HANDOVER
PORTAL MANAGEMENT DOCUMENT

NON-CONFIDENTIAL - July 2022

FUEL CELLS AND HYDROGEN OBSERVATORY

The Fuel Cells and Hydrogen Observatory has been prepared for Clean Hydrogen JU under a public procurement contract.

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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.

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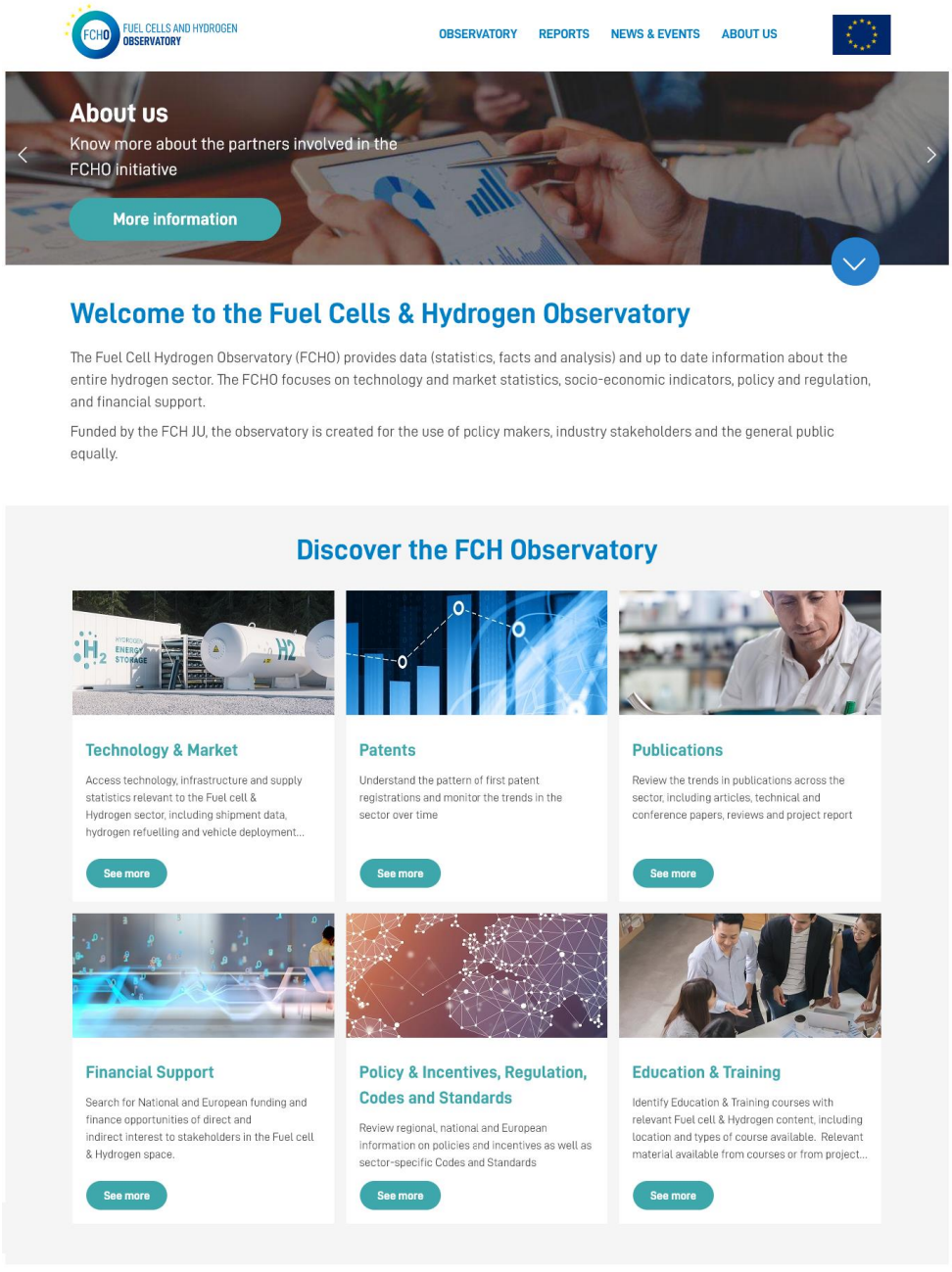
CHAPTER 1: PORTAL MANAGEMENT AND STRUCTURE

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.

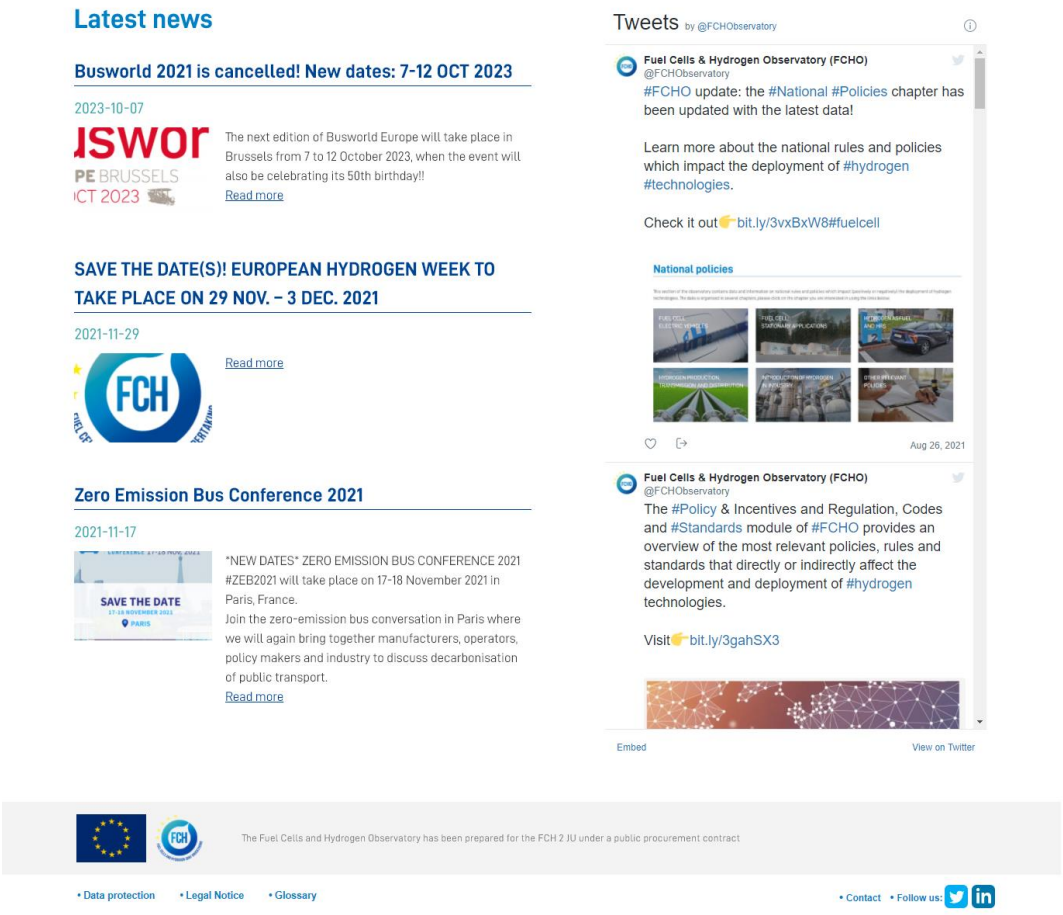
1. Homepage

URL: https://www.fchobservatory.eu/
The current portal homepage is the following:



The 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:

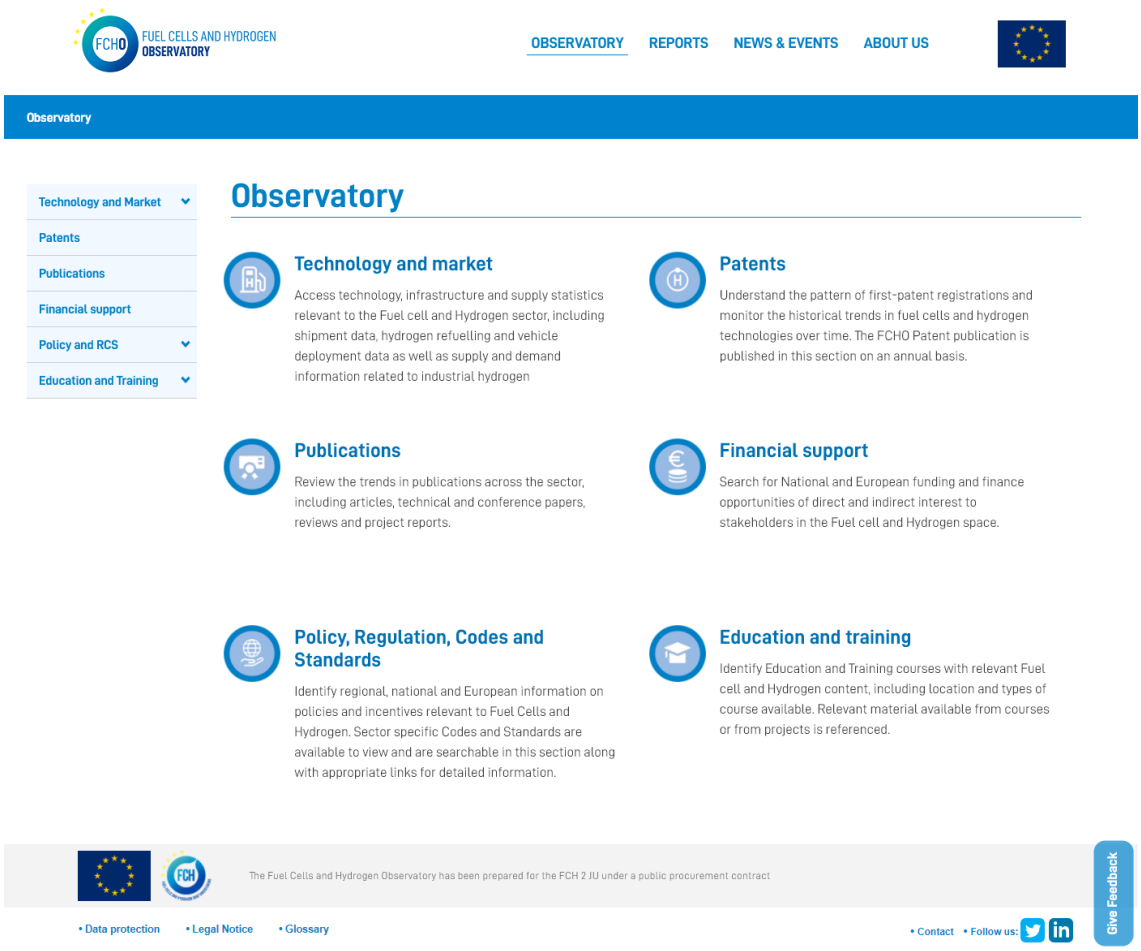


The latest news shown in the homepage are a preview of the *News & Events* menu explained later on in this document. Besides this, the latest FCHO tweets are displayed on the right side. Lastly, in the footer, there are several links to small sections as well as the link to all the social media accounts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

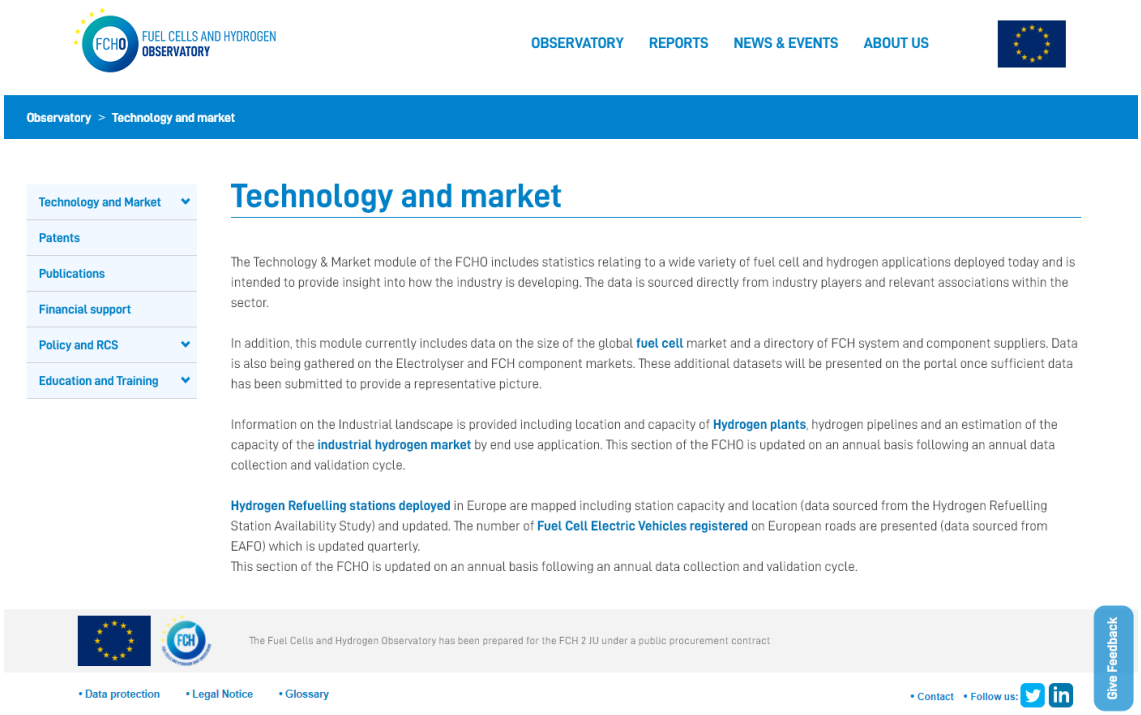


Each section of this menu can be accessed through the menu on the left or by clicking on the titles of the paragraphs (each section has a short description on the content displayed). The texts are provided by E4Tech.

2.1 Technology and market

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

The introductory page of this section is as follows:

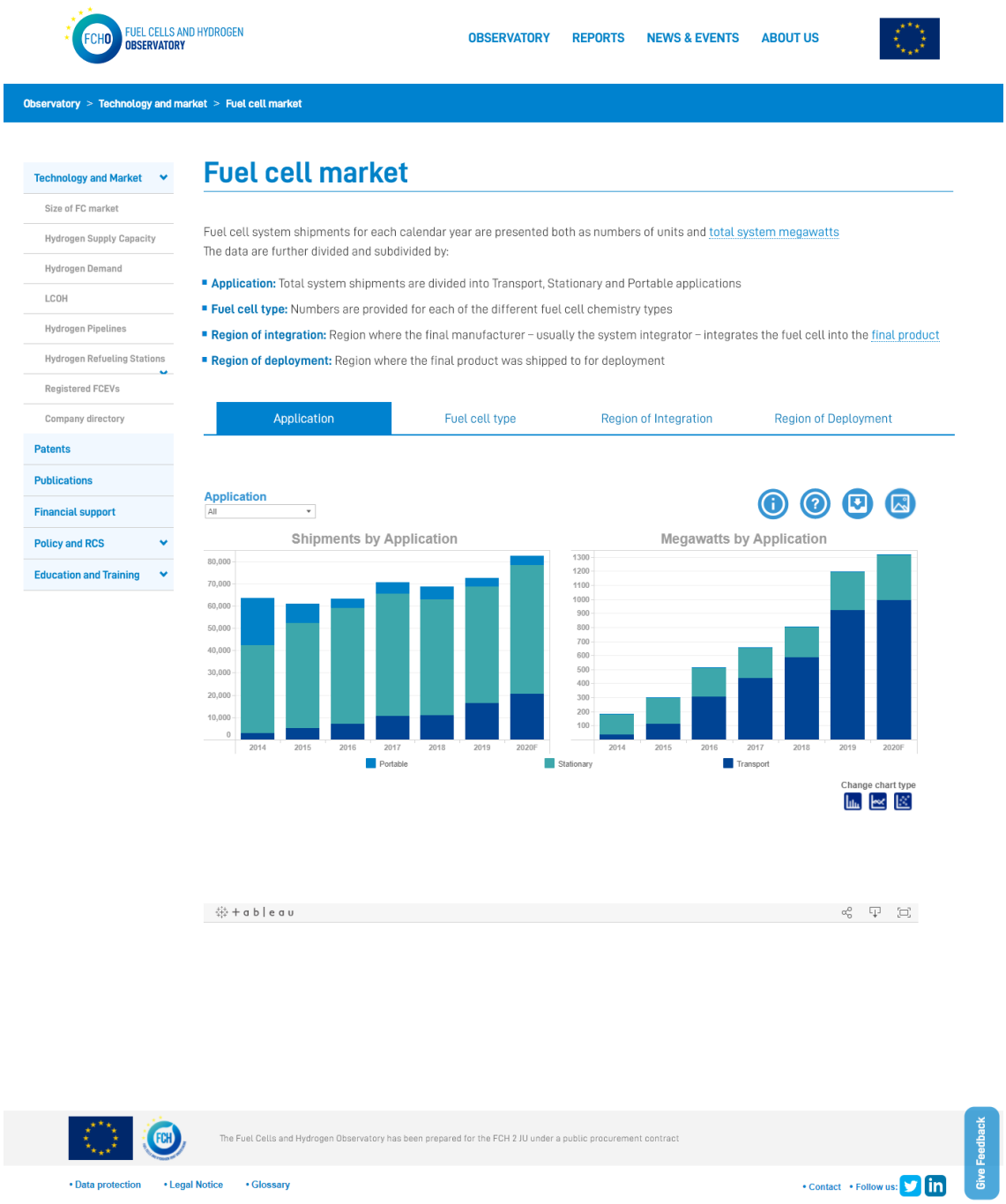


The introductory text of this section contains links to all the subsections included in it and is provided by E4Tech.

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:



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:

Data tables and charts

2020f is our forecast for the full year, based on firm data from January to September.

