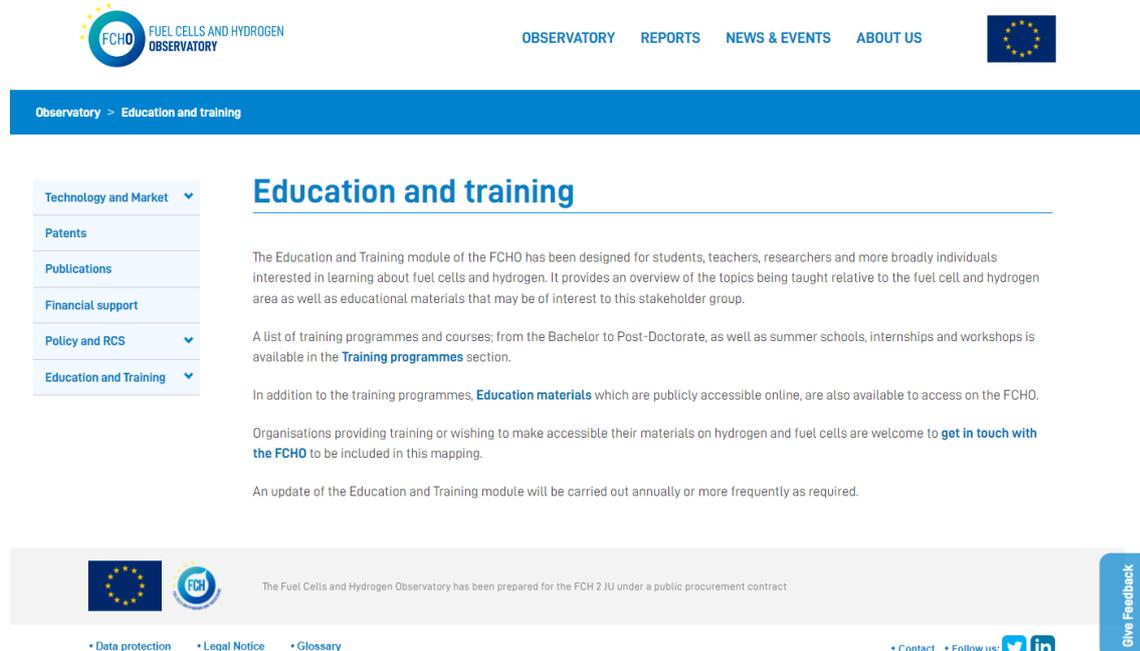
URL: <https://www.fchobservatory.eu/observatory/policy-and-rcs>
<https://www.hylaw.eu/>

This subsection only appears in the landing page of the section Policy and RCS and is an hyperlink to the HyLaw webpage.

2.6 Education and Training

URL: <https://www.fchobservatory.eu/observatory/education-and-training>

The introductory page of this section is as follows:



Observatory > Education and training

Education and training

The Education and Training module of the FCHO has been designed for students, teachers, researchers and more broadly individuals interested in learning about fuel cells and hydrogen. It provides an overview of the topics being taught relative to the fuel cell and hydrogen area as well as educational materials that may be of interest to this stakeholder group.

A list of training programmes and courses; from the Bachelor to Post-Doctorate, as well as summer schools, internships and workshops is available in the **Training programmes** section.

In addition to the training programmes, **Education materials** which are publicly accessible online, are also available to access on the FCHO.

Organisations providing training or wishing to make accessible their materials on hydrogen and fuel cells are welcome to **get in touch with the FCHO** to be included in this mapping.

An update of the Education and Training module will be carried out annually or more frequently as required.

The Fuel Cells and Hydrogen Observatory has been prepared for the FCH 2 JU under a public procurement contract

• Data protection • Legal Notice • Glossary • Contact • Follow us:   

The introductory text for the landing page is provided by Hydrogen Europe Research. This section has 2 subsections: Training Programmes and Education materials.

Training Programmes

URL: <https://www.fchobservatory.eu/observatory/education-and-training/training-programmes>

This subsection contains an introductory text, a free search filter, 3 selectors (Training Programme category, Language and Focus of the programme), an Open Street map together with the list of programmes:

- Technology and Market ▾
- Patents
- Publications
- Financial support
- Policy and RCS ▾
- Education and Training ▾
- Education materials
- Training programmes

Training programmes

Training is displayed by location within the map and users can explore the data by selecting the type of training of interest. Categories refer to the different levels of education: Vocational training, Bachelor, Master, Doctorate and Post-Doctorate programmes. Off-curricula training are also listed, such as summer schools, workshops, or internships, as well as long-life training opportunities with the professional training category. Two additional filters on the language and the focus of the training are available to refine the search according to user needs.

Training programme	Language	Focus of the training
- Any - ▾	- Any - ▾	- Any - ▾

Apply



Bachelor in Materials Science

Bachelor Programme
University of Turin
[View more](#)

Bachelor in Chemical engineering

Bachelor Programme
Politecnico di Milano
[View more](#)

Bachelor of Chemical Engineering Technology

Bachelor Programme
University of Antwerp
[View more](#)

Bachelor in Energy and Environment engineering

Bachelor Programme
University of San Jorge
[View more](#)

Give Feedback

By clicking on the map pins or on the 'View more' in the list, a detailed profile of the selected programme is shown:



- Technology and Market ▾
- Patents
- Publications
- Financial support
- Policy and RCS ▾
- Education and Training ▾

Bachelor in Materials Science

Location: Turin
 Name of the university: **University of Turin**
 Language(s): Italian
 Cost of the programme: Complimentary
 Topics covered in the programme
 ✓ H2 Production
 ✓ H2 Storage, Transport and Distribution
 Access to materials/infrastructure:
 ✓ Handbooks, Slides, Handouts, Notes
 Participants restrictions: No

Courses tackling Fuel Cells and Hydrogen:

Materials for energy with laboratory

- ✓ ECTS/ EQF: 6
- ✓ Hours of lecture per week: 50
- ✓ Capacity of the course: More than 30
- ✓ Prerequisite: Basics on materials science
- ✓ Type of assessment: Oral exam



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[Data protection](#) [Legal Notice](#) [Glossary](#)

[Contact](#) [Follow us:](#) [Twitter](#) [LinkedIn](#)

Give Feedback

In order to show all the data in the chart, the list and the detailed profiles, the input data file is provided by Hydrogen Europe Research.

To be able to display all the information in the Tableau charts, the input data excel file has to have always the following format:

				INTERNSHIP	PHD
#	Latitude	Longitude	Organisation	Materials / Infrastructures	Name of the PHD school / programme
IN1	40.68507359	14.77342114	Laboratory of Energy and Propulsion Laboratory (e-ProLab, University of Technical University of Denmark, Department of Energy Conversion and Storage)	Labs (real or virtual)	
IN2	55.78768962	12.55052406	HYSAFER Centre (Ulster University)	Books / E-Books Handbooks, Slides, Handouts, Notes E-Learning Tools e.g. MOOC Simulation environment Labs (real or virtual)	
IN3	54.6880055	8467326725495	HYSAFER Centre (Ulster University)	Books / E-Books Handbooks, Slides, Handouts, Notes E-Learning Tools e.g. MOOC Simulation environment Labs (real or virtual)	
IN4	47.05304586	13911084086935	HyCentA Research GmbH	Books / E-Books Handbooks, Slides, Handouts, Notes Simulation environment Labs (real or virtual) Demonstration Platforms	
IN5	40.32702964	6603519016564	IMDEA Energy Institute	Books / E-Books Handbooks, Slides, Handouts, Notes Labs (real or virtual)	

Education materials

URL: <https://www.fchobservatory.eu/observatory/education-and-training/training-programmes>

This subsection contains an introductory text, a free search filter, 4 selectors (ISCED, Course focus, Language and Source) and the list of materials:



- Technology and Market ▾
- Patents
- Publications
- Financial support
- Policy and RCS ▾
- Education and Training ▾
 - Education materials
 - Training programmes

Education materials

Education materials publicly accessible online can be found in this subsection. Materials can be retrieved by 'level', as classified by the International Standard Classification of Education (ISCED), by course focus, by language or by source of material. You can use the different selectors to refine your search.

ISCED	Course focus	Language	Source
- Any - ▾	- Any - ▾	- Any - ▾	- Any - ▾

Apply

COURSE TITLE ▲	TYPE OF MATERIALS	SOURCE	
Accumulo energetico	slides	HySchools	view
Activité d'apprentissage - Distribution de l'hydrogène	Exercise	HySchools	view
Alternative Fahrzeugkonzepte	Slides	H2 Training	view
Alternative fuels	Slides	H2 Training	view
Alternative Treibstoffe	Slides	H2 Training	view
An introduction to Fuel Cells - Status and applications of fuel cell technology, Competing technologies & the market place	Slides	TrainHy	view
An introduction to Fuel Cells - Status and applications of fuel cell technology - Competing technologies & the market place	Slides	TrainHy	view
Antecedentes de la economía del hidrógeno	Slides	H2 Training	view
Antica?ile hidroenului	slides	HySchools	view

By clicking on 'View' in the right part of the list, a detailed profile of the selected material is shown:



- Technology and Market ▾
- Patents
- Publications
- Financial support
- Policy and RCS ▾
- Education and Training ▾

Applicazioni dell'idrogeno

COURSE FOCUSED ON H2 end-uses	TYPE OF MATERIALS slides	LANGUAGE Italian	SOURCE HySchools
YEAR 2019	LAST UPDATE Sat, 10/10/2020 - 12:00	WEBSITE/WEBLINK External link to material	



The Fuel Cells and Hydrogen Observatory has been prepared for the FCH 2 JU under a public procurement contract

In order to show all the data in the list and the detailed profiles, the input data file is provided by Hydrogen Europe Research.