Shipments by Application

1,000s units	2014	2015	2016	2017	2018	2019	2020f
Portable	21,2	8,7	4,2	5,0	5,7	3,9	4,1
Stationary	39,5	47,0	51,8	54,9	51,9	52,2	57,8
Transport	2,9	5,2	7,2	10,6	10,9	16,4	20,5
Total	**63,6**	**60,9**	**63,2**	**70,5**	**68,5**	**72,5**	**82,4**

Shipments by Region of Deployment

1,000s units	2014	2015	2016	2017	2018	2019	2020f
Europe	5,6	8,4	4,4	5,1	7,7	10,7	12,7
N America	16,9	6,9	7,7	9,4	9,3	8,1	10,7
Asia	39,3	44,6	50,6	55,3	50,9	53,5	58,8
RoW	1,8	1,0	0,5	0,8	0,6	0,2	0,2
Total	**63,6**	**60,9**	**63,2**	**70,5**	**68,5**	**72,5**	**82,4**

Shipments by region of System Integration

1,000s units	2014	2015	2016	2017	2018	2019	2020f
Europe	6,3	8,0	4,2	6,6	8,8	10,0	16,8
N America	4,3	6,5	6,3	8,4	6,6	6,7	11,0
Asia	53,0	46,2	52,5	55,4	53,1	55,7	54,6
RoW	0,0	0,2	0,2	0,0	0,0	0,0	0,0
Total	**63,6**	**61,0**	**63,2**	**70,5**	**68,5**	**72,5**	**82,4**

Shipments by Fuel Cell Type

1,000s units	2014	2015	2016	2017	2018	2019	2020f
PEMFC	58,4	53,5	44,5	43,7	39,7	45,7	53,6
DMFC	2,5	2,1	2,3	2,8	3,7	3,7	3,8
PAFC	0,0	0,1	0,1	0,2	0,2	0,3	0,3
SOFC	2,7	5,2	16,2	23,7	24,9	22,8	24,7
MCFC	0,1	0,0	0,0	0,0	0,0	0,0	0,0
AFC	0,0	0,0	0,1	0,1	0,0	0,0	0,0
Total	**63,6**	**60,9**	**63,2**	**70,5**	**68,5**	**72,5**	**82,4**

Megawatts by Application

MW	2014	2015	2016	2017	2018	2019	2020f
Portable	0,4	0,9	0,3	0,6	0,7	0,4	0,4
Stationary	147,8	183,6	209,0	222,3	220,6	274,8	324,8
Transport	37,2	113,6	307,2	435,7	584,5	921,1	993,5
Total	**185,4**	**298,1**	**516,5**	**658,6**	**805,8**	**1.196,3**	**1.318,7**

Megawatts by Region of Deployment

MW	2014	2015	2016	2017	2018	2019	2020f
Europe	9,9	27,7	27,4	38,9	41,2	113,0	148,6
N America	69,8	108,4	213,6	331,8	425,3	339,2	252,7
Asia	104,5	159,7	273,8	285,8	337,9	743,9	912,4
RoW	1,2	2,3	1,7	2,1	1,2	0,2	5,0
Total	**185,4**	**298,1**	**516,5**	**658,6**	**805,8**	**1.196,3**	**1.318,7**

Megawatts by Region of System Integration

MW	2014	2015	2016	2017	2018	2019	2020f
Europe	3,1	4,8	6,7	8,2	11,0	13,8	22,8
N America	137,1	171,0	188,3	215,7	179,4	167,3	176,8
Asia	45,2	121,6	320,8	434,6	615,4	1010,2	1119,1
RoW	0,0	0,7	0,8	0,1	0,0	0,0	0,0
Total	**185,4**	**298,1**	**516,5**	**658,6**	**805,8**	**1191,3**	**1318,7**

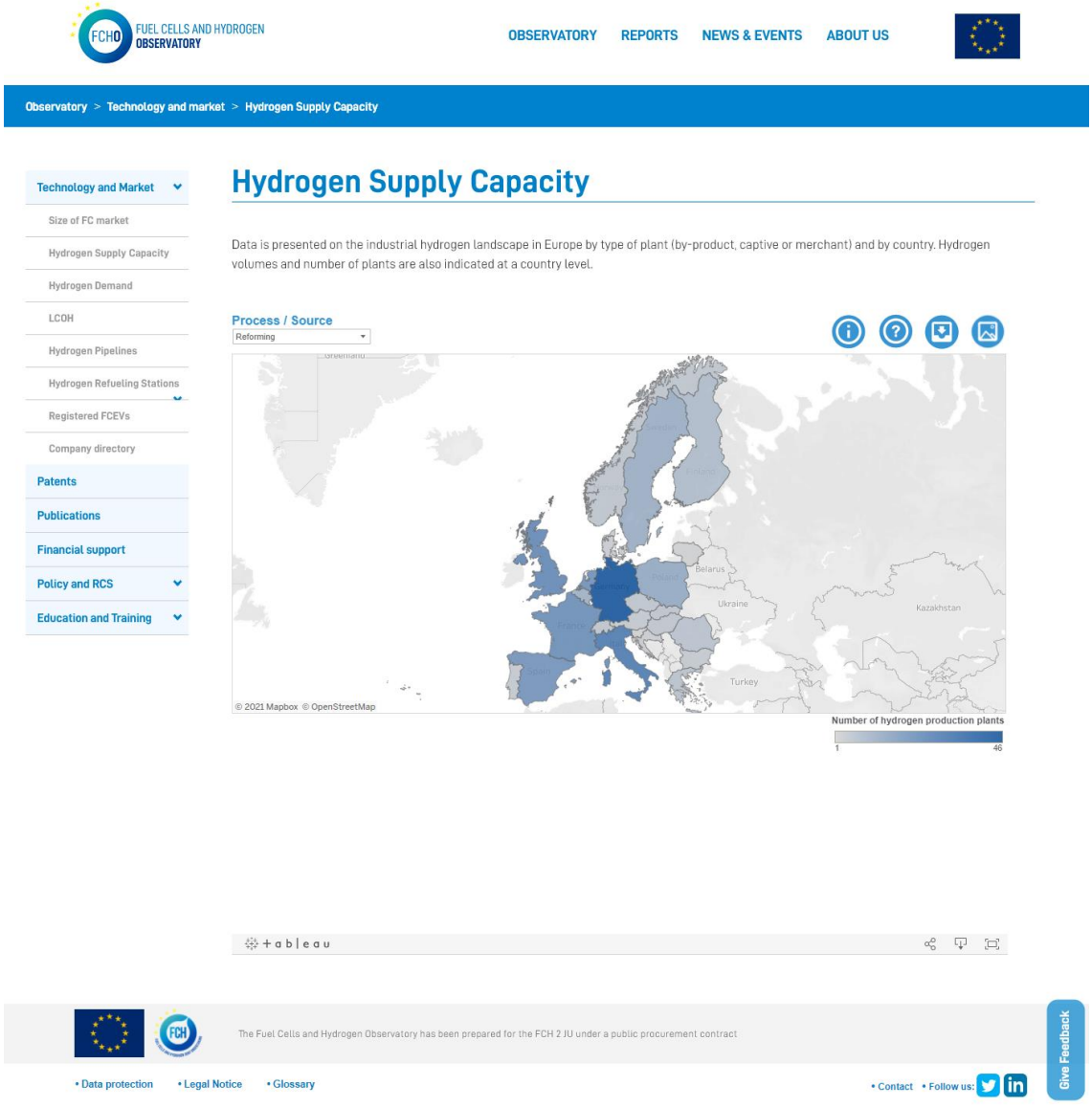
Megawatts by Fuel Cell Type

MW	2014	2015	2016	2017	2018	2019	2020f
PEMFC	72,7	151,8	341,0	466,7	609,0	948,0	1029,7
DMFC	0,2	0,2	0,2	0,3	0,4	0,4	0,4
PAFC	3,8	24,0	56,2	81,0	86,3	130,9	132,2
SOFC	38,2	53,3	62,9	85,2	84,1	106,8	147,5
MCFC	70,5	68,6	55,7	24,7	25,8	10,2	8,8
AFC	0,0	0,2	0,5	0,6	0,1	0,0	0,1
Total	**185,4**	**298,1**	**516,5**	**658,6**	**805,8**	**1.196,3**	**1.318,7**

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:



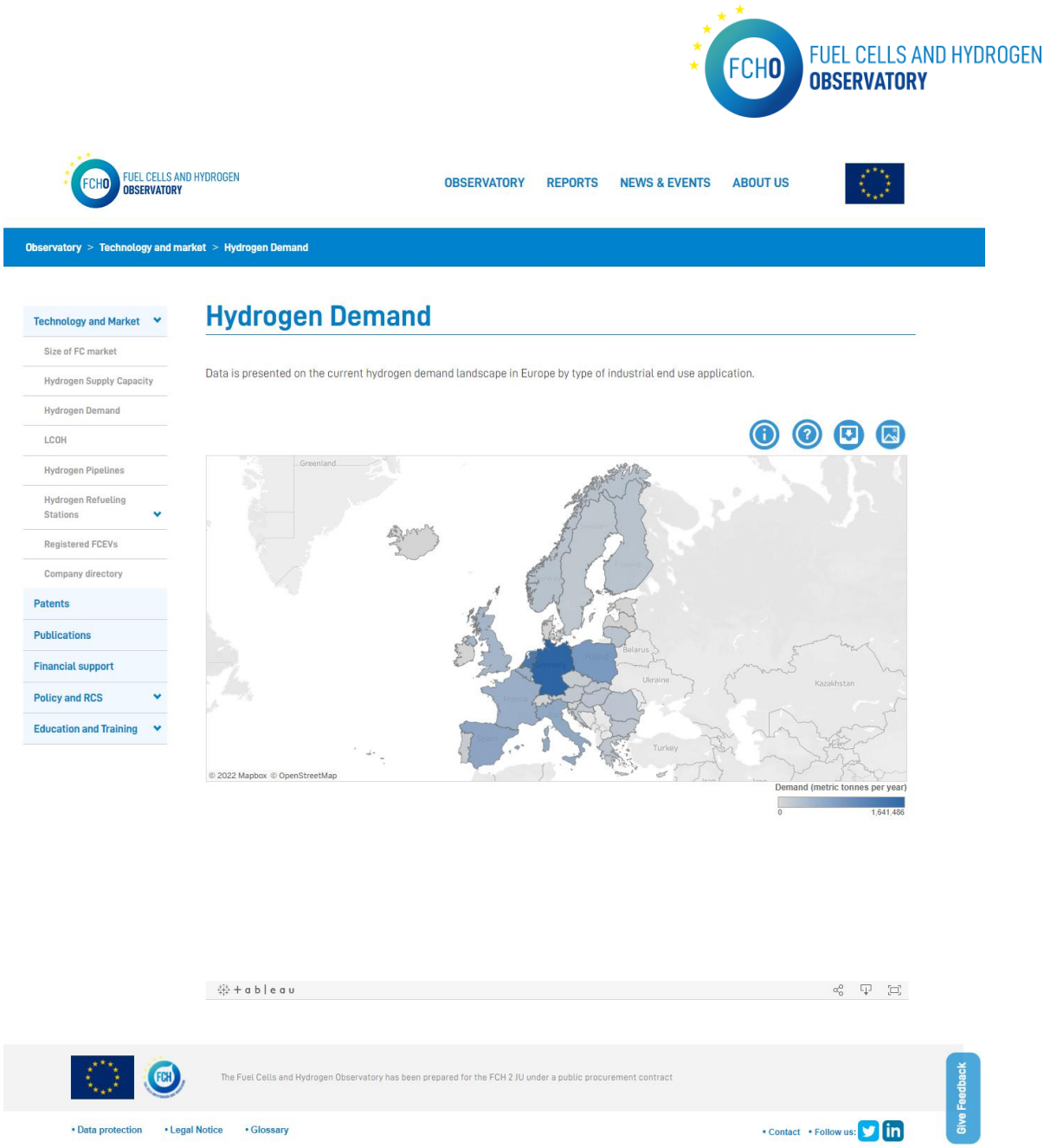
In order to show all the data in the Tableau charts, the input data file and the downloadable file are provided by Hydrogen Europe.
To be able to display all the information in the Tableau charts, the input data excel file has to have always the following format:

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 S	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

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:



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.fchobservatory.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':

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
Luxembou	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
Netherlan	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

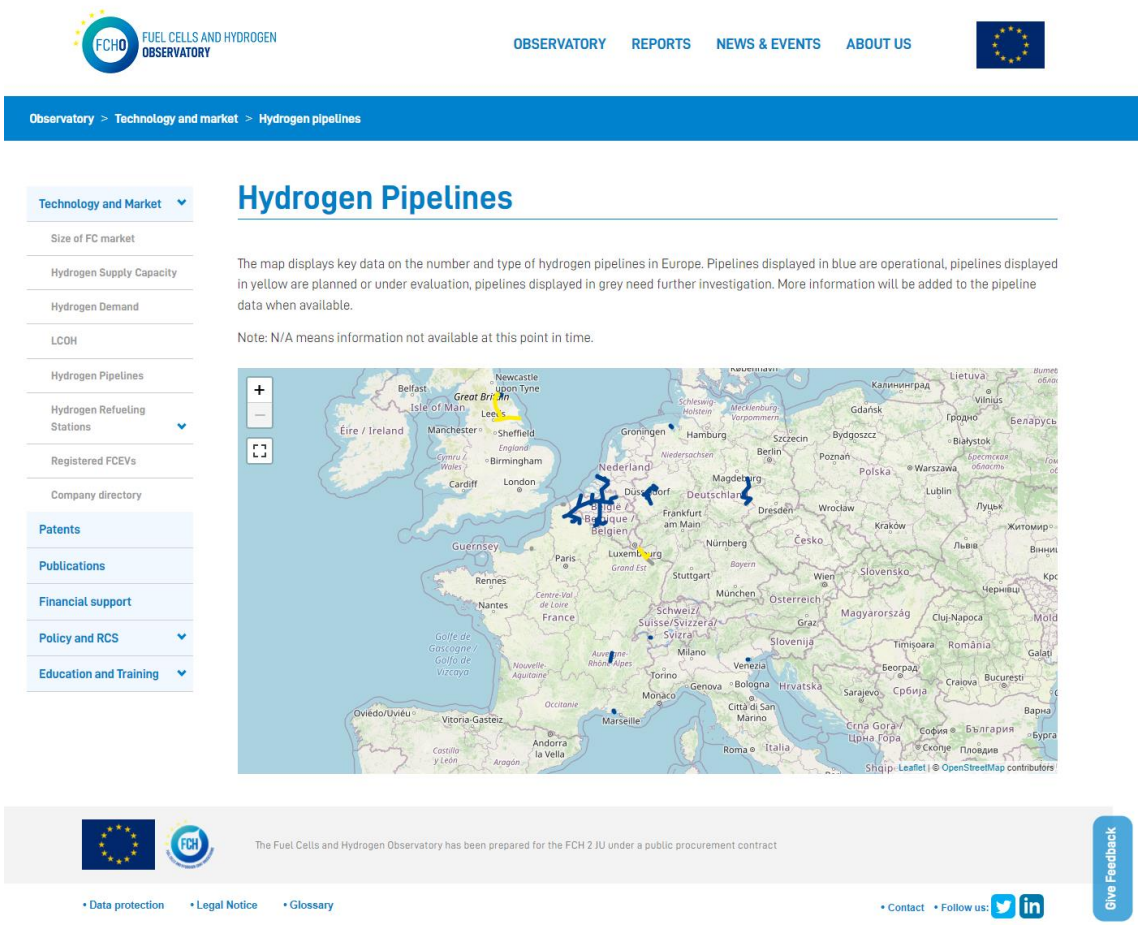
For 'Green hydrogen costs' chart:

1. Scenario 2 - Renewable hydrogen with direct connection to RES								
Countr	PV CF_avg	PV CF_top	PV CF_	Onshor	Onshore v	Onshore w	Offshore w	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.fchobservatory.eu/observatory/technology-and-market/hydrogen-pipelines

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



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

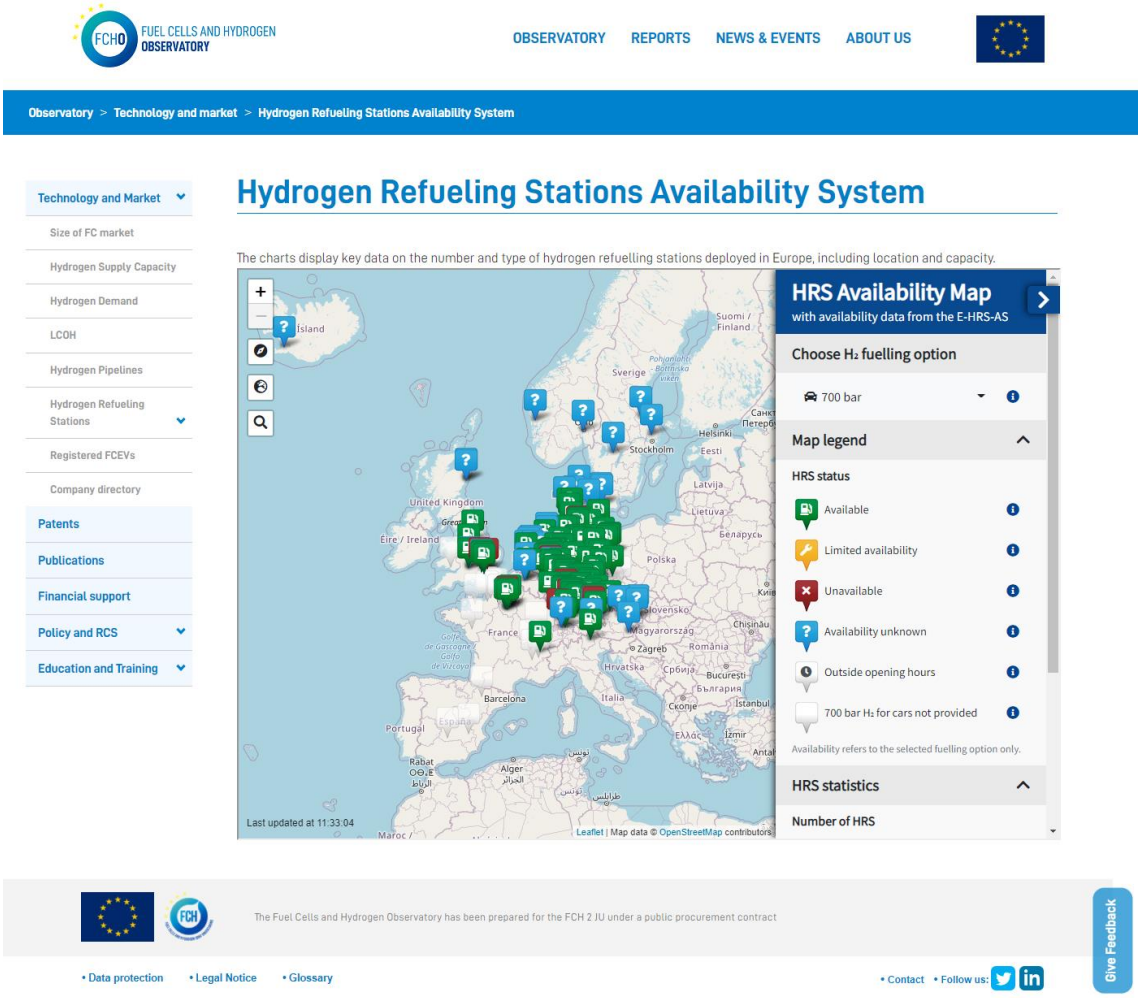
To be able to display all the information in the chart, the input data excel file has to have always the following format:

Reference	Owner	Length	End-users	Typology	Capacity	Diameter	Pressure	Material	Status	Source
		km			m3/h	mm	bar			
1	Air Liquide	964	Chemicals, Petrochmicals	Dedicated	N/A	100	100	N/A	In operation	[1]
2	Air Liquide	240	Chemicals, Petrochmicals	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	[1]
13	Air Products	5	Chemicals	Dedicated	N/A	N/A	N/A	N/A	In operation	[1]
14	Air Products	50	Chemicals, Petrochmicals	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	[1]
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

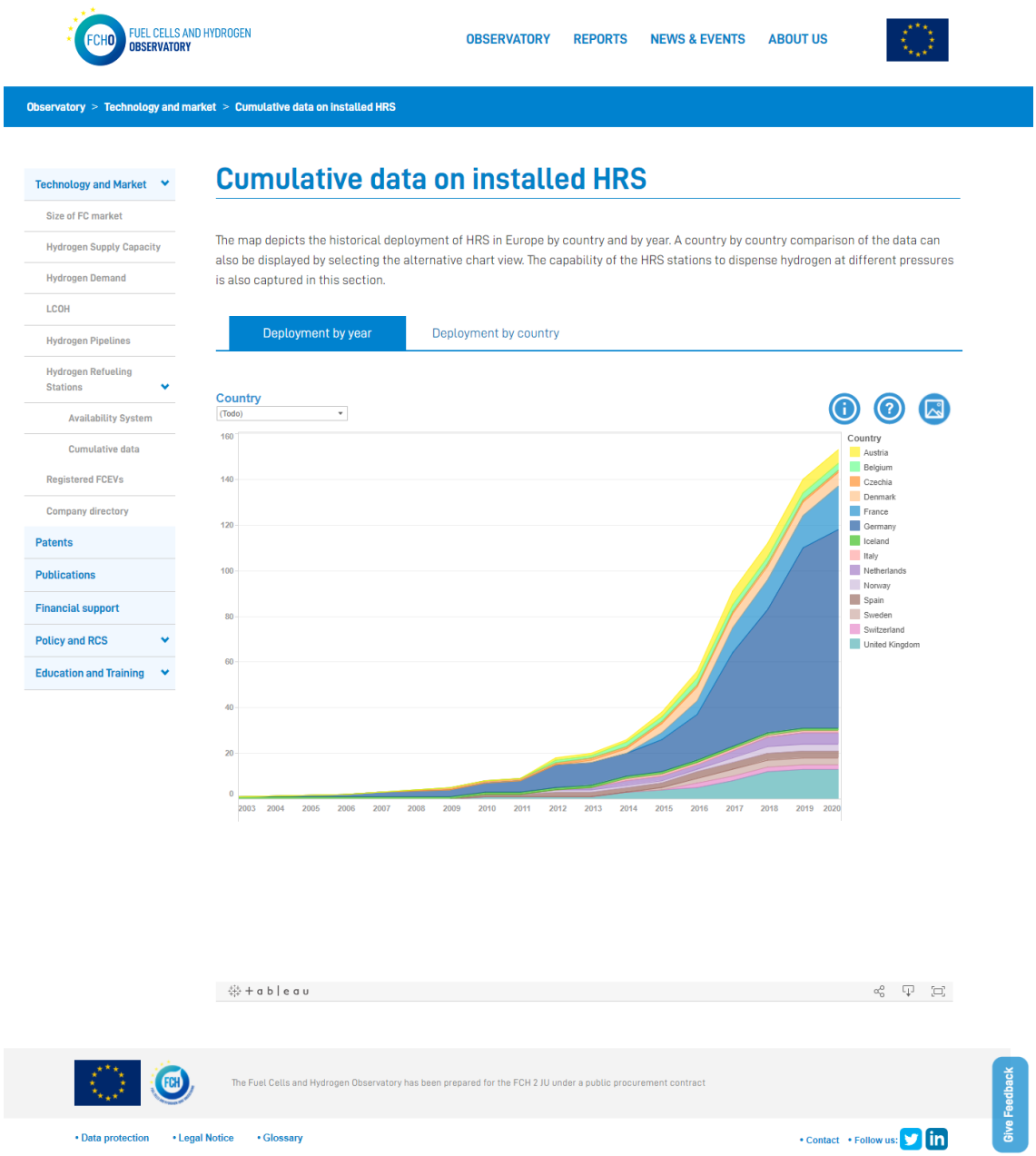
The Hydrogen refuelling Stations – Availability System subsection contains an introductory text and an iframe embedding the HRS Availability Map from https://h2-map.eu/ .



Hydrogen Refuelling Stations – Cummulative Data

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

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



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 ov	techno	funder	street address	postal code	city	countr	timezone	geolocation
AJMFY	Kolding	Danish Hydrogen Fuel A/S		Danish Hy	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	Laatzen	H2 Mobility	Shell	H2 Mobil	Air Liquid	FCH JU	Karlsruher Str. 12	30880	Laatzen	Germany	Europe/Berlin	9.796992999999
BAXKC	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	Connectir	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 Kir	Europe/London	-3.82216999999
BQDWS	Lohfelden	H2 Mobility	Shell	H2 Mobil	Air Liquid	Connectir	Alexander-von-Humb	34253	Lohfelden	Germany	Europe/Berlin	9.527152999999
BYHWT	Arnhem	PitPoint			HyGear		Westervoortsedijk 7	6827 AV	Arnhem	Netherlan	Europe/Amsterdam	5.946620396358
CCEXN	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	12.18918299999
DIHCB	Berlin | Heerstraße	H2 Mobility	TOTAL	H2 Mobil	Linde AG	BMVI	Heerstraße 35-37	13593	Berlin	Germany	Europe/Berlin	13.26046399999
DJAJP	Paris | Pont de l'Alma	Air Liquide	Air Liquid	Air Liquid	Air Liquide		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 regstrations', 'Annual registrations' and 'Cumuative net registrations':

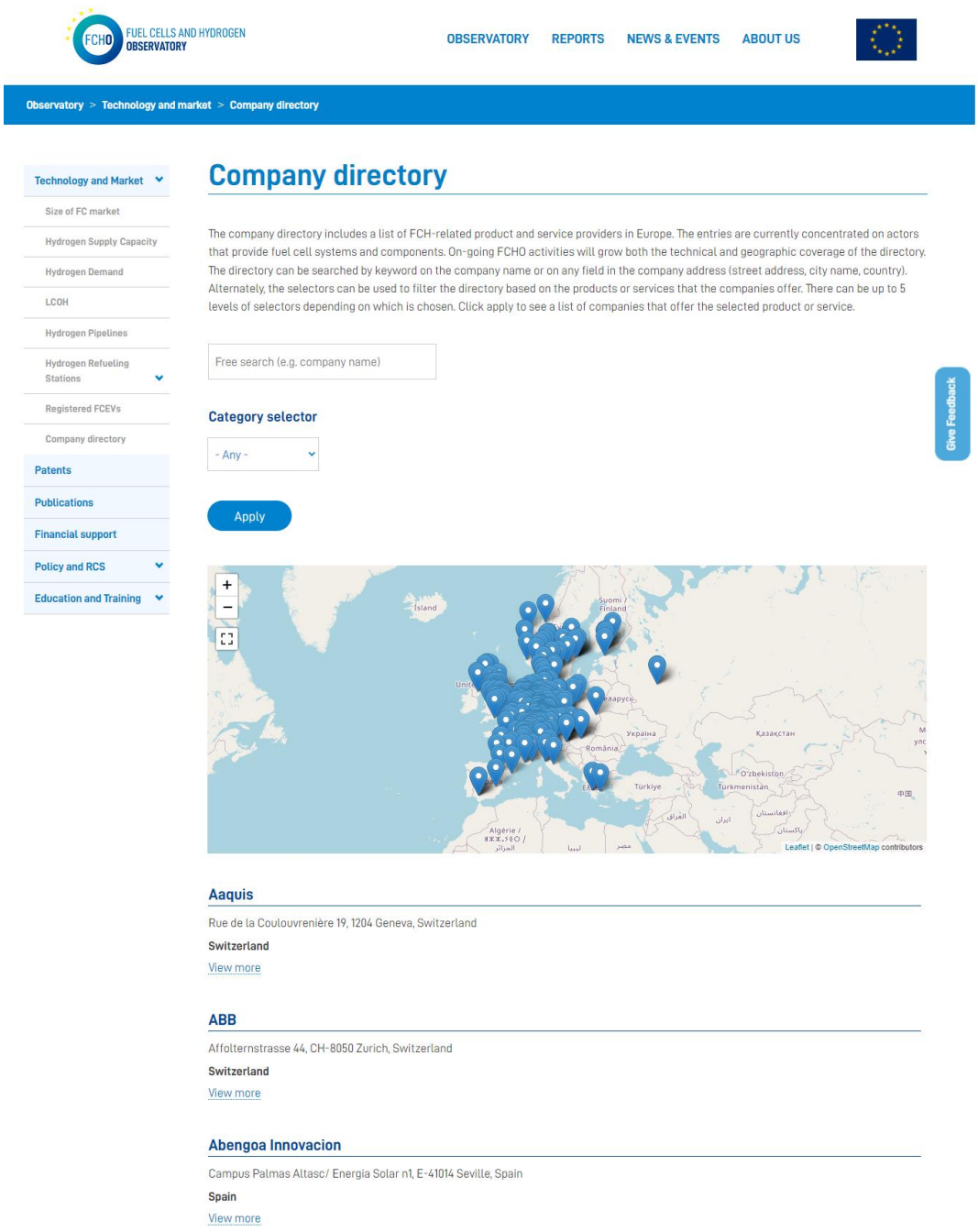
In order to show all the data in the Tableau charts, the input data file is provided by E4Tech. To be able to display all the information in the Tableau charts, the input data excel file has to have always the following format:

	2008						2009						2010						2011			
Country	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	1	0	0	0	0	0	1	1
European Uni	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1
Austria																						
Belgium															1						1	1
Bulgaria																						
Croatia																						
Cyprus																						
Czech Republic																						
Denmark																						
Estonia																						
Finland																						
France																						
Germany																						
Greece																						
Hungary																						
Iceland																						
Ireland																						
Italy																						
Latvia																						
Liechtenstein																						

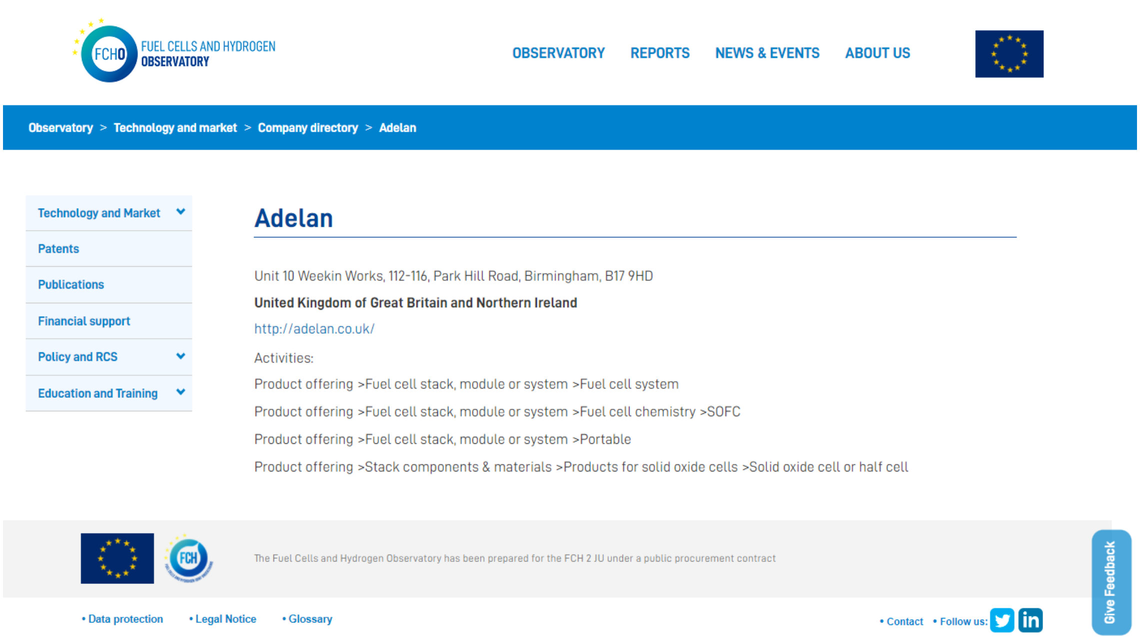
Company directory

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

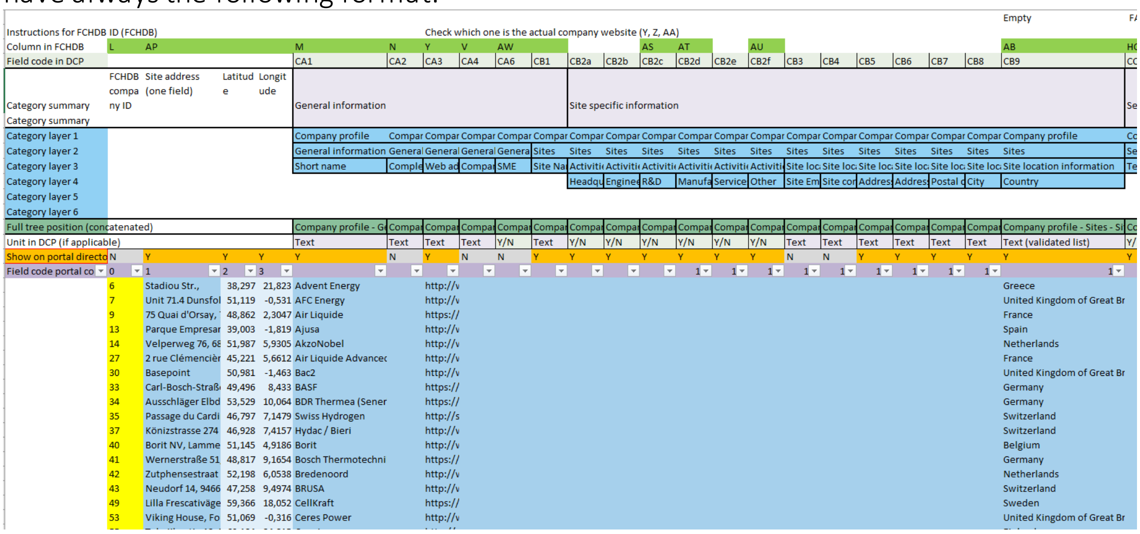
The Company directory subsection contains an introductory text, a free search filter, a category selector, an Open Street map together with the list of companies:



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



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:

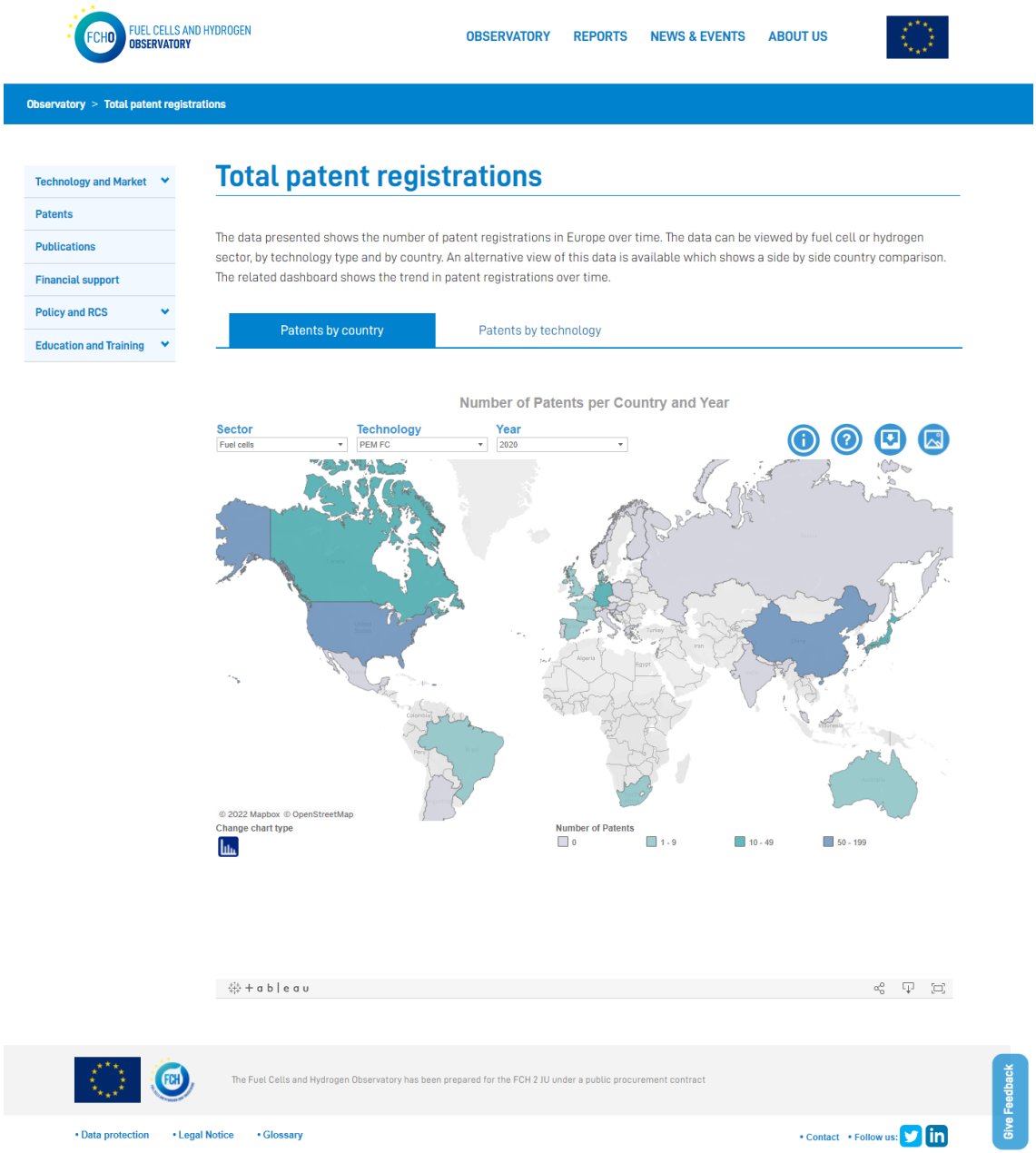


FCHDB company ID	Site address (one field)	Latitude	Longitude	Short name	Web address	Country
6	Stadiou Str.,	38,297	21,823	Advent Energy	http://v	Greece
7	Unit 71.4 Dunsfol	51,119	-0,531	AFC Energy	http://v	United Kingdom of Great Br
9	75 Quai d'Orsay,	48,862	2,3047	Air Liquide	https://	France
13	Parque Empresar	39,003	-1,819	Ajusa	http://v	Spain
14	Velperweg 76, 68	51,987	5,9305	AkzoNobel	http://v	Netherlands
27	2 rue Clémencièr	45,221	5,6612	Air Liquide Advancec	http://v	France
30	Basepoint	50,981	-1,463	Bac2	http://v	United Kingdom of Great Br
33	Carl-Bosch-Straß	49,496	8,433	BASF	https://	Germany
34	Ausschläger Elbd	53,529	10,064	BDR Thermea (Sener	https://	Germany
35	Passage du Cardi	46,797	7,1479	Swiss Hydrogen	http://s	Switzerland
37	Könizstrasse 274	46,928	7,4157	Hydac / Bieri	http://v	Switzerland
40	Borit NV, Lamme	51,145	4,9186	Borit	http://v	Belgium
41	Wernerstraße 51	48,817	9,1654	Bosch Thermotechni	https://	Germany
42	Zutphensestraat	52,198	6,0538	Bredenoord	http://v	Netherlands
43	Neudorf 14, 9466	47,258	9,4974	BRUSA	http://v	Switzerland
49	Lilla Frescativäge	59,366	18,052	CellKraft	https://	Sweden
53	Viking House, Fo	51,069	-0,316	Ceres Power	http://v	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:



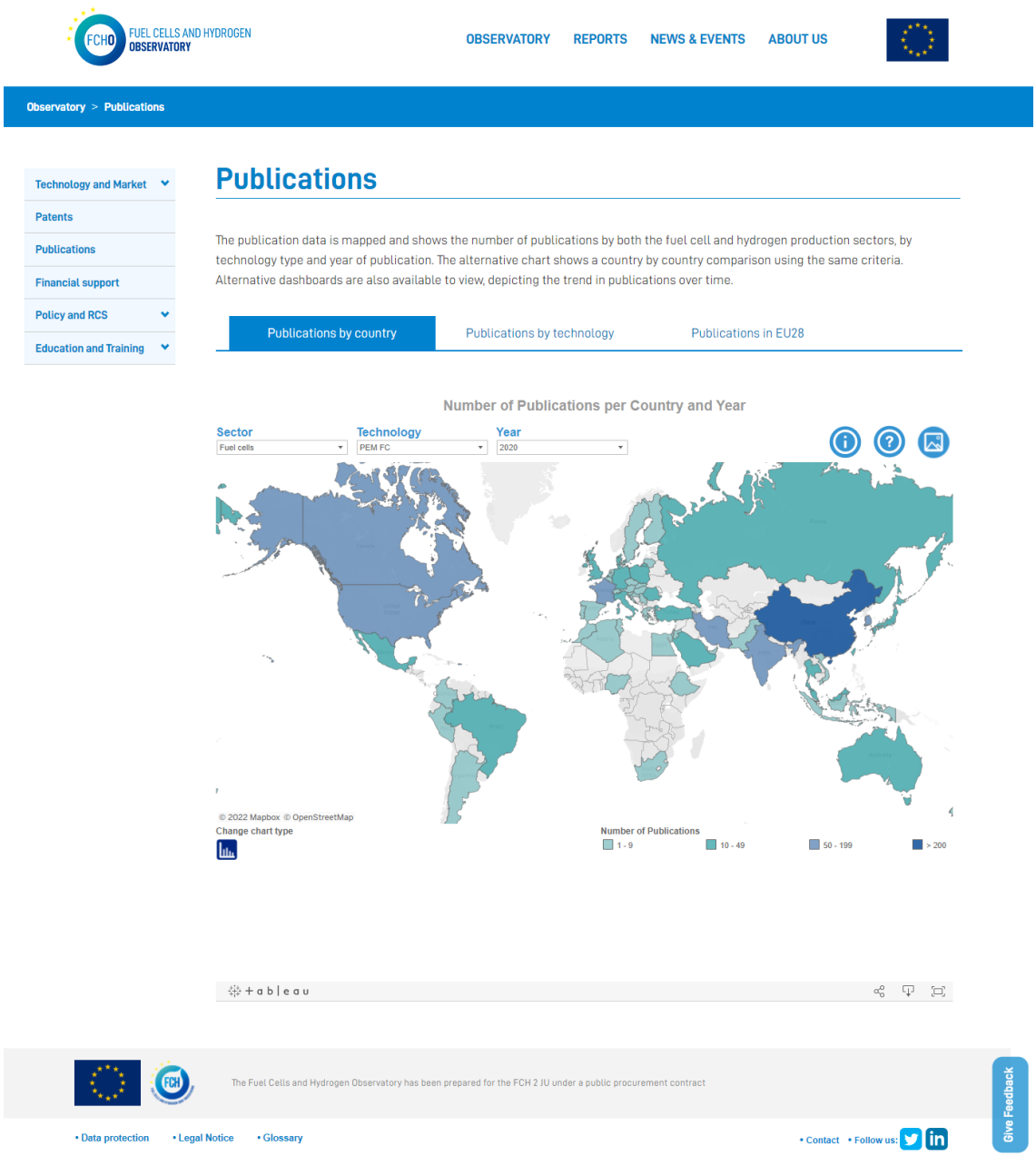
In order to show all the data in the Tableau charts, the input data file is provided by E4Tech. To be able to display all the information in the Tableau charts, the input data excel file has to have always the following format:

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:



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

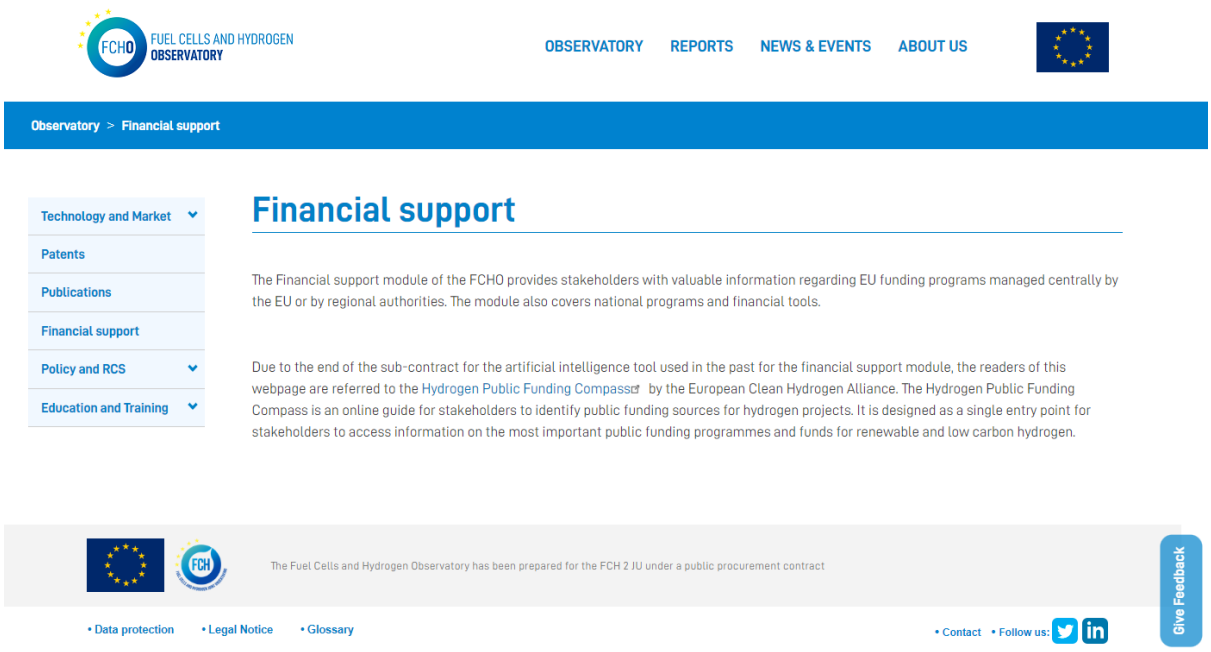
Then, all the files listed below have to merged in the masters publications aggregated file with the following format:

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 U	Performance	2019
Fuel cells	Alkaline FC	S_2-s2.0-850	review	[Yu H., Xie F.	[China]	[Chinese Aca	Recent progr	2019
Fuel cells	Alkaline FC	pat_fam_323	patent	[BLATOV DM	[Russian Fed	[SHUBINA VA	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	Investigation	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 Institu	Cost enginee	1997
Fuel cells	Alkaline FC	S_2-s2.0-000	article	[Lee J.-S., Sh	[South Korea	[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 fuel	1996
Fuel cells	Alkaline FC	S_2-s2.0-003	article	[Kiros Y.]	[Sweden]	[Royal Institu	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., Wa	[Japan]	[Central Res	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., Ca	[United State	[Carburos Me	Electrogener	1998
Fuel cells	Alkaline FC	S_2-s2.0-003	article	[Spaepen S.,	[United State	[ZEVCO Inc]	Alkaline fuel	1999
Fuel cells	Alkaline FC	S_2-s2.0-003	article	[Schwartz S.,	[Sweden, Inc	[Royal Institu	Electrode Re	1999
Fuel cells	Alkaline FC	S_2-s2.0-003	article	[Daniel-Ivad	[Canada, Aus	[Battery Tech	Intermittent	1999
Fuel cells	Alkaline FC	S_2-s2.0-003	article	[Yi S.-C., Jo J.	[South Korea	[Hanyang Un	Computation	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., Yar	[Japan]	[Central Res	Lanthanum a	1999
Fuel cells	Alkaline FC	S_2-s2.0-003	article	[Xing B., Sava	[Canada]	[École Polyte	Hydrogen/ox	2000
Fuel cells	Alkaline FC	S_2-s2.0-003	article	[Schwartz S.,	[Sweden]	[Roy. Inst. T.	Long-term hy	2000
Fuel cells	Alkaline FC	S_2-s2.0-003	article	[Gsellmann J	[Austria, Uni	[Electric Aut	Alkaline fuel	2000

2.4 Financial support

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

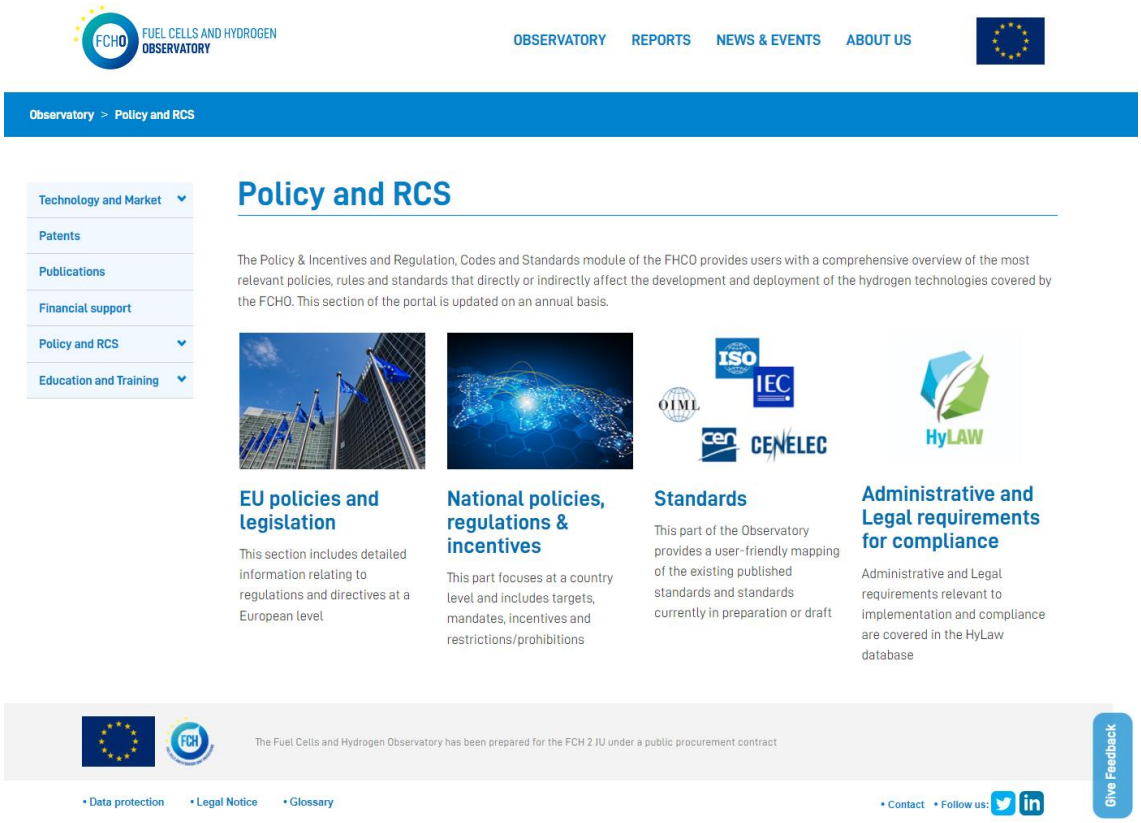
The Financial support section includes an explanatory text and a link to the Hydrogen Public Funding Compass:



2.5 Policy and RCS

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

The introductory page of this section is as follows:



The Policy and RCS section conatins 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

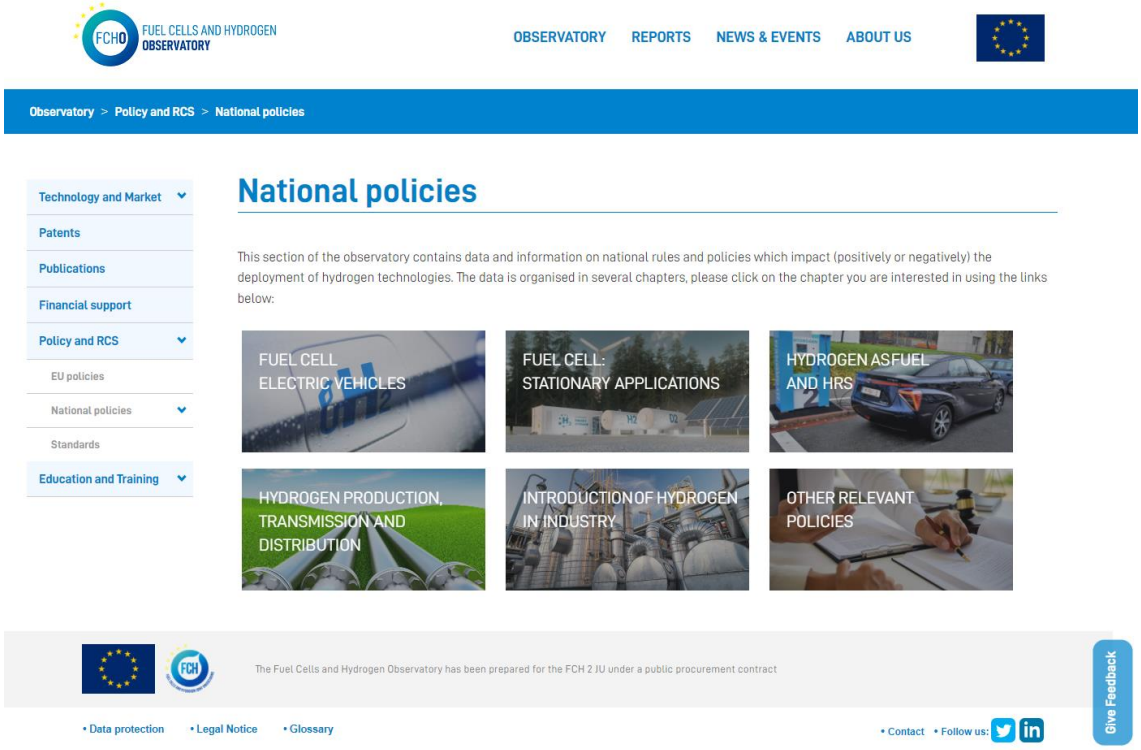
The EU policies and legislation subsection includes an introductory text and a Drupal development to the relevant EU policies filtered by 3 selectors depending the relevant area chosen:

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:

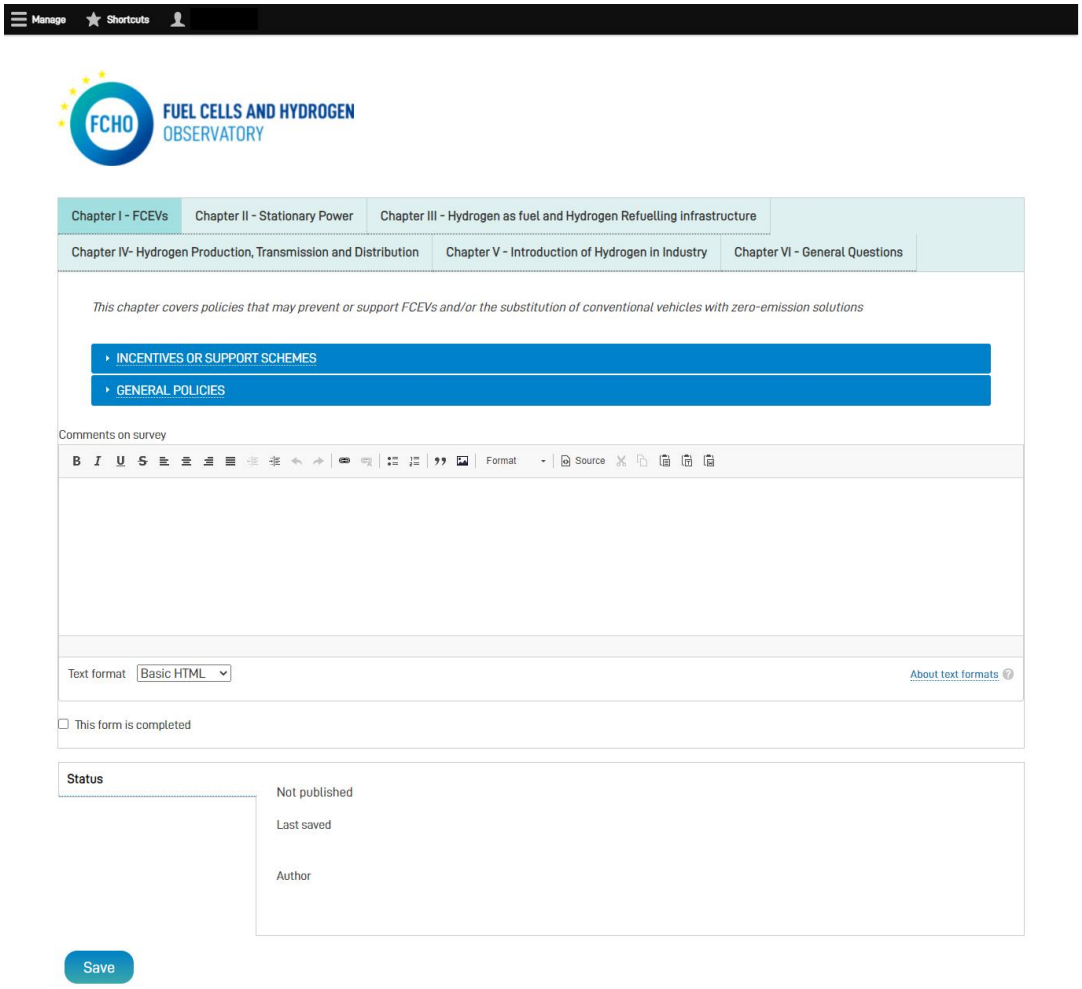


The introductory text for the landing page as well as the images are provided by E4Tech.

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

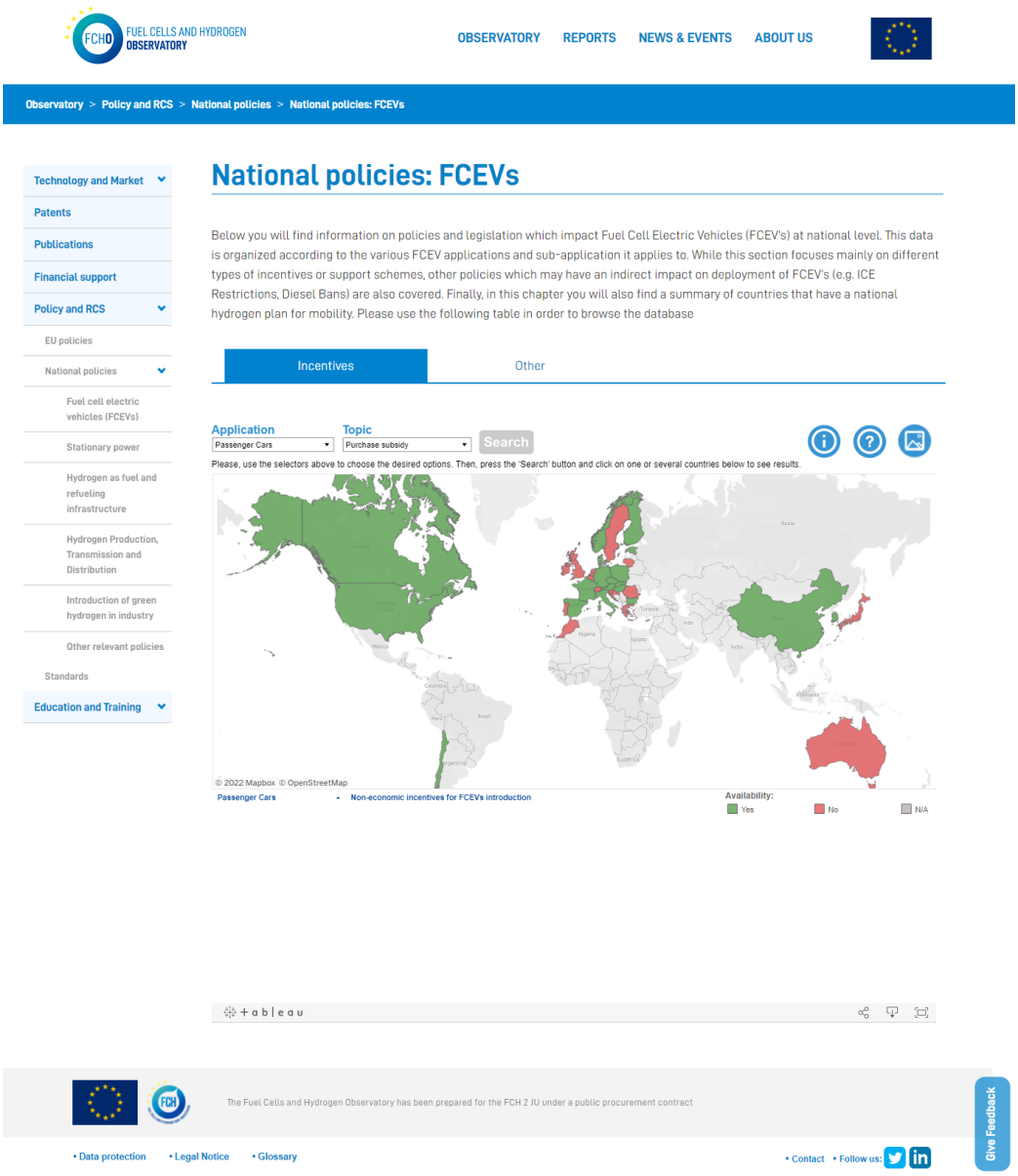
The data shown in this subsection (in all the 6 chapters) is **provided by the National representatives of the countries through the questionnaire created in the backend**.



- ***Chapter 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'.

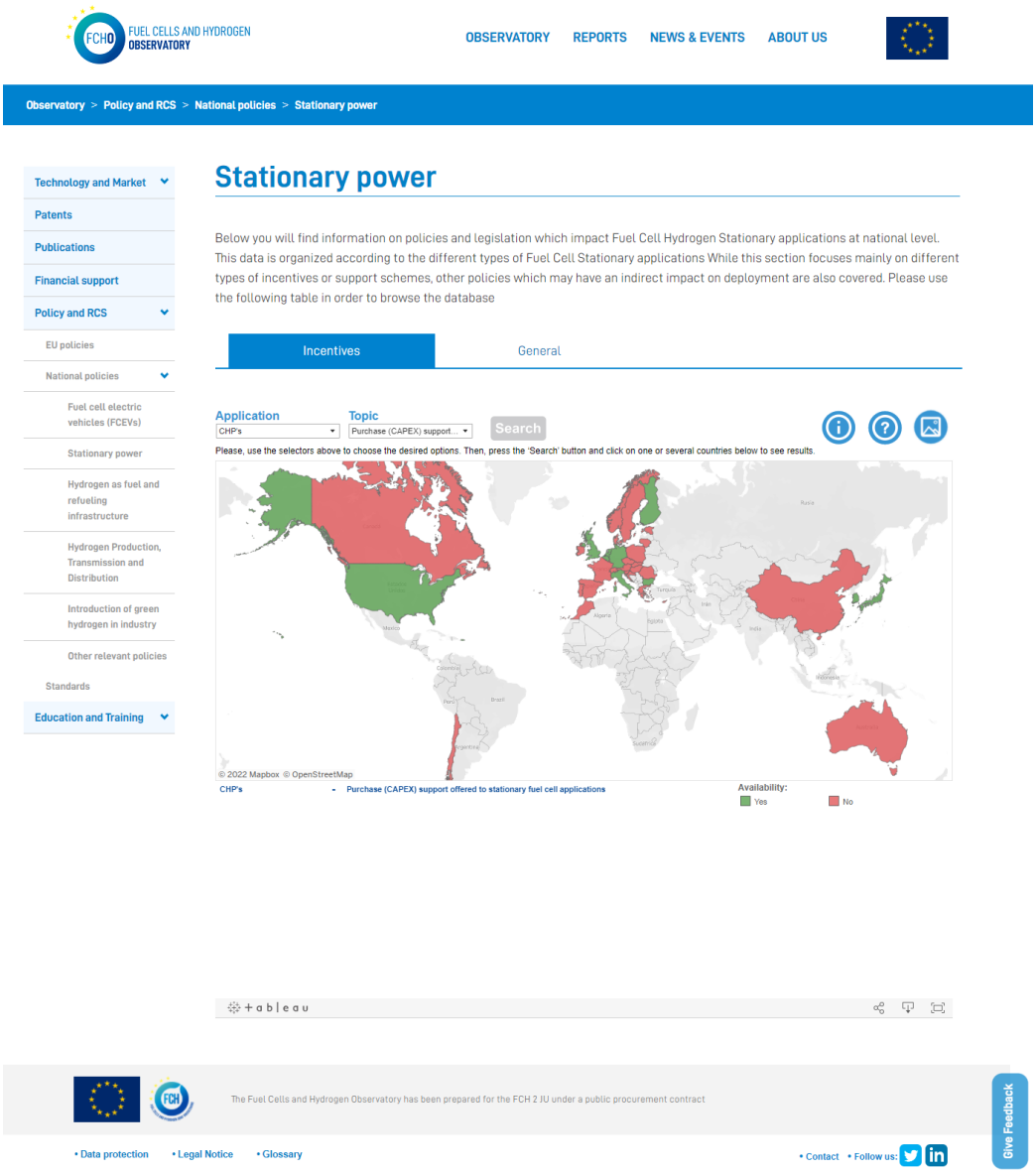


The data shown in these Tableau charts is provided by the National contributors though the questionnaire in the backend.

- ***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'.

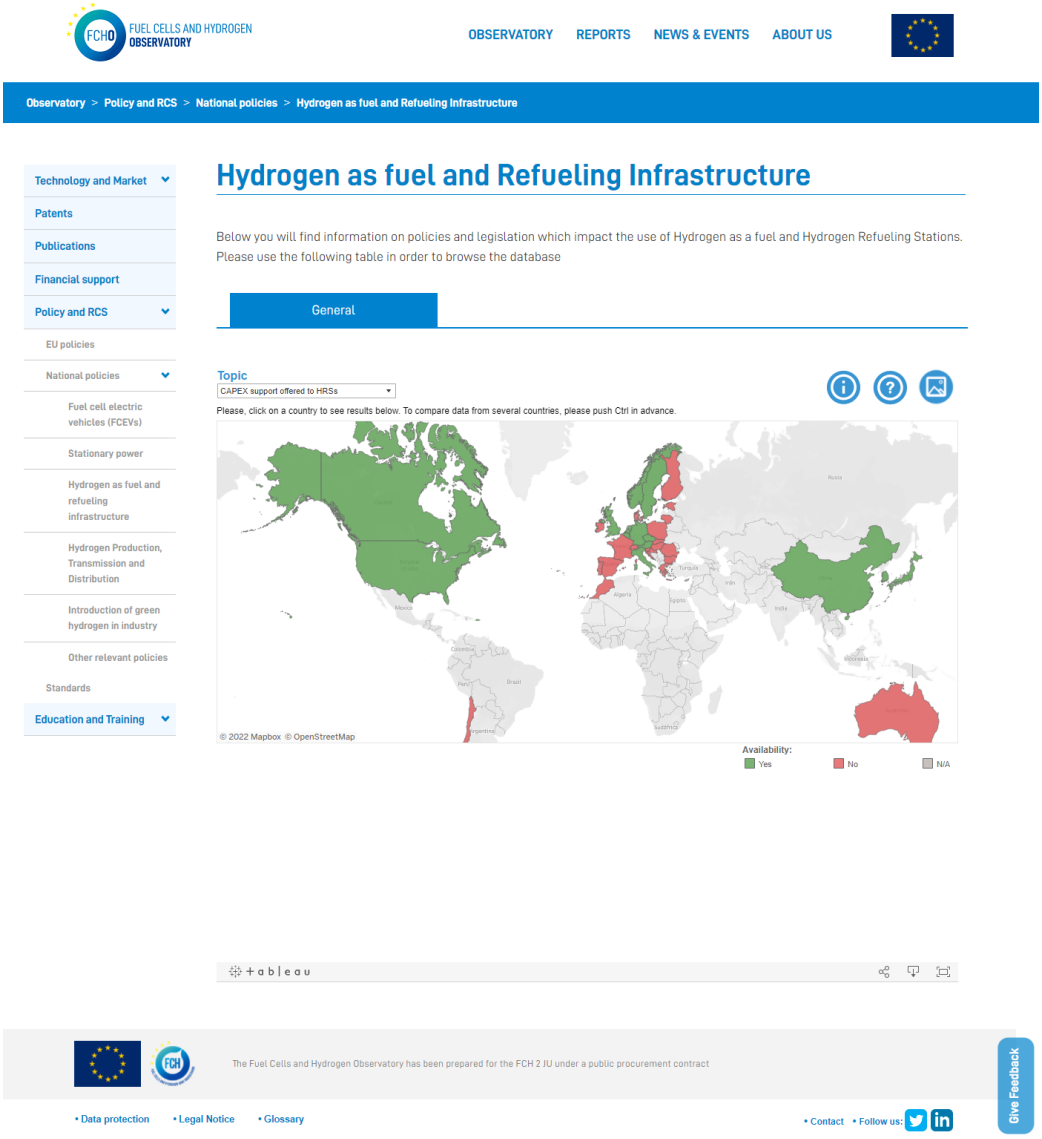


The data shown in these Tableau charts is provided by the National contributors though the questionnaire in the backend.

- ***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':

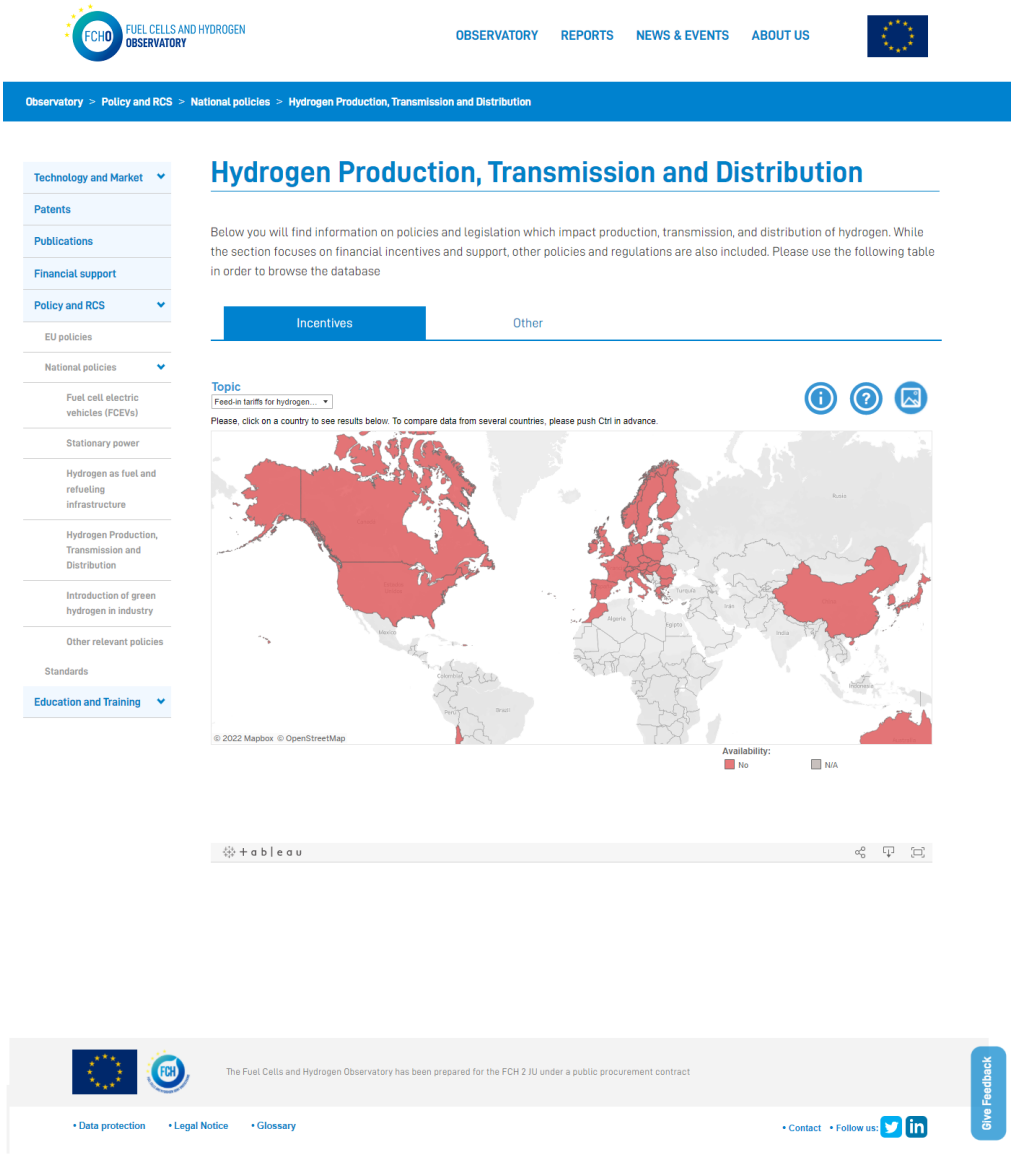


The data shown in this Tableau chart is provided by the National contributors though the questionnaire in the backend.