To be able to display all the information in the Tableau charts, the input data excel file has to have always the following format:

Selector	More info	Selector	Search result	Search result	Leave	More info	Selector	Selector	More info
ISCE	Technologies focused on	Course focused on	Repeat in more info	Type of material	Info	Website/weblink	Language	Source	Project ID
8	H2 end-uses	H2 end-uses	An introduction to Fuel Cells - Status and applications of fuel cell technology, Competing technologies & the market place	Slides	Robert Steinberger-Wilckens	http://www.hysafe.org/science/eAcademy/JSFCH/JSFCH2012/Steinberger-WilckensR_AnIntroductionToFuelCells.pdf	English	TrainHy	http://www.hysafe.org/
8	Hydrogen	Regulations, Codes, Standards & Safety	Introduction to Hydrogen Safety Engineering	Slides	Vladimir Moikov	http://www.hysafe.org/science/eAcademy/JSFCH/JSFCH2012/MoikovVV_IntroductionToHydrogenSafetyEngineering.pdf	English	TrainHy	http://www.hysafe.org/
8	Hydrogen & Fuel Cells	Basic Electrochemistry	Basic Thermodynamics and System Analysis for Fuel Cells	Slides	Robert Steinberger-Wilckens	http://www.hysafe.org/science/eAcademy/JSFCH/JSFCH2012/Steinberger-WilckensR_BasicThermodynamicsAndSystemAnalysisForFuelCells.pdf	English	TrainHy	http://www.hysafe.org/
8	Hydrogen & Fuel Cells	Basic Electrochemistry	Introduction to Basic Electrochemistry for Fuel Cells and Electrolysis	Slides	Claude Lamy	http://www.hysafe.org/science/eAcademy/JSFCH/JSFCH2012/LamyC_IntroductionToBasicElectrochemistryForFuelCellsAndElectrolysis.pdf	English	TrainHy	http://www.hysafe.org/
8	H2 end-uses	H2 end-uses	Electrochemistry – High Temperature Concepts	Slides	Nigel Sammes	http://www.hysafe.org/science/eAcademy/JSFCH/JSFCH2012/SammesN_HighTemperatureElectrochemistry.pdf	English	TrainHy	http://www.hysafe.org/
8	H2 end-uses	H2 end-uses	SOFC Electrolytes and Anodes	Slides	Alan Atkinson	http://www.hysafe.org/science/eAcademy/JSFCH/JSFCH2012/AtkinsonA_ElectrolytesAndAnodes.pdf	English	TrainHy	http://www.hysafe.org/

3. Reports

URL: <https://www.fchobservatory.eu/reports>

This menu contains the reports generated in 2020, 2021 and 2022 divided in different chapters. This reports can be downloaded in pdf format:



Reports

These following reports are compiled based on the information and data collected during the data collection cycle of the FCHO. The objective is to provide stakeholders with valuable informative data to reflect the development of and trends within the sector over the previous year. Over time the depth and breadth of these reports will increase to reflect how the industry is performing and as the information collated within the FCHO expands.

2022



CHAPTER 1 TECHNOLOGY AND MARKET

This report focusses on global fuel cell system shipments and on European FCH actors, vehicle registrations, refuelling stations and the hydrogen market.

[Download](#)



CHAPTER 2 FCHO MARKET

This chapter tracks changes in the structure of hydrogen supply and demand in Europe.

[Download](#)



CHAPTER 3 POLICIES

This chapter provides an overview of EU and national policies across various hydrogen and fuel cell related sectors.

[Download](#)



CHAPTER 4 STANDARDS

This chapter presents information on standards relevant for the deployment of hydrogen and fuel cells with particular attention paid to recently issued and revised standards.

[Download](#)



CHAPTER 5 PATENTS APPENDIX

The patent appendix report complements the analysis of granted patents covered in the main patent report with an analysis of filing and grant statistics.

[Download](#)



CHAPTER 5 PATENTS REPORT

This chapter presents a range of statistical patent data as an indicator of research and development activity in the sector.

[Download](#)



CHAPTER 6 EDUCATION AND TRAINING

This chapter offers a repository of hydrogen and fuel cell related training and education materials available in Europe.

[Download](#)

2021



CHAPTER 1 TECHNOLOGY AND MARKET

This report focusses on global fuel cell system shipments and on European FCH actors, vehicle registrations, refuelling stations and the hydrogen market.

[Download](#)



CHAPTER 2 HYDROGEN SUPPLY & DEMAND

This chapter tracks changes in the structure of hydrogen supply and demand in Europe.

[Download](#)



CHAPTER 3 POLICIES

This chapter provides an overview of EU and national policies across various hydrogen and fuel cell related sectors.

[Download](#)



CHAPTER 4 STANDARDS

This chapter presents information on standards relevant for the deployment of hydrogen and fuel cells with particular attention paid to recently issued and revised standards.

[Download](#)



CHAPTER 5 PATENTS REPORT

This chapter presents a range of statistical patent data as an indicator of research and development activity in the sector.

[Download](#)



CHAPTER 5 PATENTS APPENDIX

The patent appendix report complements the analysis of granted patents covered in the main patent report with an analysis of filing and grant statistics.

[Download](#)



CHAPTER 6 EDUCATION AND TRAINING

This chapter offers a repository of hydrogen and fuel cell related training and education materials available in Europe.

[Download](#)

2020



CHAPTER 1 TECH & MARKET

This report focusses on global fuel cell system shipments and on European FCH actors, vehicle registrations, refuelling stations and hydrogen market.

[Download](#)



CHAPTER 2 HYDROGEN SUPPLY & DEMAND

This chapter tracks changes in the structure of hydrogen supply and demand in Europe.

[Download](#)



CHAPTER 3 POLICIES

This chapter provides an overview of EU and national policies across various hydrogen and fuel cell related sector.

[Download](#)



CHAPTER 4 STANDARDS

This chapter presents a large number of standards relevant for the deployment of hydrogen and fuel cells.

[Download](#)



This Fuel Cells and Hydrogen Observatory has been prepared for the FCH 2.0 under a public procurement contract

[Data protection](#)
[Legal Notice](#)
[Glossary](#)

[Contact](#)
[Follow us:](#)

The reports in pdf format as well as the images are provided by E4Tech.

4. News and events

URL: <https://www.fchobservatory.eu/news-events>

This menu contains the News and Events that the contributors/users have introduced in the backend. When the contributor enters the new or the event in the backend, it automatically appears in this menu:



OBSERVATORY REPORTS NEWS & EVENTS ABOUT US



News and events



Busworld 2021 is cancelled! New dates: 7-12 OCT 2023

2023-10-07

The next edition of Busworld Europe will take place in Brussels from 7 to 12 October 2023, when the event will also be celebrating its 50th birthday!!

[Read more](#)



SAVE THE DATE(S)! EUROPEAN HYDROGEN WEEK TO TAKE PLACE ON 29 NOV. – 3 DEC. 2021

2021-11-29

[Read more](#)



Zero Emission Bus Conference 2021

2021-11-17

NEW DATES ZERO EMISSION BUS CONFERENCE 2021 #ZEB2021 will take place on 17-18 November 2021 in Paris, France.

Join the zero-emission bus conversation in Paris where we will again bring together manufacturers, operators, policy makers and industry to discuss decarbonisation of public transport.

[Read more](#)



FCH Observatory: New reports available!

2021-10-28

[Read more](#)

5. About Us

URL: <https://www.fchobservatory.eu/about-us>

This menu contains information about the institutions and companies behind the portal as well as the national contributors. All this information is provided by E4Tech:



[OBSERVATORY](#) [REPORTS](#) [NEWS & EVENTS](#) [ABOUT US](#)



About us

The Fuel Cells & Hydrogen Observatory (FCHO) is a FCHJU initiative to provide relevant information for interested stakeholders in the sector. The partners involved in developing and maintaining the FCHO are highlighted below.

Technology and Market Statistics & Socio-Economic Indicators (FCH Supply chain and Jobs)



E4tech is an international strategic consultancy focused on sustainable energy. Since 1997 its team has worked with companies, governments, and investors to help them understand the global opportunities in clean energy. Sound technical knowledge, thorough and insightful analysis and years of experience allow them to give objective and strategic business and policy advice. Their clients call on them for support in taking decisions under uncertain conditions, shortening development times, identifying markets, finding investors and managing risk.



Policy and Regulation



Hydrogen Europe is the European association representing the interest of the hydrogen and fuel cell industry and its stakeholders. We promote hydrogen as the enabler of a zero-emission society. With more than 110 companies, 70 research organisations and 16 national associations as members, our association encompasses the entire value chain of the European hydrogen and fuel cell ecosystem collaborating in the Fuel Cell Hydrogen Joint Undertaking (FCH JU). We are a Brussels-based association fostering knowledge and pushing for fact-based policy making ensuring that the European regulatory framework enables the role of Hydrogen in our society.



The German Hydrogen and Fuel Cell Association (DWV) is the umbrella organization of hydrogen and fuel cell technology in Germany. The DWV stands for the technological development and market introduction of hydrogen technologies for over 2 decades and represents over 100 industry companies and research organization with more than 1.5 million employees nationwide.



Patents & Publications



HGF offers the dynamic intellectual property service that every innovative and competitive organisation requires, wherever they are and whenever they need it. Our approach, from the inception of ideas to the enforcement of IP rights is truly collaborative. Our unique and successful client relationships come from our strategic teams that fit around each client's requirements.



Codes and Standards



Founded in 1916 as the 'Main Commission for the Standardization of the Netherlands', NEN has grown into an organization with approximately 280 employees, over 500 standards committees and more than 5,000 active committee members. NEN acts as a facilitator for standardization and it does this by bringing together stakeholders on a particular subject and providing its expertise on standardization. The result is a widely accepted standard that can be implemented within the particular branch. Well known standards are ISO 9001, NEN 1010 and ISO 26000. It also publishes the national and international standards to make them as widely accepted as possible. Finally NEN also provides training courses and gives advice on implementing the standards.



CHAPTER 2: BACK-END MANAGEMENT GUIDE

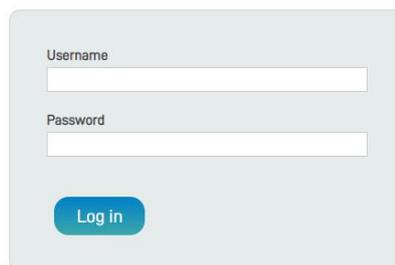
1. Credentials

To maintain and update the portal, some users were created to access to the backend of the portal. The backend of the portal is located in <https://www.fchobservatory.eu/user/login>
The access page is as shown below:



Thank you for being a contributor to the Hydrogen and Fuel Cells Observatory, in order to input data and access the questionnaire, please enter your credentials below.

With reference to the EUDPR Regulation 1725/2018, we confirm that this questionnaire does not gather or process any personal information.



There, the credentials (user and password) will be asked and for that purpose, some users were created. This information is **confidential** and therefore only those permitted by Clean Hydrogen JU have access to it.

Each user has their own password and the actions each one can do are listed in the previous table.

In other to see the different sections, the user should click on the 'Shortcuts' tab on the top of the page:



Education and training Review education surveys

Once the user has clicked on 'Shortcuts', the different sections to which the user has access will appear below.

In order to log out, the user will click on the username right next to the shortcuts and then, click on the log out button. The page will be automatically redirected to the FCHO portal.



View profile Edit profile Log out

1. Use of the back-end – Content managers

***Disclaimer:** Those sections of shortcuts which are not included in this document must not be manipulated or edited by the content managers. In that case, any effect that this may have on the public portal (modification of content and/or visualisation of it) will not be responsibility of Inycom.

In this section, the menus available in the ‘Shortcuts’ part will be explained.

2.1 Review National Policies survey

This menu serves to introduce the information that appears in the following URL: <https://www.fchobservatory.eu/observatory/policy-and-rcs/national-policies>

This menu allows to access to each questionnaire as well as seeing progress and the moment when the ‘Finished’ button has been pushed.

It is accessible on top from Shortcuts > Review national policies surveys

Admin Review National Policies Survey		
Admin Review National Policies Survey		
Survey	Finished	
<input type="text"/>	- Any -	
<input type="button" value="Apply"/>		
SURVEY	PERCENTAGE	STATUS
finland	92.06 %	Finished On: Tue, 11 / 19 / 2019 – 09:12
united kingdom	92.06 %	Finished On: Tue, 11 / 19 / 2019 – 09:42
greece	92.06 %	Finished On: Tue, 11 / 19 / 2019 – 09:16
italy	92.06 %	Not Finished
ireland	92.06 %	Finished On: Tue, 11 / 19 / 2019 – 09:19
Germany V2	92.06 %	Not Finished

2.2 Admin News and Events

This menu serves to introduce the information that appears in the following URL: <https://www.fchobservatory.eu/news-events>

This menu allows to add a new or event. In addition, the news and events created can be edited by clicking on the ‘Edit’ button or deleted by clicking on ‘Delete’ button.

It is accessible on top from Shortcuts > Admin News and Events.

Admin News and Events				
Admin News and Events				
<input type="button" value="+ Add new or event"/>				
Title	Published status			
<input type="text"/>	- Any -			
<input type="button" value="Filter"/>				
TITLE	DATE	AUTHOR	STATUS	OPERATIONS
European Green Deal Call: €1 billion investment to boost the green and digital transition	2020-09-21	communications	Published	<input type="button" value="Edit"/>
Fuel Cells & Hydrogen Observatory Launch Webinar	2020-09-15	edu	Published	<input type="button" value="Edit"/>
FCH Observatory: the go-to source for up-to-date information about the hydrogen and fuel cells sector is now live!	2020-09-15	communications	Published	<input type="button" value="Edit"/>

Each one is structured with heading, date, image, summary for the main menu and full body for the full piece of news.

Here is an example:

Title

Date

Image


Alternative text

Short description of the image used by screen readers and displayed when the image is not loaded. This is important for accessibility.

 [the_eu_green_deal.jpg](#) (352.04 KB) Remove

Description ([Edit summary](#))

2.3 Admin Reports

This menu serves to introduce the information that appears in the following URL: <https://www.fchobservatory.eu/reports>

This menu allows to add a new report as well as edit and delete it. It is accessible on top from Shortcuts > Admin Reports.

Admin tableau pages

Admin tableau pages
+ Add new report

Status

Apply

TITLE	PUBLISH/UNPUBLISH	EDIT	VIEW
Chapter 4 Standards	Unpublish	Edit	View
Chapter 3 Policies	Unpublish	Edit	View
Chapter 2 Hydrogen Supply & Demand	Unpublish	Edit	View
Chapter 1 Tech & Market	Unpublish	Edit	View

When uploading a new report, the following categories must be completed: Title, summary, description, and date. Then, and image and a file can be uploaded as well.

Title

Summary

Description ([Edit summary](#))

B I U S [bulleted list] [numbered list] [link] [image] | Format | Source | [undo] [redo] [copy] [paste]

This chapter presents a large number of standards relevant for the deployment of hydrogen and fuel cells

Date



Alternative text

Short description of the image used by screen readers and displayed when the image is not loaded. This is important for accessibility.

 Standards.png (48.46 KB) Remove

File
 Chapter_4_Standards_070920_0.pdf Remove

2.4 Admin EU policies

This menu serves to introduce the information that appears in the following URL: <https://www.fchobservatory.eu/observatory/Policy-and-RCS/EU-policies>

This menu allows us to generate the general policy (heading, links to related legislation and standard text). It is accessible on top from Shortcuts > Admin EU policies.

In this menu new policies can be added. Furthermore, the policies can be edited and deleted as it is shown in the image below:

Admin EU Policies

Admin EU Policies

+ Add new EU Policy

Title Published status Language

Filter

TITLE	AUTHOR	STATUS	UPDATED	OPERATIONS
Industrial Policy and Green Growth	edu	Published	08/18/2020 - 16:21	Edit
The EU Energy System Integration Strategy under the EU Green Deal	Anonymous (not verified)	Published	08/18/2020 - 09:51	Edit
European Climate Law	edu	Published	08/17/2020 - 18:03	Edit
Policy test	Anonymous (not verified)	Published	08/12/2020 - 12:35	Edit

If a policy needs to be edited, the URL, the heading and then the body text can be added. An example is shown below:

Heading

Legislation Show row weights

URL

Start typing the title of a piece of content to select it. You can also enter an internal path such as /node/add or an external URL, such as http://example.com. Enter <front> to link to the front page.

Link text

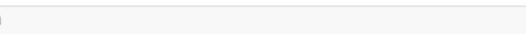
URL

Start typing the title of a piece of content to select it. You can also enter an internal path such as /node/add or an external URL, such as http://example.com. Enter <front> to link to the front page.

Link text

Add another item

General description

B I U S  Format - | Source 

The Renewable Energy Directive (RED) has the potential to have a major positive impact on the deployment of clean hydrogen technologies, in particular the production and storage of renewable hydrogen as well as the integration of renewable hydrogen in the transport sector.

The RED imposes, collectively, on Member States, an obligation to ensure that the share of energy from renewable sources in the Union's gross final consumption of energy in 2030 is at least 32%. This target is subject to (upward) revision if the Commission observes substantial cost reductions in the production of renewable energy.

National contributions towards this target are set by MS, within Integrated national energy and climate plans (INECPs) in accordance with Regulation (EU) 2018/1999 (The Governance Regulation) and other acts (e.g. Effort Sharing Regulation)

To help Member States meet the 32% obligation, Hydrogen can:

2.5 Admin EU policies item

This menu serves to introduce the information that appears in the following URL: <https://www.fchobservatory.eu/observatory/Policy-and-RCS/EU-policies>

This menu allows us to enter the 'extra' text which is required in each specific category for each general EU policy generated in the previous Admin EU policies menu first.