- *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'.

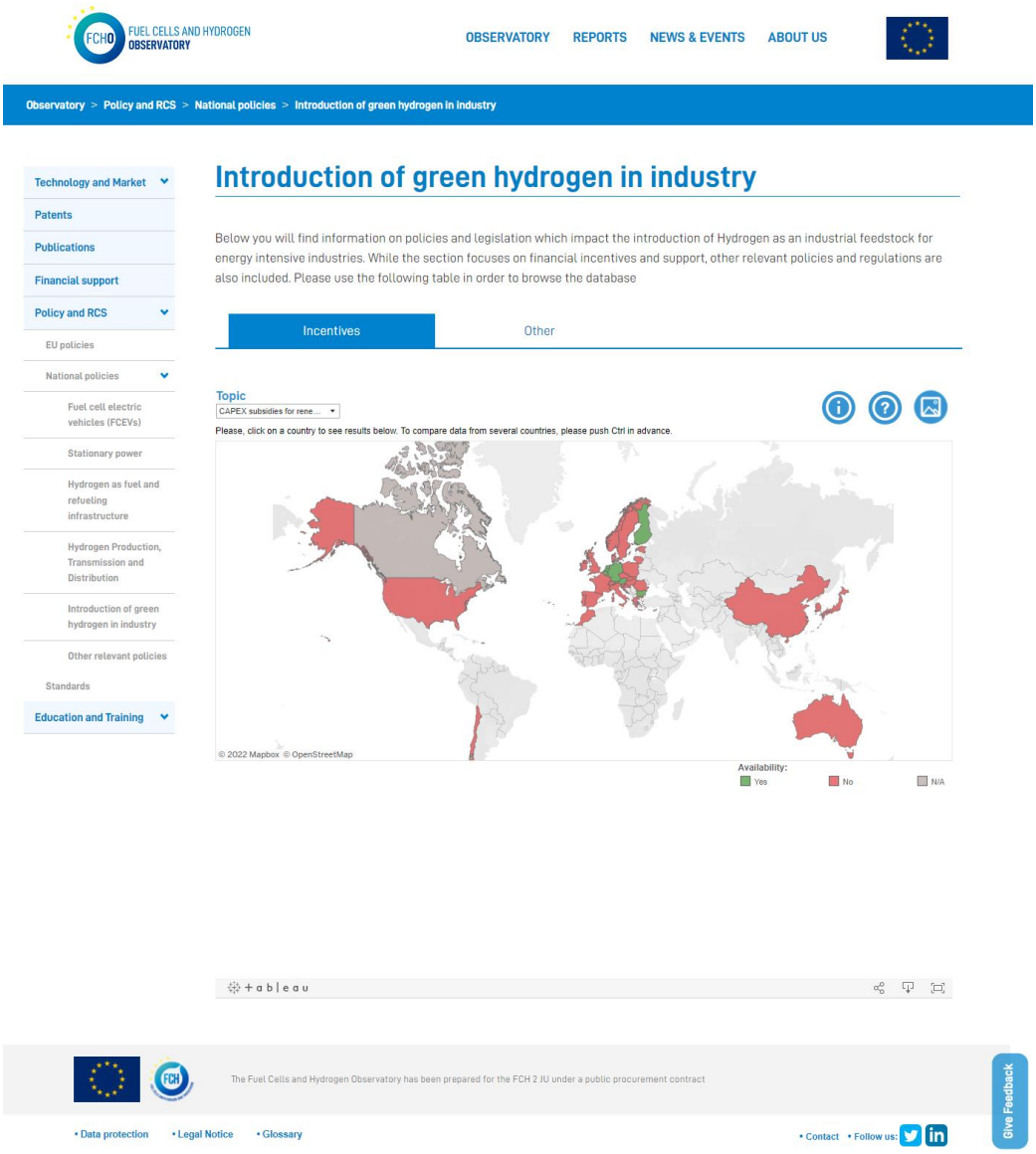


The data shown in these Tableau charts is provided by the National contributors though the questionnaire in the backend.

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

  URL: https://www.fchobservatory.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 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

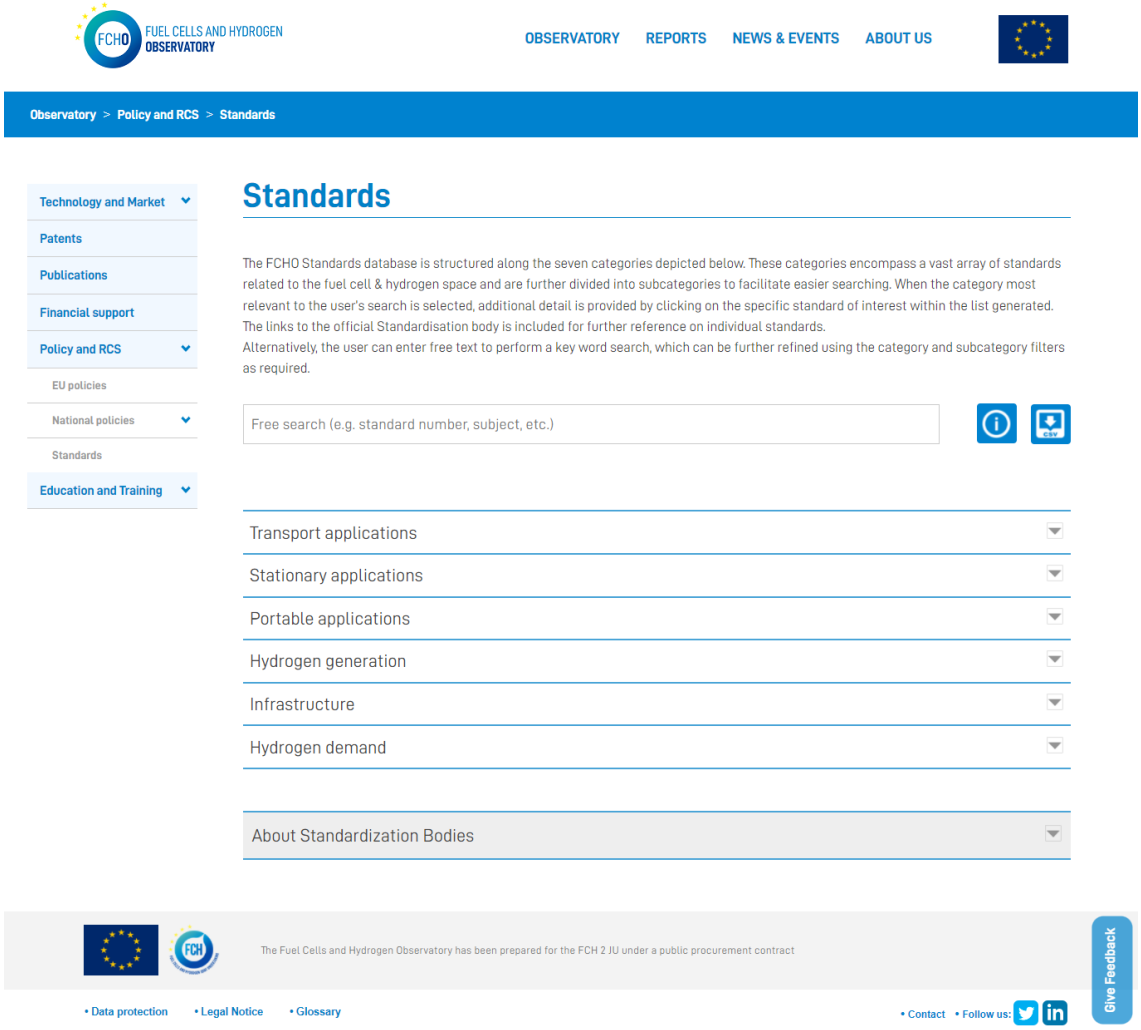
  This National policies chapter includes an introductory text and a Tableau chart that represents the data from the chapter 6 in the questionnaire 'General questions':

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

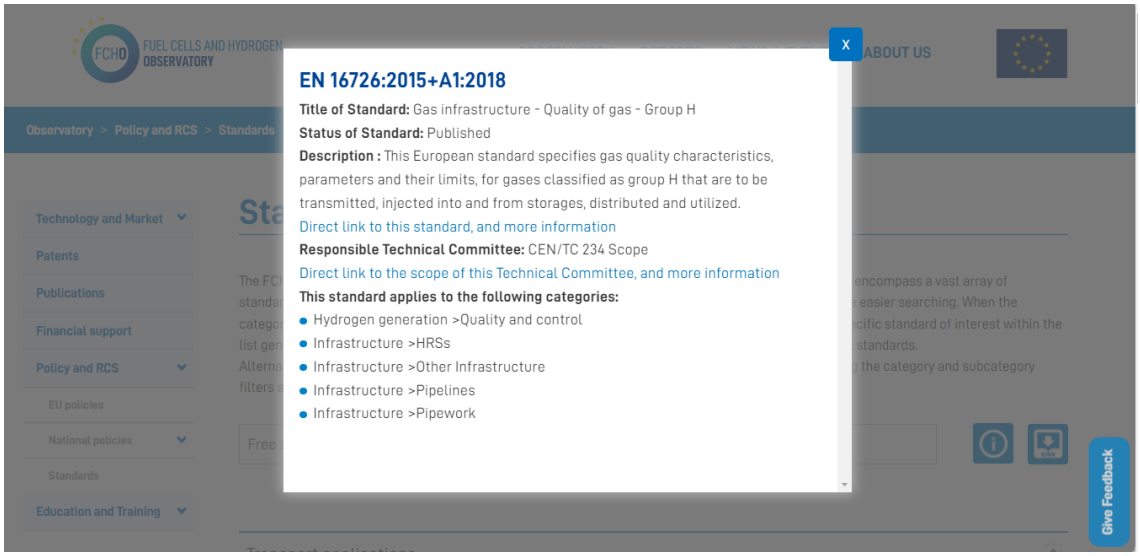
Standards

URL: https://www.fchobservatory.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:



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

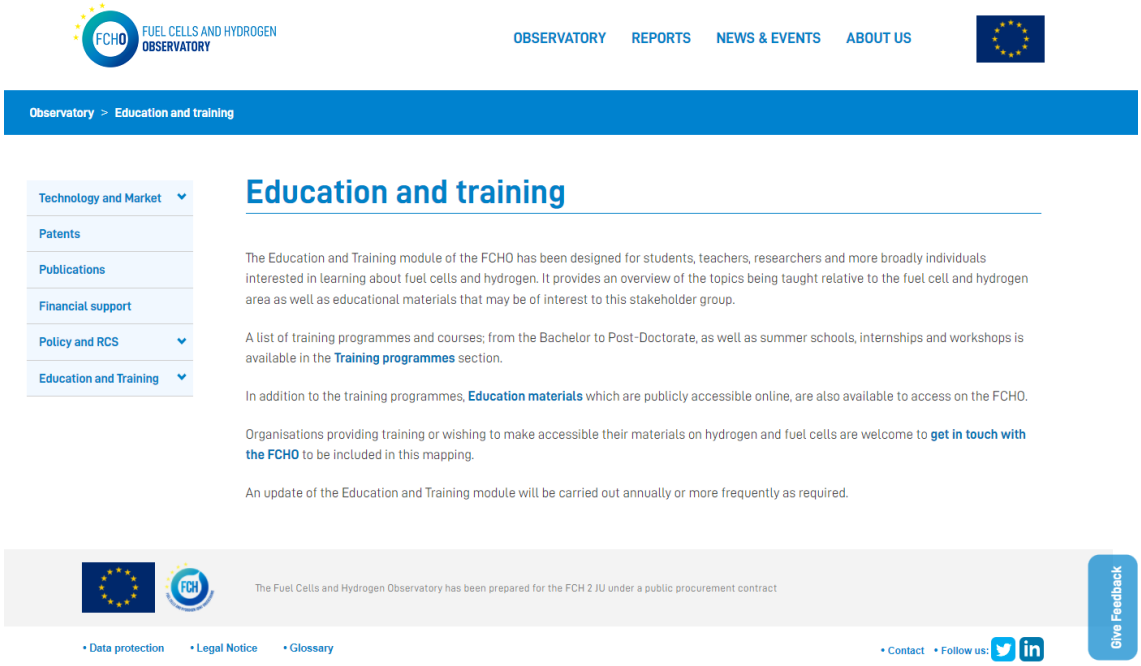
URL: *https://www.fchobservatory.eu/observatory/policy-and-rcs*
https://www.hylaw.eu/

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:

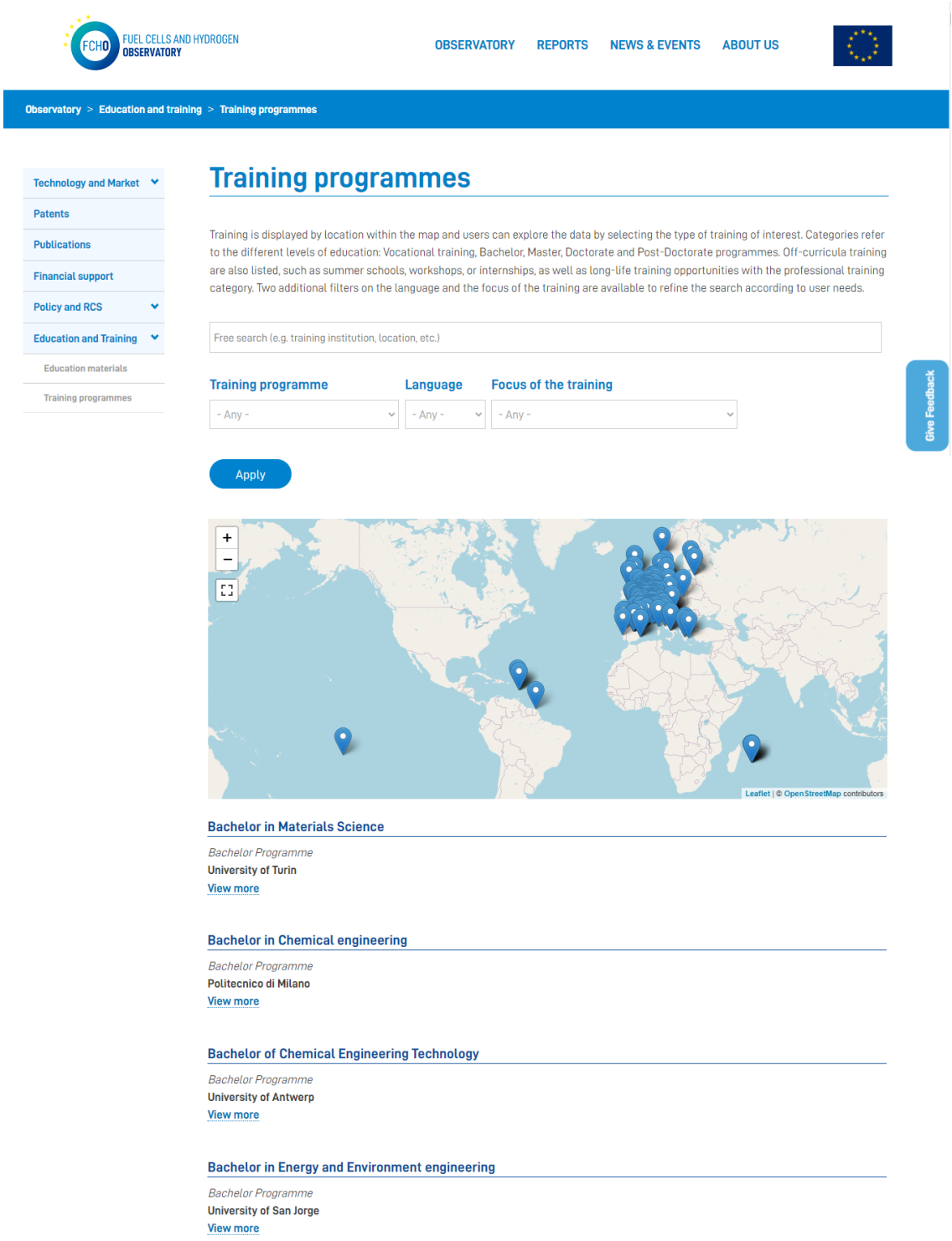


The introductory text for the landing page is provided by Hydrogen Europe Research.
This section has 2 subsections: Training Programmes and Education materials.