It is accessible on top from Shortcuts > Admin EU policy items.

It is possible to create new text if, for an existing EU policy, it is wanted extra text to appear in a certain category level:

Title category *

Category

- None -

Eu policy

- None -

Description

B I U S                                      

File repository

File repository

+ Add new file + Add new image

NAME	TYPE	DOWNLOAD LINK	LINK TO EDIT MEDIA	LINK TO DELETE MEDIA
Test	Files	https://fchobservatory.eu/media/11/download	edit	delete

When uploading a new file or image, the name to be displayed in the portal can be chosen. Once saved, it will appear in the menu (the one in the screenshot above).

Add Images

Add media item » Add Images

Name *

Image

+ info One file only.
10 MB limit.
Allowed types: png gif jpg jpeg.

Choose file No file chosen

One file only.
10 MB limit.
Allowed types: png gif jpg jpeg.

Revision information
No revision

Revision log message
+ info Briefly describe the changes you have made.

Save

Then it will be possible to see the type, if it is an image or a file, and a downloadable link will automatically appear (highlighted in yellow in the image below). Then the link to the document can be used wherever (e.g. as a hyperlink in a piece of news) to then attach a document to such piece of news.

File repository

File repository

+ Add new file + Add new image

NAME	TYPE	DOWNLOAD LINK	LINK TO EDIT MEDIA	LINK TO DELETE MEDIA
Test	Files	https://fchobservatory.eu/media/11/download	edit	delete

2.7 Feedback results

This menu allows to see the comments received through the 'Give feedback' tab on the portal.

The **Submissions** page displays a customizable overview of a webform's submissions. Submissions can be reviewed, updated, flagged and/or annotated. [Watch video](#)

▼ FILTER SUBMISSIONS

Filter by submitted data and/or notes All [5]

5 submissions

#	★ 📄	CREATED	SUBMITTED TO	USER	IP ADDRESS	NAME	ORGANISATION	EMAIL ADDRESS	COMMENTS
5	★ 📄	Mon, 09/28/2020 - 17:04		Anonymous	80.200.180.75	Luca Bertuccioli	E4tech	luca.bertuccioli@e4tech.com	Test
4	★ 📄	Wed, 09/16/2020 - 10:36		Anonymous	31.54.6.96	Jane Patterson	Ricardo	jane.patterson@ricardo.com	Searching th
3	★ 📄	Wed, 09/16/2020 - 10:35		Anonymous	98.158.252.46	Vincent Mattelaer	Toyota Motor Europe	vincent.mattelaer@toyota-europe.com	Under 'Stan
2	★ 📄	Tue, 09/15/2020 - 14:35		Anonymous	192.36.224.119	Patric Stafshede	Celcibus AB	patric.stafshede@celcibus.com	I think the v
1	★ 📄	Tue, 09/15/2020 - 11:46		Anonymous	80.156.247.164	Michael Schröder	Roth Industries	michael.schroeder@roth-industries.com	

CHAPTER 3: IT MANAGEMENT GUIDE

In this chapter, all the necessary information about the developments done within the platform are explained as well as the maintenance schedule including the latest updates.

1. Update and management of dynamic analysis charts

In this section, all the details related to the Tableau charts will be explained.

Tableau credentials:

This information is **confidential** and therefore only those permitted by Clean Hydrogen JU have access to it

Database credentials:

This information is **confidential** and therefore only those permitted by Clean Hydrogen JU have access to it.

1.1 FCHO.twbx (FCHO)

This tableau connects to the Excel files. In order to modify it, the access path to the excels must be modified. In addition, the excels must have the same sheet name for the change to be made correctly.

The transformations of these Excel sheets are performed within Tableau.

1.2 Technology and Market - Size of FC Market

ULR in the portal: <https://www.fchobservatory.eu/observatory/technology-and-market/fc-market>

In this case the table has to be rotated to have the years as a single column.

To update this Excel, in case you only want to update some value, but do not want to change the number of columns, i.e. the number of years, it is just a matter of modifying the connection string from the Excel to our new Excel. This Excel must comply with the considerations indicated at the end.

In case a new year is added, modifications will have to be made again. To avoid changing the legend colours and other predefined settings later, for this update instead of modifying the Excel path, we will load a new data source to our new Excel, we will pivot the table to have it the way wanted. Then, what will be done is to replace the data source from a sheet that uses the old Excel. This will automatically switch all charts using the old Excel to the new one and keep the settings. Once the data source has been replaced, simply delete the old connection.

Shipments by region of Deployment

URL in the portal: <https://www.fchobservatory.eu/observatory/technology-and-market/fc-market-region-deployment>

The legend for this sheet and all related sheets is:

 Europe	 #0081c7
 N America	 #3da7ab
 Asia	 #004494
 RoW	 #ffed00

- **Shipments by Region of Deployment chart**
Excel file: FCHO-Shipment data.xlsx
Sheet: sBy region of deployment
- **Megawatts by Region of Deployment chart**
Excel file: FCHO Shipment data.xlsx
Sheet: MWRegion of adoption

Shipments by Application

URL in the portal: <https://www.fchobservatory.eu/observatory/technology-and-market/fc-market>

The legend for this sheet and all related sheets is:

 Portable	 #0081c7
 Stationary	 #3da7ab
 Transport	 #004494

- **Shipments by Application chart**
Excel file: FCHO-Shipment data.xlsx
Sheet: sBy Application
- **Megawatts by Application chart**
Excel file: FCHO-Shipment data.xlsx
Sheet: MWBy application

Shipments by FC Type

URL in the portal: <https://www.fchobservatory.eu/observatory/technology-and-market/fc-market-fc-type>

The legend for this sheet and all related sheets is:

AFC	#ffed00
MCFC	#cbdfec
SOFC	#0081c7
PAFC	#6c87b3
DMFC	#3da7ab
PEMFC	#004494

- **Shipments by Fuel Cell Type chart**
Excel file: FCHO-Shipment data.xlsx
Sheet: sBy fuel cell type
- **Megawatts by Fuel Cell type chart**
Excel file: FCHO-Shipment data.xlsx
Sheet: MW by FC type

Shipments by Region of Integration

URL in the portal: <https://www.fchobservatory.eu/observatory/technology-and-market/fc-market-region-integration>

The legend for this sheet and all related sheets is:

Europe	#0081c7
N America	#3da7ab
Asia	#004494
RoW	#ffed00

- **Shipments by Region of Integration chart**
Excel file: FCHO-Shipment data.xlsx
Sheet: sBy regi of system integration
- **Megawatts by Region of Integration chart**
Excel file: FCHO-Shipment data.xlsx
Sheet: MW Regi sytem integration

1.3 Technology and Market – Registered FCEVs

New FCEVs registrations

URL in the portal: <https://www.fchobservatory.eu/observatory/technology-and-market/net-number-of-fcevs>

The legend for this sheet and all related sheets is:

0	#d3d3d3
1 - 49	#87c2c4
50 - 149	#3da7ab
150 - 299	#618ab8
> 300	#0a4c98

- **Heat map**
Excel file: EAFO transformed data.xlsx
Sheet: EAFO Tableau
- **Bar chart**
Excel file: EAFO transformed data.xlsx
Sheet: EAFO Tableau

For reading this table, modifications have to be made in Excel and Tableau.
In Excel, first filter by Fuel = 'FCEV'. This is going to be the table to use.
At the top, complete the years so that all columns have a year associated with them.
Now, disregarding the fuel column, we pivot it to have the countries as columns and the year and vehicle type as rows.
Finally, add a 'Fuel' column where all rows will take the value 'FCEV'.
This new table should be in a sheet called EAFO Tableau. Now load the table in Tableau and pivot the countries back to have them in a single column. We now have the data as it is used in the published Tableau.
To update this data, proceed again by creating a new data source and making the modifications indicated above. Once this is done, replace the data source as indicated in 'Size of FC Market'.

Annual registrations

URL in the portal: <https://www.fchobservatory.eu/observatory/technology-and-market/net-number-of-fcevs-annual>

The legend for this sheet and all related sheets is:

 L Two and three wheel vehicles	 #0a4c98
 L6+L7 Quadricycles	 #ff7f0e
 M1 Passenger cars	 #618ab8
 M2+M3 Buses & Coaches	 #87c2c4
 N1 Light commercial vehicles (<3.5 tonnes)	 #0081c7
 N2+N3 Trucks & Heavy goods vehicles	 #ffed00

- **Total Annual New FCEVs by Type chart**
Excel file: EAFO fleet – 2022 v2.xlsx
Sheet: Fleet data Tableau

For reading this table, modifications have to be made in Excel and Tableau.
To read this table, modifications must be made in Excel and Tableau.
In Excel, at the top, complete the years so that all the columns have a year associated with them and discard the Fuel column. This column will be added later.

Pivot the table to have the countries as columns and the year and type of vehicle as rows.
Finally, add a 'Fuel' column where all rows will take the value 'H2'.

This new table should be in a sheet called Fleet data Tableau. Now load the table in Tableau and pivot the countries back to have them in a single column. We now have the data as it is used in the published Tableau.

To update this data, proceed again by creating a new data source and making the modifications indicated above. Once this is done, replace the data source as indicated in 'Size of FC Market'.

Cumulative net registrations

URL in the portal: <https://www.fchobservatory.eu/observatory/technology-and-market/net-number-of-fcev-net>

The legend for this sheet and all related sheets is:

 L Two and three wheel vehicles	 #0a4c98
 L6+L7 Quadricycles	 #ff7f0e
 M1 Passenger cars	 #618ab8
 M2+M3 Buses & Coaches	 #87c2c4
 N1 Light commercial vehicles (<3.5 tonnes)	 #0081c7
 N2+N3 Trucks & Heavy goods vehicles	 #ffed00

- **Total Annual New FCEVs by Type chart**

Excel file: EAFO fleet – 2022 v2.xlsx

Sheet: Fleet data Tableau

It would be updated at the same time as the previous one because they use the same data source.

1.4 Publications

Publications by country

URL in the portal: <https://www.fchobservatory.eu/observatory/publications>

The legend for this sheet and all related sheets is:

 0	 #d3d3d3
 1 - 9	 #87c2c4
 10 - 49	 #3da7ab
 50 - 199	 #618ab8
 > 200	 #0a4c98

- **Number of Publications per Country and Year (heat map & bar chart)**

Excel file 1: Aggregated.xlsx

Sheet 1: Gram_

Excel file 2: Tabla Paises.xlsx

Sheet 2: export

These two sheets cross by year, to show only the desired countries by year.

To update, although the colours will have to be changed afterwards, it is recommended to do this from the existing connection by modifying the connection string.
No transformations have to be performed in this case in Excel or Tableau.

Publications by technology

URL in the portal: <https://www.fchobservatory.eu/observatory/publications-by-technology>

The legend for this sheet and all related sheets is:

	Alkaline electrolysis		#ffed00
	Alkaline FC		#0a4c98
	Other production methods		#618ab8
	PEM electrolysis		#3da7ab
	PEM FC		#21b600
	SO electrolysis		#6ee05a
	SO FC		#0081c7

- **Number of Publications per technology and Year chart**

Excel file: Aggregated.xlsx

Sheet: Gram_

In this case do not make the crossover with the table of countries.

There would be no need to make any modification in Excel.

Publications by technology

URL in the portal: <https://www.fchobservatory.eu/observatory/publications-eu28>

The legend for this sheet and all related sheets is:

	Alkaline electrolysis		#ffed00
	Alkaline FC		#0a4c98
	Other production methods		#618ab8
	PEM electrolysis		#3da7ab
	PEM FC		#21b600
	SO electrolysis		#6ee05a
	SO FC		#0081c7

- **Number of Publications in EU28 Countries chart**

Excel file 1: Aggregated.xlsx

Sheet 1: Gram_

Excel file 2: Tabla Paises.xlsx

Sheet 2: export

No modifications would have to be made in Excel. The linkage is the same as in the case of Publications per Country.

1.5 Technology and Market – Cumulative data

Deployment by year

URL in the portal: <https://www.fchobservatory.eu/observatory/publications-eu28>

Excel file: 2022 HRS data update. xlsx

Sheet 1: HRS publicar Tableau

Sheet 2: Paises

These two sheets cross by year, to show only the desired countries by year.

To update it is recommended to create a new data source and replace.

To update it, modify the 'Paises' table so that it contains the new year with the desired countries. In addition, in 'HRS publicar Tableau', we must pivot the columns HRS at 700 bar (car), HRS at 350 bar (car) and HRS at 350 bar (bus). This must be done in Tableau.

Deployment by country

URL in the portal: <https://www.fchobservatory.eu/observatory/technology-and-market/hydrogen-refueling-stations/cumulative-data-country>

The legend for this sheet and all related sheets is:

	0	#d3d3d3
	1-14	#3da7ab
	15-29	#0081c7
	>30	#0a4c98

- **Deployment by country (heat map and bar chart)**

Excel file: 2022 HRS data update. xlsx

Sheet: HRS publicar Tableau

In this case we do not cross-reference with the Country table.

To update it is recommended to create a new data source and substitute.

To update, modify the 'Paises' table to contain the new year with the desired countries. In addition, in 'HRS publicar Tableau', we must pivot the columns HRS at 700 bar (car), HRS at 350 bar (car) and HRS at 350 bar (bus). This must be done in Tableau.

1.6 Patents

Patents by country

URL in the portal: <https://www.fchobservatory.eu/observatory/patents>

The legend for this sheet and all related sheets is:

	0		#d3d3d3
	1 - 9		#87c2c4
	10 - 49		#3da7ab
	50 - 199		#618ab8
	> 200		#0a4c98

- **Patents by country (heat map and bar chart)**

Excel file: Reformatted Fuel Cell Patent Data 2022.xlsx

Sheet: Sheet1

In Tableau, we will have to pivot the year columns to have it as a single column.
To update, it is recommended to create a new connection and then replace it.

Patents by technology

URL in the portal: <https://www.fchobservatory.eu/observatory/patents-by-technology>

The legend for this sheet and all related sheets is:

	AFC		#87c2c4
	DAFC/DMFC & DMFC		#59acbe
	Electrolysis		#bce4d8
	Inorganic		#45a2b9
	Low Carbon		#2c5985
	MCFC		#358ead
	PAFC		#0081c7
	PEM FC		#316f96
	SO FC		#004494

- **Patents by technology (heat map and bar chart)**

Excel file: Reformatted Fuel Cell Patent Data 2022.xlsx

Sheet: Sheet1

In Tableau, we will have to pivot the year columns to have it as a single column.
To update, it is recommended to create a new connection and then replace it.

1.7 Technology and Market – Hydrogen Supply Capacity

URL in the portal: <https://www.fchobservatory.eu/observatory/technology-and-market/hydrogen-supply-capacity>

The legend for this sheet is:

	0		#d3d3d3
	1 - 9		#87c2c4
	10 - 49		#3da7ab
	50 - 199		#618ab8
	> 200		#0a4c98

Excel file 1: FCHO_2022_H2Market Supply Capacity Data_download_20220314.xlsx

Sheet 1: Sheet1

Excel file 2: FCHO_2022_Supply capacity locations for Inycom_20220314_20220330.xlsx

Sheet 2: Production capacity

Tables are cross-referenced by Country and 'Process/source'='Production process'.

In the table Production capacity we have for each country, the city with its latitude and longitude (modified in case they are repeated) and the type of production process. This sheet is used to draw the points on the map.

In case of an update, it is recommended to create a new connection and to replace it afterwards.

No transformations have to be carried out on any of the tables. They are read raw.

1.8 Technology and Market – Hydrogen Demand

URL in the portal: <https://www.fchobservatory.eu/observatory/technology-and-market/hydrogen-demand>

Excel file: FCHO_2022_T&M_Demand data 20220314.xlsx

Sheet: Demand

We have to pivot in tableau all columns except the country column and put the following names: 'Hydrogen end use' for the texts and 'Demand value' for the values.

It is recommended to create a new connection and, after modifications, replace.

1.9 Technology and Market – LCOH

Grid connected electrolysis

URL in the portal: <https://www.fchobservatory.eu/observatory/technology-and-market/levelised-cost-of-hydrogen-grid-connected-electrolysis>

- **Heat map chart**

Excel file: FCHObservatory_LCOH_2022.xlsx

Sheet: 1

In Tableau, we will have to pivot the category columns to have it as a single column. The names of these two new columns will be 'Cost categories' for the categories and 'LCOH (EUR/Kg)' for the value.

To update, it is recommended to create a new connection and then replace it.

- **Bar chart**

The legend for this sheet is:

	Taxes		#0081c7
	Grid fees		#3da7ab
	Wholesale electricity costs		#004494
	CAPEX and maintenance		#ffed00

Excel file: FCHObservatory_LCOH_2022.xlsx

Sheet: 1

The update of the data will be done simultaneously with the previous step because they use the same connection.

Green hydrogen costs

URL in the portal: <https://www.fchobservatory.eu/observatory/technology-and-market/levelised-cost-of-hydrogen-green-hydrogen-costs>

Excel file: FCHObservatory_LCOH_2022.xlsx

Sheet: 1

Tableau, we will have to pivot the category columns to have it as a single column. The names of these two new columns will be 'RE source' for the categories and 'LCOH (EUR/Kg)' for the value.

To update it is recommended to create a new connection and then replace it.

1.10 FCHO.twbx (FCHO)

This Tableau connects to a mysql where the views created from the National Policies questionnaires are stored. For each 'chapter' we have a different view.

In this case, no transformations are carried out on the data.

The connections are made by extraction, so every time we want to see the updated data we have to update it manually and republish the tableau.

In any view, to update the data, simply go to Data and update the desired extraction.