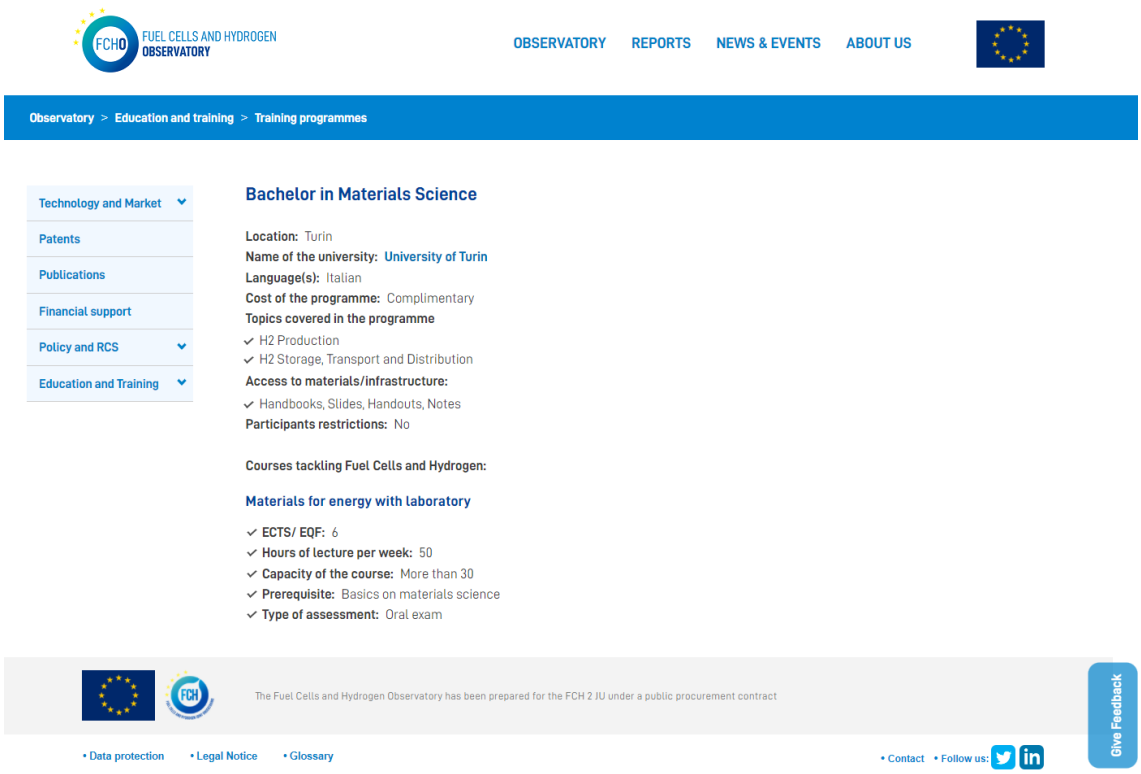
Training Programmes

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:



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



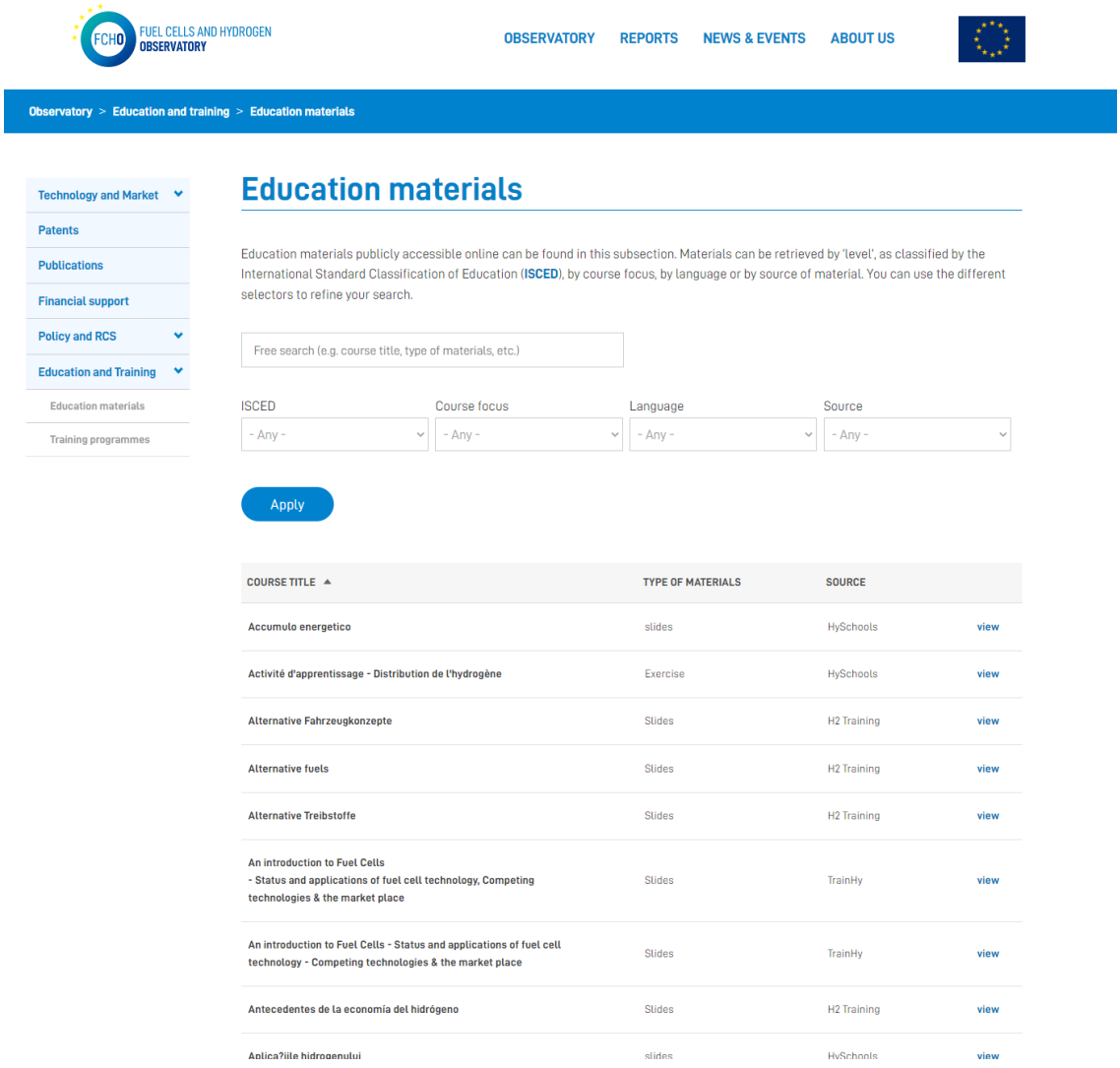
In order to show all the data in the chart, the list and the detailed profiles , the input data file is provided by Hydrogen Europe Research.
To be able to display all the information in the Tableau charts, the input data excel file has to have always the following format:

			INTERNSHIP	INTERNSHIP	PHD
#	Latitude	Longitude	Organisation	Materials / Infrastructures	Name of the PhD school / programme
IN1	40,68507359	14,77342114	Laboratory of Energy and Propulsion Laboratory (ePropLab, University of	Labs (real or virtual)	
IN2	55,78768962	12,55052406	Technical University of Denmark, Department of Energy Conversion and Storage	Books / E-Books| Handbooks, Slides, Handouts, Notes| E-Learning Tools e.g. MOOCs| Simulation environment| Labs (real or virtual)	
IN3	54,6880055	3467926725495	HySAFER Centre (Ulster University)	Books / E-Books| Handbooks, Slides, Handouts, Notes| E-Learning Tools e.g. MOOCs| Simulation environment| Labs (real or virtual)	
IN4	47,05304586	3911084086395	HyCentA Research GmbH	Books / E-Books| Handbooks, Slides, Handouts, Notes| Simulation environment| Labs (real or virtual)| Demonstration Platforms	
IN5	40,32702964	8603519016564	IMDEA Energy Institute	Books / E-Books| Handbooks, Slides, Handouts, Notes| Labs (real or virtual)	

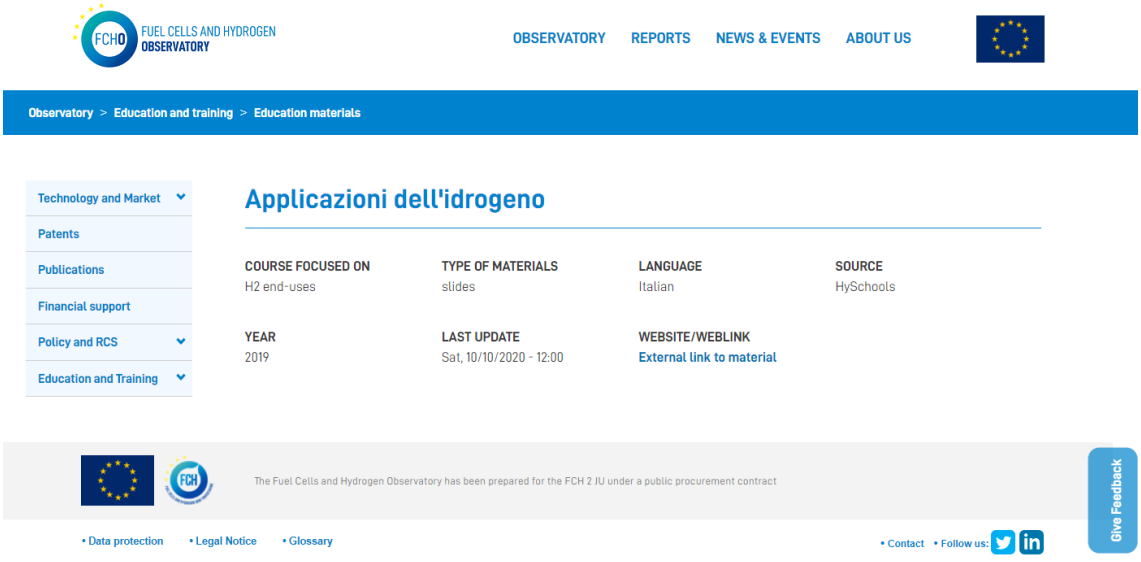
Education materials

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:



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



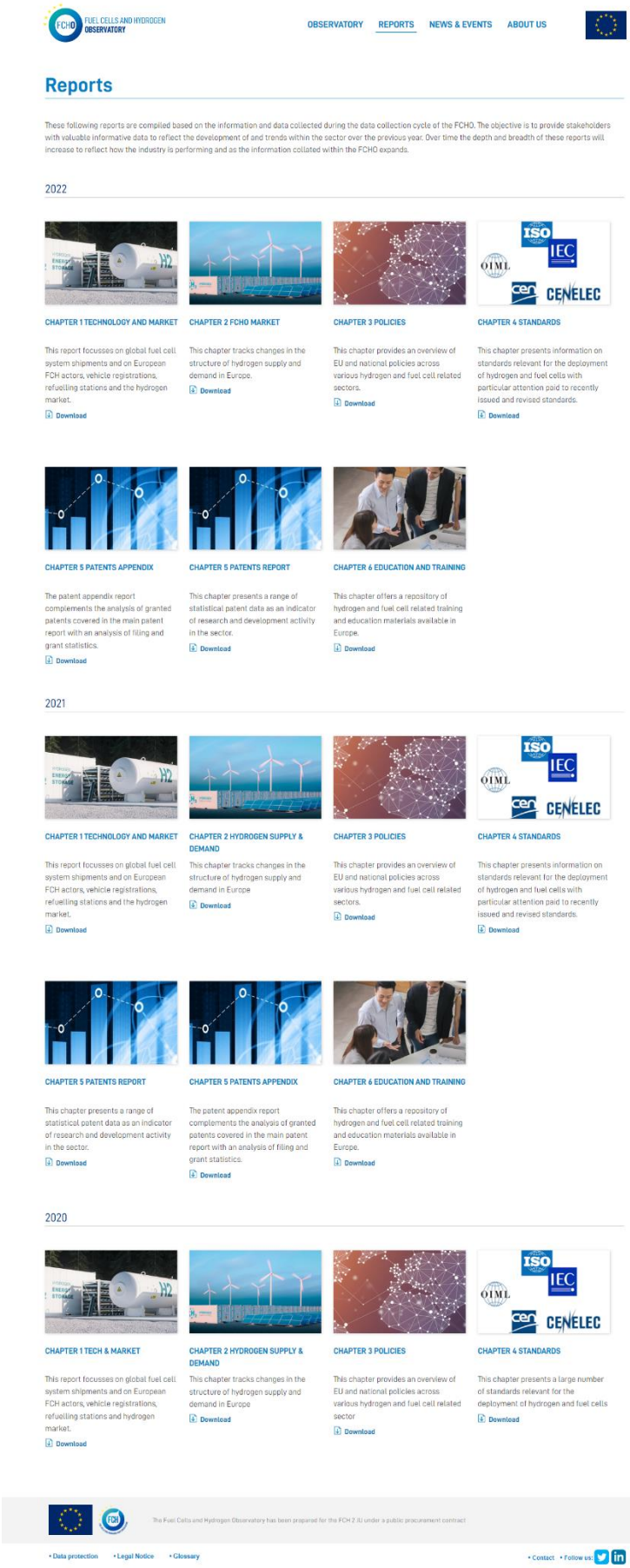
In order to show all the data in the list and the detailed profiles, the input data file is provided by Hydrogen Europe Research.
To be able to display all the information in the Tableau charts, the input data excel file has to have always the following format:

	Selector	More info	Selector	Search result	Search result	Leave	More Info	Selector	Selector	More info
				Repeat in more info	Repeat in more info					
	ISCED	Technologies focused on	Course focused on	Course title	Type of material	Author	Website/weblink	Language	Source	Project Link
	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/JSSFCH/JSSFCH2012/SteinbergerWilckensR_AnIntroductionToFuelCells.pdf	English	TrainHy	http://www.hysafe.org/
	8	Hydrogen	Regulations, Codes, Standards & Safety	Introduction to Hydrogen Safety Engineering	Slides	Vladimir Molkov	http://www.hysafe.org/science/eAcademy/JSSFCH/JSSFCH2012/MolkovVV_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/JSSFCH/JSSFCH2012/SteinbergerWilckensR_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/JSSFCH/JSSFCH2012/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/JSSFCH/JSSFCH2012/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/JSSFCH/JSSFCH2012/AtkinsonA_El	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:



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

4. News and events

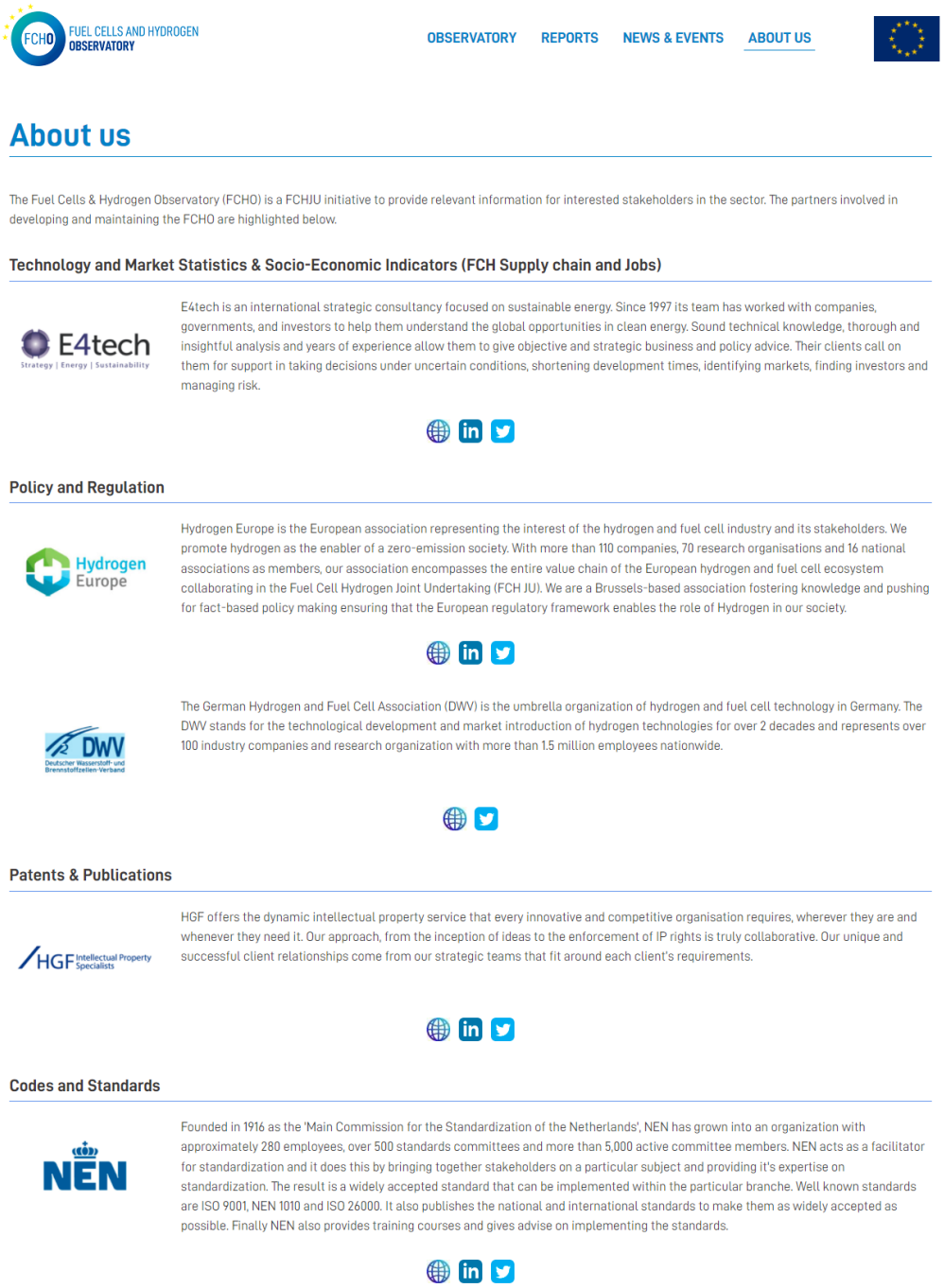
URL: https://www.fchobservatory.eu/news-events