FCEVs Incentives y Other (Chapter 1)

View: v_national_policies_ch1_modified_v2

Stationary power Incentives y Other (Chapter 2)

View: v_national_policies_ch2

Hydrogen as fuel and refueling Infrastructure General (Chapter 3)

View: v_national_policies_ch3

Hydrogen Production, Transmission and distribution Incentives y Other (Chapter 4)

View: v_national_policies_ch4_updt_04_21

Introduction of green hydrogen in industry Incentives y Other (Chapter 5)

View: v_national_policies_ch5_updt_04_21

Other relevant policies (Chapter 6)

View: v_national_policies_ch6

IMPORTANT CONSIDERATIONS

When doing path substitution in an Excel file, it is very important to keep in mind that the number of columns must be the same. In addition, the columns must have the same name as the initial one to ensure that everything is replaced automatically. Finally, the new Excel must have the same name for the sheet where the table is located.

On the other hand, when changes are to be made to the table again because, as mentioned above, the number of columns changes, make sure that the columns are named exactly the same for the correct substitution. However, in this case it does not matter which Excel name or Excel sheet you read from.

2. Data content configuration

In this section, all the menus and sections in the portal that are Drupal developments will be explained.

2.1 Standards menu

URL: <https://www.fchobservatory.eu/observatory/policy-and-rcs/standards>

This menu is a Drupal development.

The entries at standards can be found as an accordion list ordered by categories. The view also has a free text filter and an export button.

Standards are stored as Drupal's content type 'Standard' and can be added via csv import. If it is wanted to replace or update all the already existing standards, it is necessary to delete them first.

CSV REQUIREMENTS

The file must be codified as UTF-8 without BOM, fields must be separated by ';' and entries by line breaks. This applies to every csv import to be done in the portal.

In the standard's case, fields must follow this order:

- 0- Category
- 1- Subcategory
- 2- Class
- 3- Subclass
- 4- Relevant Standard or Work Programme
- 5- Title
- 6- Description
- 7- Status
- 8- Legal directive
- 9- Legal Mandate
- 10- Citation OJEU
- 11- Standard Link
- 12- TC Scope
- 13- Affiliation
- 14- NEN's internal comments
- 15- Full link to Standard
- 16- TC link

Before uploading the file, the rows must be alphabetically ordered by the 'Relevant Standard or Work Programme' field. The existent categories also must be checked in the platform (https://fchobservatory.eu/admin/structure/taxonomy/manage/standard_categories/overview) before uploading the file.

Additionally, the links must also include 'https://www.' or 'http://www.' To be correctly displayed as hyperlinks.

The csv must be uploaded to the `fchobservatory/sites/default/files` as 'standards.csv'.

The import is automatically made when visiting the page
https://fchobservatory.eu/import_standards_csv

Logs will be displayed on the same page in order to check if all standards have been correctly imported. It's recommended to always check if all standards have been correctly created by confirming the last standard in alphabetic order.

2.2 Hydrogen Pipelines

URL: <https://www.fchobservatory.eu/observatory/technology-and-market/hydrogen-pipelines>

This menu is a Drupal development and includes an OpenStreetMap display locating the existing Hydrogen pipelines.

The data from this section is stored as Drupal's content type 'Pipeline' and can be added via csv import.

If it is needed to replace all the previously existing pipelines or updating them, it is required to delete them first.

CSV REQUIREMENTS

The file must be codified as UTF-8 without BOM, fields must be separated by ';' and entries by line breaks. This applies to every csv import in the portal.

In the Hydrogen pipeline's case, two different CSV files are needed (one must contain the list of pipelines and the other must contain the different segments of those pipelines including the coordinates), and fields must follow this order:

For the CSV containing the pipelines data:

- 0- Reference (pipeline number)
- 1- Owner
- 2- Length
- 3- End users
- 4- Typology
- 5- Capacity
- 6- Diameter
- 7- Pressure
- 8- Material
- 9- Status

For the CSV containing the segments and coordinates for the pipelines:

- 17- Reference (pipeline number)
- 18- Segment (letter)
- 19- Start (coordinates)
- 20- End (coordinates)
- 21- Start (city)
- 22- End (city)

The CSV files must be uploaded to the `fchobservatory/sites/default/files` as 'pipelines' and 'pipelinesegments.csv'.

The import is automatically made when visiting the page https://fchobservatory.eu/import_pipelines_csv

2.3 Education and Training – Education materials

URL: <https://www.fchobservatory.eu/observatory/education-and-training/education-materials>

This menu is a Drupal development.

The entries can be found in a table with free search, ISCED, course focus, language and source filters.

Education materials are stored as Drupal's content type 'Education material' and can be added via csv import.

If it is needed to replace all the previously existing pipelines or updating them, it is required to delete them first.

CSV REQUIREMENTS

The file must be codified as UTF-8 without BOM, fields must be separated by ';' and entries by line breaks. This applies to every csv import in the portal.

In the education material's case, fields must follow this order:

- 0- ISCED
- 1- Technology
- 2- Focus
- 3- Title
- 4- Type
- 5- Author
- 6- Website

- 7- Language(s)
- 8- Source
- 9- Project link
- 10- Year
- 11- Date

Links must include 'https://www.' or 'http://www.' to be displayed correctly.

Before uploading the file the existent referenced items must be checked in the platform:

Languages:

https://fchobservatory.eu/admin/structure/taxonomy/manage/materials_language/overview

Sources:

https://fchobservatory.eu/admin/structure/taxonomy/manage/materials_source/overview

Materials:

https://fchobservatory.eu/admin/structure/taxonomy/manage/technology_materials/overview

Focus:

https://fchobservatory.eu/admin/structure/taxonomy/manage/materials_focus/overview

Technologies:

<https://fchobservatory.eu/observatory/education-and-training/education-materials>

The csv must be uploaded to the fchobservatory/sites/default/files as 'trainingmaterials.csv'.

The import is automatically made when visiting the page

https://fchobservatory.eu/import_materials_csv

2.4 Education and Training – Training programmes

URL: <https://www.fchobservatory.eu/index.php/observatory/education-and-training/training-programmes>

This menu is a Drupal development and it includes an OpenStreetMap display locating the existing Training programmes.

The entries can be found in a map and a list with free search, training programme, language and focus filters.

Training programmes are stored as Drupal’s content type ‘Education and training’ and can be added via csv import.

If it is needed to replace all the previously existing pipelines or updating them, it is required to delete them first.

CSV REQUIREMENTS

The file must be codified as UTF-8 without BOM, fields must be separated by ‘;’ and entries by line breaks. This applies to every csv import in the portal.

In the training programme’s case, the order of the fields depends on the category.

Before uploading the file, the existing referenced items must be checked in the platform and links must include ‘https://www.’ or ‘http://www.’.

The csv must be uploaded to the fchobservatory/sites/default/files as ‘trainingeducation.csv’.

The import is automatically made when visiting the page https://fchobservatory.eu/import_education_csv

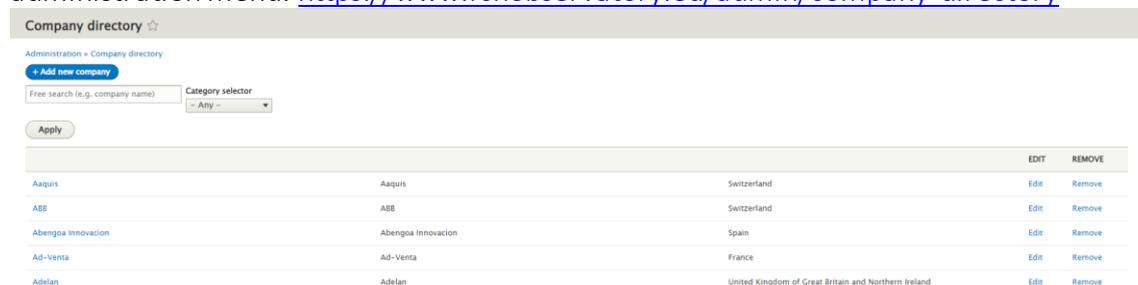
2.5 Company Directory

URL: <https://www.fchobservatory.eu/observatory/technology-and-market/company-directory>

This menu is a Drupal development.

This page is composed by a OpenStreetMap map and a regular view with a free search and category filter.

Companies are stored as Drupal’s content type ‘Company’ and can be added from an administration menu: <https://www.fchobservatory.eu/admin/company-directory>



Company directory			EDIT	REMOVE
Aaquis	Aaquis	Switzerland	Edit	Remove
ABB	ABB	Switzerland	Edit	Remove
Abengoa Innovacion	Abengoa Innovacion	Spain	Edit	Remove
Ad-Ventia	Ad-Ventia	France	Edit	Remove
Adelan	Adelan	United Kingdom of Great Britain and Northern Ireland	Edit	Remove

The administration view has a list of companies with options to edit and remove and a button to create new companies that redirects to the creation form.

The company categories can be reviewed, added ,edited and removed from it’s taxonomy page:

https://www.fchoobservatory.eu/admin/structure/taxonomy/manage/company_categories/overview

3. HRS API Export

This HRS API export was provided by the FCHO IT provider in a monthly basis to the datastream owner of the HRS Cumulative data section of the FCHO portal. In this section, the installation of the application is explained.

*Prior to the installation of the application, it is necessary to install MySQL and set up the compressed database on the same server. This database will be used by the app to store the relevant data.

Once the database is ready, the steps to install the app are as follows:

1. Install Node.js on the server that will allow to run the application.

The installation instructions are in the following URL: <https://help.dreamhost.com/hc/en-us/articles/360029083351-Installing-a-custom-version-of-NVM-and-Node-js>

First install NVM (if not already installed) and then use it to install Node.js. And it is important to make sure that the Node.js version is v12.10.0 which is compatible with the application.

After installation, Node.js stays in this path:

```
[ec2-user@ip-172-31-15-213 v12.10.0]$ ls -lrt
total 156
drwxr-xr-x 5 ec2-user ec2-user  45 Sep  4 2019 share
drwxr-xr-x 3 ec2-user ec2-user  26 Sep  4 2019 lib
-rw-r--r-- 1 ec2-user ec2-user 26037 Sep  4 2019 README.md
-rw-r--r-- 1 ec2-user ec2-user 77127 Sep  4 2019 LICENSE
drwxr-xr-x 3 ec2-user ec2-user  18 Sep  4 2019 include
-rw-r--r-- 1 ec2-user ec2-user 52442 Sep  4 2019 CHANGELOG.md
drwxr-xr-x 2 ec2-user ec2-user  40 Sep  4 2019 bin
[ec2-user@ip-172-31-15-213 v12.10.0]$ pwd
/home/ec2-user/.nvm/versions/node/v12.10.0
[ec2-user@ip-172-31-15-213 v12.10.0]$
```

2. It is necessary to copy the 'appfcho.zip' zip file which is the application to the server and then unzip it in the path \$HOME of the user. Alternatively, it can be copied directly to this same path with the FTP.



appfcho.zip

```
[ec2-user@ip-172-31-15-213 ~]$ cd $HOME
[ec2-user@ip-172-31-15-213 ~]$ ls -lrt
total 0
drwxrwxr-x 4 ec2-user ec2-user 96 Sep 16 2019 appfcho
[ec2-user@ip-172-31-15-213 ~]$
```

- Use crontab which is used to schedule tasks on the Unix server. This allows to schedule to run the node.js application every X time it is desired.

On the original server it was scheduled to run twice a day or every 12 hours (00h and 12h):

```
0 0-23/12 * * * cd /home/ec2-user/appfcho && /home/ec2-user/.nvm/versions/node/v12.10.0/bin/node app.js >> /home/ec2-user/appfcho/LOG/crontab.log 2>&1
```

Then it has to be added to the crontab with this command line:

```
crontab -e
```

First it will be empty and then it is necessary to insert this line that was mentioned before:

```
0 0-23/12 * * * cd /home/ec2-user/appfcho && /home/ec2-user/.nvm/versions/node/v12.10.0/bin/node app.js >> /home/ec2-user/appfcho/LOG/crontab.log 2>&1
```

(It is important to verify that these paths are the correct ones on the new server).



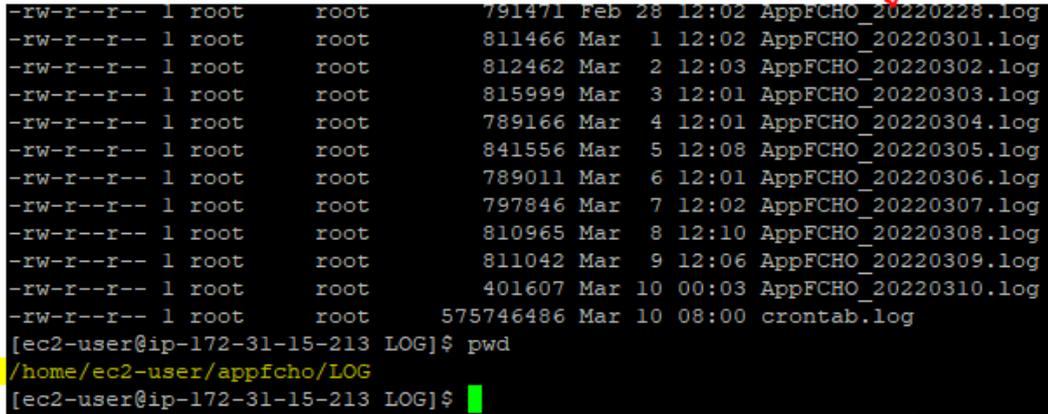
When entering this line, save and exit with :wq!

It can be checked that it is already programmed with this command line:

```
crontab -l
```

```
[ec2-user@ip-172-31-15-213 ~]$ sudo crontab -l
0 0-23/12 * * * cd /home/ec2-user/appfcho && /home/ec2-user/.nvm/versions/node/
v12.10.0/bin/node app.js >> /home/ec2-user/appfcho/LOG/crontab.log 2>&1
[ec2-user@ip-172-31-15-213 ~]$
```

4. The results of the executions of this node.js application by the crontab can be seen in this LOG directory inside the appfcho application:



```
-rw-r--r-- 1 root root 791471 Feb 28 12:02 AppFCHO_20220228.log
-rw-r--r-- 1 root root 811466 Mar 1 12:02 AppFCHO_20220301.log
-rw-r--r-- 1 root root 812462 Mar 2 12:03 AppFCHO_20220302.log
-rw-r--r-- 1 root root 815999 Mar 3 12:01 AppFCHO_20220303.log
-rw-r--r-- 1 root root 789166 Mar 4 12:01 AppFCHO_20220304.log
-rw-r--r-- 1 root root 841556 Mar 5 12:08 AppFCHO_20220305.log
-rw-r--r-- 1 root root 789011 Mar 6 12:01 AppFCHO_20220306.log
-rw-r--r-- 1 root root 797846 Mar 7 12:02 AppFCHO_20220307.log
-rw-r--r-- 1 root root 810965 Mar 8 12:10 AppFCHO_20220308.log
-rw-r--r-- 1 root root 811042 Mar 9 12:06 AppFCHO_20220309.log
-rw-r--r-- 1 root root 401607 Mar 10 00:03 AppFCHO_20220310.log
-rw-r--r-- 1 root root 575746486 Mar 10 08:00 crontab.log
[ec2-user@ip-172-31-15-213 LOG]$ pwd
/home/ec2-user/appfcho/LOG
[ec2-user@ip-172-31-15-213 LOG]$
```

4. Maintenance schedule

This section includes the maintenance schedule carried out for the different menus on the portal. The table below lists all the content shown in the portal, when was last updated, who is the datastream owner, the frequency of update and more relevant information:

Section	URL	Data presentation	Frequency of update	Description of update	Last update	Datastream owner in charge of supply input data to Inycom	Data input format	Name of last data input file shared
Observatory landing page	https://www.fchobservatory.eu/observatory	Drupal Text	1 per year	Modification of text and existing hyperlinks	Q3 2020	E4Tech	Word document/plain text in email	N.A
Observatory > Technology and market	https://www.fchobservatory.eu/observatory/technology-and-market	Drupal Text	1 per year	Modification of text and existing hyperlinks	Q3 2020	E4Tech	Word document/plain text in email	N.A
Observatory > Technology and market > Size of FC Market	https://www.fchobservatory.eu/observatory/technology-and-market/fc-market	Drupal Text + Tableau charts	1 every 3 months	Modification of text and refresh of existing Tableau charts with updated input excel file in agreed format	April 2022	E4Tech	Word document/plain text in email and input excel file in the agreed format	2021 FCHO Shipment data
Observatory > Technology and market > Hydrogen Supply Capacity	https://www.fchobservatory.eu/observatory/technology-and-market/hydrogen-supply-capacity	Drupal Text + Tableau chart	1 per year	Modification of text and refresh of existing Tableau charts with updated input excel file in agreed format	March 2022	Hydrogen Europe	Word document/plain text in email and input excel file in the agreed format	FCHO_2022_H2Market Supply Capacity Data_20220314 / FCHO_2022_Supply capacity locations for Inycom_20220314_20220330

Observatory > Technology and market > Hydrogen Demand	https://www.fchobservatory.eu/observatory/technology-and-market/hydrogen-demand	Drupal Text + Tableau chart	1 per year	Modification of text and refresh of existing Tableau charts with updated input excel file in agreed format	March 2022	Hydrogen Europe	Word document/plain text in email and input excel file in the agreed format	FCHO_2022_T &M_Demand data 20220314
Observatory > Technology and market > LCOH	https://www.fchobservatory.eu/observatory/technology-and-market/levelised-cost-of-hydrogen-grid-connected-electrolysis	Drupal Text + Tableau charts	1 per year	Modification of text and refresh of existing Tableau charts with updated input excel file in agreed format	June 2022	Hydrogen Europe	Word document/plain text in email and input excel file in the agreed format	FCHObservatory_LCOH_2022
Observatory > Technology and market > Hydrogen Pipelines	https://www.fchobservatory.eu/observatory/technology-and-market/hydrogen-pipelines	Drupal Text + Open Street Map	1 per year	Modification of text and refresh of existing Open Street map with updated input excel file in agreed format	09/07/2021	Hydrogen Europe	Word document/plain text in email and input excel file in the agreed format	20210709 FCHO_pipeline s (002)
Observatory > Technology and market > HRS > Availability System	https://www.fchobservatory.eu/observatory/technology-and-market/hydrogen-refueling-stations-availability-system	Drupal Text + iframe (Open Street Map)	N.A	N.A	N.A	iframe from https://h2-map.eu/	N.A	HRS-H2 deployment update 3
Observatory > Technology and market > HRS > Cumulative data	https://www.fchobservatory.eu/observatory/technology-and-market/hydrogen-refueling-stations/cumulative-data	Drupal Text + Tableau charts	N.A	Modification of text and refresh of existing Tableau charts with updated input excel file in agreed format	12/03/2021	E4Tech	Word document/plain text in email and input excel file in the agreed format	HRS-H2 deployment update 3
Observatory > Technology and market > Registered FCEVs	https://www.fchobservatory.eu/observatory/technology-and-market/net-number-of-fcevs	Drupal Text + Tableau charts	1 every 3 months	Modification of text and refresh of existing Tableau charts with updated input excel file in agreed format	June 2022	E4Tech	Word document/plain text in email and input excel file in the agreed format	EAFO fleet - 2022 v2 / EAFO registrations data

Observatory > Technology and market > Company directory	https://www.fchobservatory.eu/observatory/technology-and-market/company-directory	Drupal Text + Open Street Map + Drupal development	1 per year	Modification of text and refresh of existing Open Street map with updated input excel file in agreed format	08/09/2020	E4Tech	Word document/plain text in email and input excel file in the agreed format	20200611 FCHO-Company Directory (Output_11June2020_WEmptyFlag)
Observatory > Patents	https://www.fchobservatory.eu/observatory/patents	Drupal Text + Tableau charts	1 per year	Modification of text and refresh of existing Tableau charts with updated input excel file in agreed format	May 2022	E4Tech	Word document/plain text in email and input excel file in the agreed format	Reformatted Fuel Cell Patent Data 2022
Observatory > Publications	https://www.fchobservatory.eu/observatory/publications	Drupal Text + Tableau charts	1 per year	Modification of text and refresh of existing Tableau charts with updated input excel file in agreed format	April 2022	E4Tech	Word document/plain text in email and input excel file in the agreed format	AlkalineElectrolyzers / AlkalinesFC / H2_non_electrolysis / Onboard_Storage / PEM_electrolyzers / PEM_FC / SolidOxide / SolidOxideElectrolyzers
Observatory > Financial support	https://www.fchobservatory.eu/observatory/financial-support	Drupal Text	N.A	Modification of text	June 2022	E4Tech	Word document/plain text in email	N.A
Observatory > Policy and RCS	https://www.fchobservatory.eu/observatory/policy-and-rcs	Drupal Text	1 per year	Modification of text and existing hyperlinks	Q3 2020	E4Tech	Word document/plain text in email	N.A
Observatory > Policy and RCS > EU Policies	https://www.fchobservatory.eu/index.php/observatory/policy-and-rcs/eu-policies	Drupal Text + Drupal development	N.A	N.A	N.A	Users through the backend menu	Word document/plain text in email and input excel	N.A

							file in the agreed format	
Observatory > Policy and RCS > National Policies	https://www.fchobservatory.eu/observatory/policy-and-rcs/national-policies	Drupal Text	1 per year	Modification of text and existing hyperlinks	Q3 2020	E4Tech	Word document/plain text in email	N.A
Observatory > Policy and RCS > National Policies > Fuel cell electric vehicles (FCEVs)	https://www.fchobservatory.eu/observatory/policy-and-rcs/national-policies/fuel-cell-electric-vehicles-fcevs-incentives	Drupal Text + Tableau charts	1 per year	Refresh of Tableau charts after data input from National correspondants, review by He and approval by HE of existing information of current version of the questionnaires	April 2022	Hydrogen Europe (Questionnaires in the backend)	Word document/plain text in email and input data from National policies questionnaire	N.A
Observatory > Policy and RCS > National Policies > Stationary power	https://www.fchobservatory.eu/index.php/observatory/policy-and-rcs/national-policies/stationary-power-incentives	Drupal Text + Tableau charts	1 per year	Refresh of Tableau charts after data input from National correspondants, review by He and approval by HE of existing information of current version of the questionnaires	April 2022	Hydrogen Europe (Questionnaires in the backend)	Word document/plain text in email and input data from National policies questionnaire	N.A

Observatory > Policy and RCS > National Policies > Hydrogen as fuel and refueling infrastructure	https://www.fchobservatory.eu/observatory/policy-and-racs/national-policies/hydrogen-as-fuel-and-refueling	Drupal Text + Tableau charts	1 per year	Refresh of Tableau charts after data input from National correspondants, review by He and approval by HE of existing information of current version of the questionnaires	April 2022	Hydrogen Europe (Questionnaires in the backend)	Word document/plain text in email and input data from National policies questionnaire	N.A
Observatory > Policy and RCS > National Policies > Hydrogen Production, Transmission and Distribution	https://www.fchobservatory.eu/observatory/policy-and-racs/national-policies/hydrogen-production-transmission-and-distribution-incentives	Drupal Text + Tableau charts	1 per year	Refresh of Tableau charts after data input from National correspondants, review by He and approval by HE of existing information of current version of the questionnaires	April 2022	Hydrogen Europe (Questionnaires in the backend)	Word document/plain text in email and input data from National policies questionnaire	N.A
Observatory > Policy and RCS > National Policies > Introduction of green hydrogen in industry	https://www.fchobservatory.eu/observatory/policy-and-racs/national-policies/green-hydrogen-in-industry-incentives	Drupal Text + Tableau charts	1 per year	Refresh of Tableau charts after data input from National correspondants, review by He and approval by HE of existing information of current version of the questionnaires	April 2022	Hydrogen Europe (Questionnaires in the backend)	Word document/plain text in email and input data from National policies questionnaire	N.A

Observatory > Policy and RCS > National Policies > Other relevant policies	https://www.fchobservatory.eu/observatory/policy-and-racs/national-policies/other-relevant-policies	Drupal Text + Tableau charts	1 per year	Refresh of Tableau charts after data input from National correspondants, review by He and approval by HE of existing information of current version of the questionnaires	April 2022	Hydrogen Europe (Questionnaires in the backend)	Word document/plain text in email and input data from National policies questionnaire	N.A
Observatory > Policy and RCS > Standards	https://www.fchobservatory.eu/observatory/policy-and-racs/standards	Drupal Text + Drupal development	1 per year	Modification of text and refresh of existing Drupal development with updated input excel file in agreed format	April 2022	E4Tech	Word document/plain text in email and input excel file in the agreed format	FCHO standards data stream_version 2022-03-11as received
Observatory > Education and Training	https://www.fchobservatory.eu/observatory/education-and-training	Drupal Text	1 per year	Modification of text and existing hyperlinks	12/11/2021	Hydrogen Europe Research	Word document/plain text in email	ET FCHO - text landing page and headings 12112020
Observatory > Education and Training > Education materials	https://www.fchobservatory.eu/observatory/education-and-training/education-materials	Drupal Text + Drupal development	1 per year	Modification of text and refresh of existing Drupal development with updated input excel file in agreed format	June 2022	Hydrogen Europe Research	Word document/plain text in email and input excel file in the agreed format	Materials_Update on links_062022

Observatory > Education and Training > Training Programmes	https://www.fchobservatory.eu/observatory/education-and-training/training-programmes	Drupal Text + Open Street Map + Drupal development	1 per year	Modification of text and refresh of existing Drupal development and Open Street map with updated input excel file in agreed format	April 2022	Hydrogen Europe Research	Word document/plain text in email and input excel file in the agreed format	2022_Trainings_FCHO
Reports	https://www.fchobservatory.eu/reports	Drupal Text + Drupal development	1 per year	Modification on the text and addition of new annual reports	June 2022	E4Tech	Word document/plain text in email for the reports summaries and pdf format for the reports	N.A
News and events	https://www.fchobservatory.eu/news-events	Drupal Text + Drupal development	N.A	N.A	N.A	Users through the backend menu	N.A	N.A
About Us	https://www.fchobservatory.eu/about-us	Drupal Text + Drupal development	1 per year	Modification of text and existing hyperlinks	Q3 2020	E4Tech	Word document/plain text in email	N.A

5. Portal configuration

This section includes all the relevant information about the server and the credentials used to enter the portal.

SERVER FEATURES

For the portal to function correctly, the server that will host this platform must have the following configuration and meet (at least) the following requirements:

- MySQL server 5.7
- Apache
- PHP 7.4 (8.1 recommended)
- Composer
- Drush

ANALYTICS TOOL

Currently, the portal has the MATOMO analytics platform that collects, tracks and analyses information about the portal visitors.

This tool has to be installed by the new IT provider and they will need to create a new account. Then, they will configure it on Drupal (there is a Drupal module about Matomo: <https://www.drupal.org/project/matomo>).

USER ACCESS CREDENTIALS

This information is **confidential** and therefore only those permitted by Clean Hydrogen JU have access to it.

FCHO EMAIL ACCOUNTS

As of now, the email being displayed on the portal is the one owned by Clean Hydrogen JU: observatory@clean-hydrogen.europa.eu

This email is displayed on the contact section as well as the Cookies page.