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:

5. About Us

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

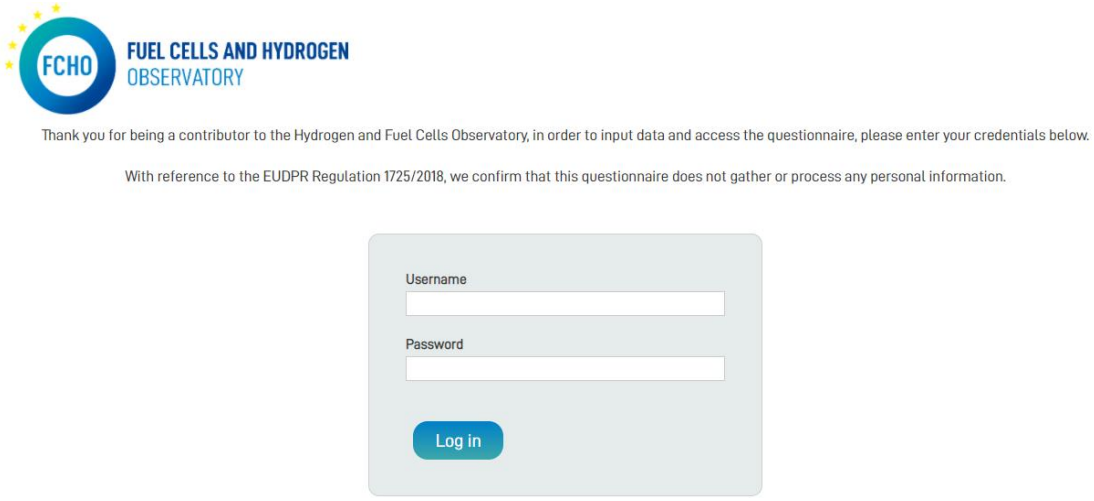
This menu contains information about the institutions and companies behind the portal as well as the national contributors. All this information is provided by E4Tech:



CHAPTER 2: BACK-END MANAGEMENT GUIDE

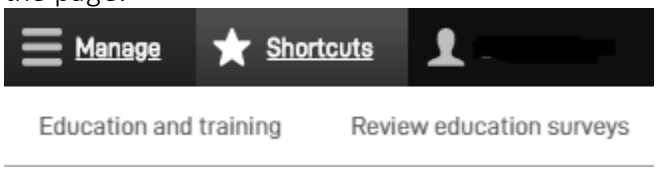
1. Credentials

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:

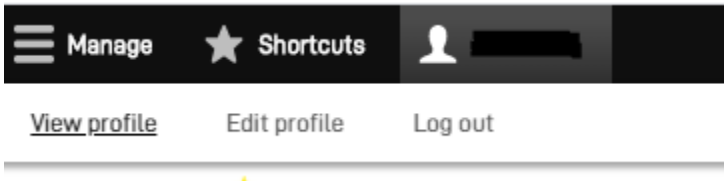


There, the credentials (user and password) will be asked and for that purpose, some users were created. This information is **confidential** and therefore only those permitted by Clean Hydrogen JU have access to it.

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:



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.



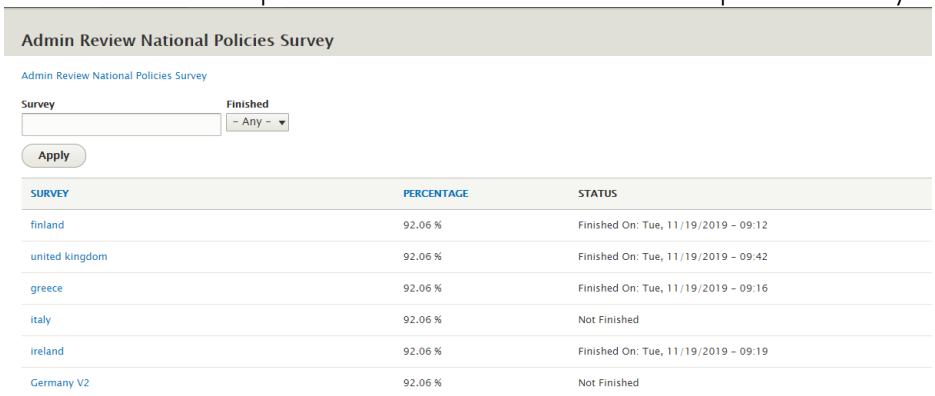
1. Use of the back-end – Content managers

*** *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

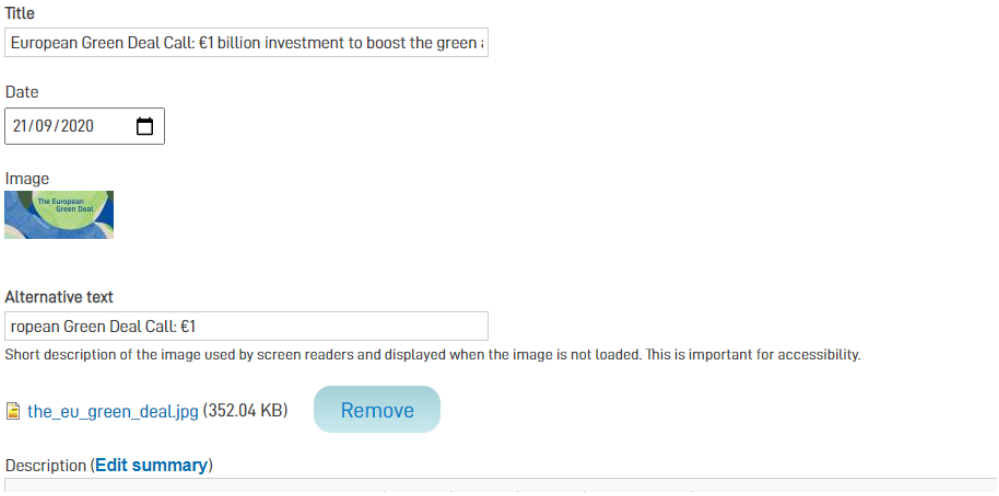


2.2 Admin News and Events

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.

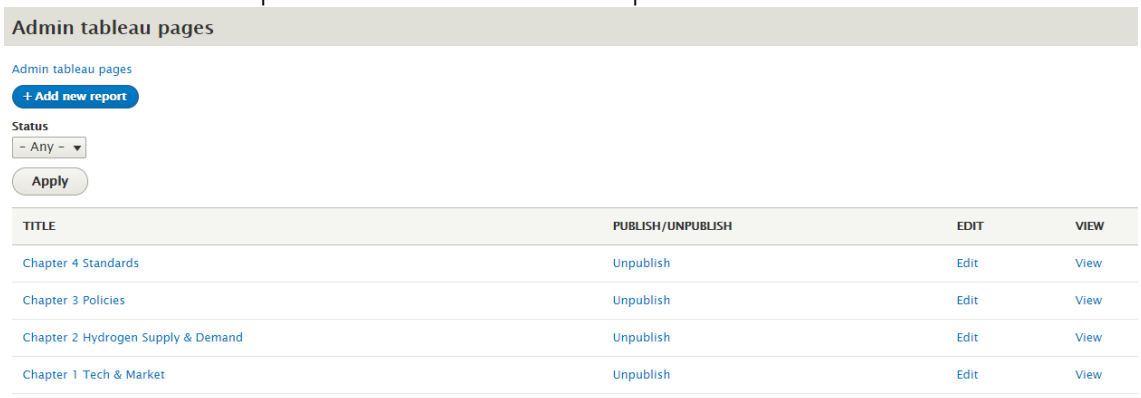
Each one is structured with heading, date, image, summary for the main menu and full body for the full piece of news.

Here is an example:

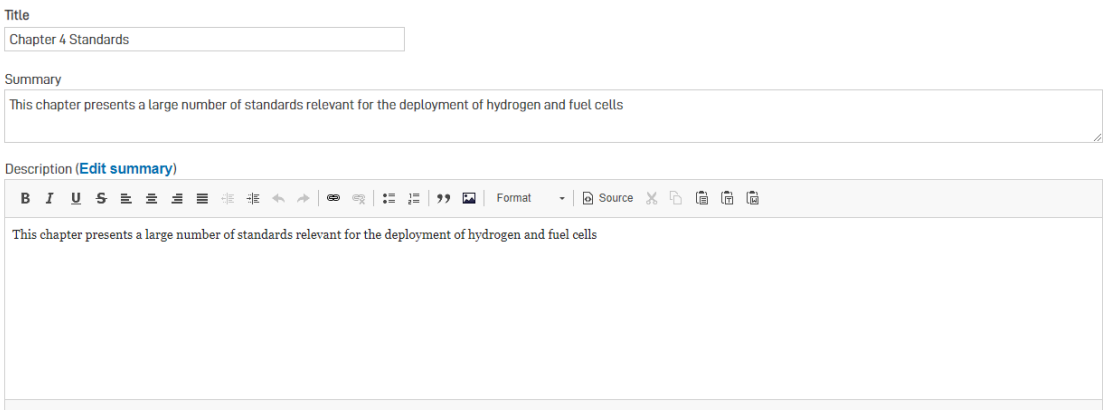


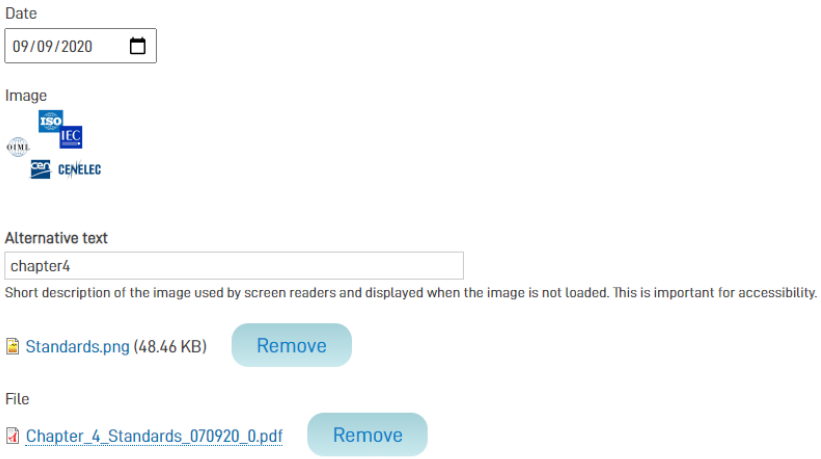
2.3 Admin Reports

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.



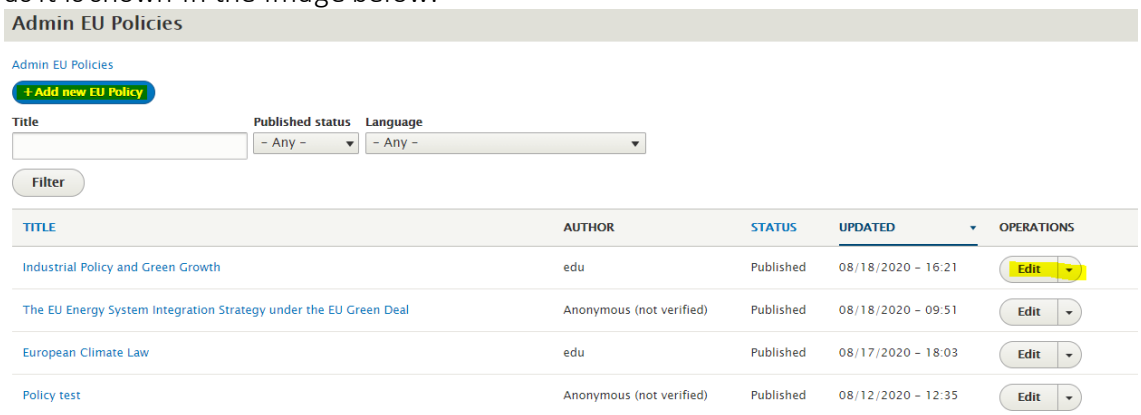
When uploading a new report, the following categories must be completed: Title, summary, description, and date. Then, and image and a file can be uploaded as well.



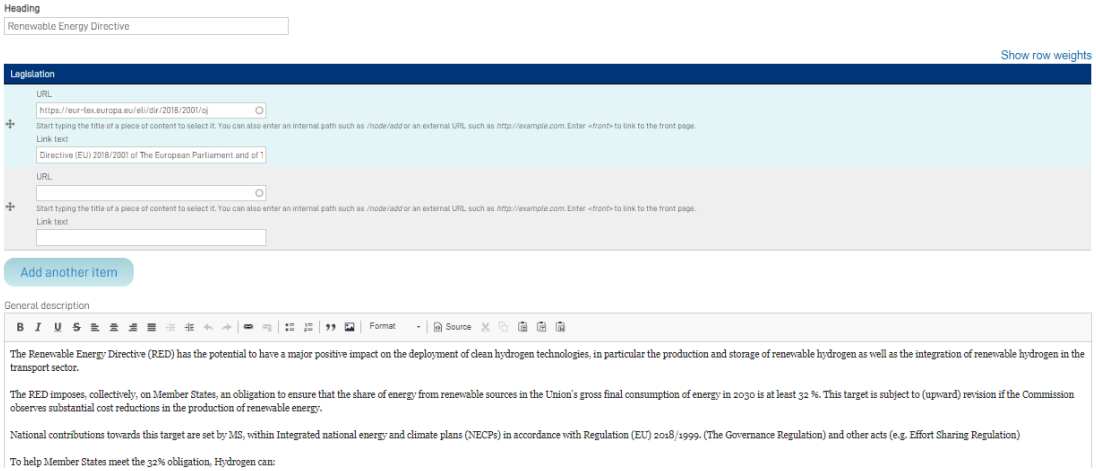


2.4 Admin EU policies

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:



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



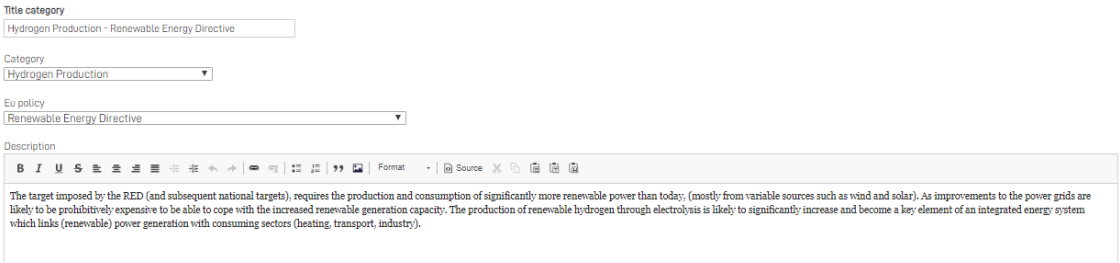
2.5 Admin EU policies item

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:

It is important to note that if a new extra text is to be created, the EU policy relative to it (main body) will have been created in Admin EU policies menu first.
In other case, if what is wanted is simply to edit the existing text in the categories, it can be changed:

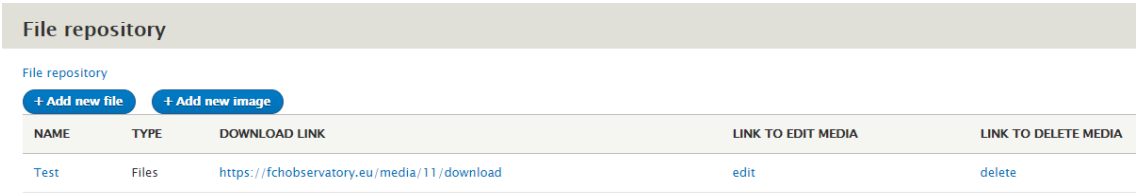
- Example for the Hydrogen Production extra text added to the RED:



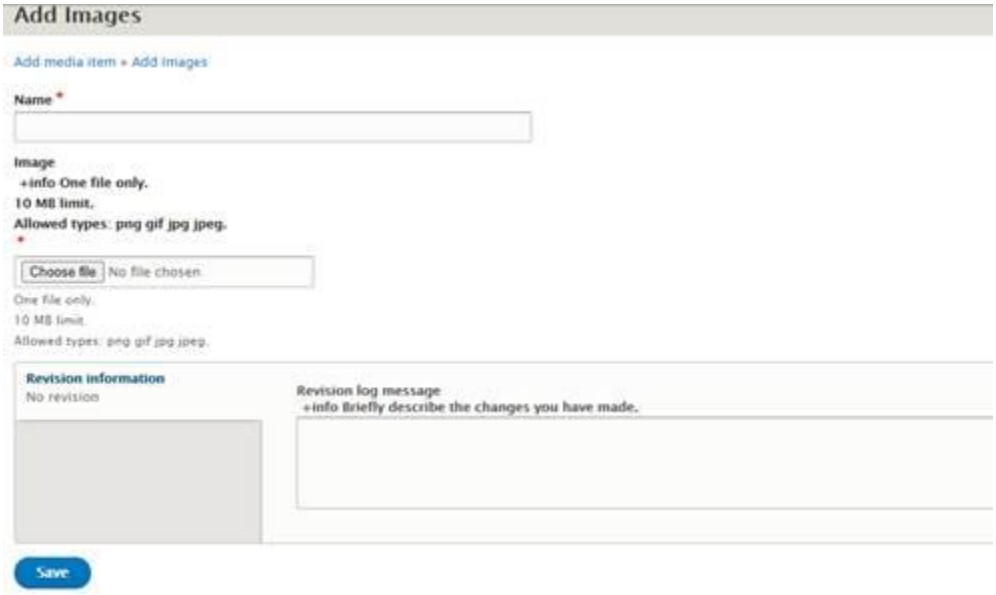
After adding text in both menus (Admin EU policies and Admin EU policy items), it is necessary to save. Then, the information will appear in the portal.

2.6 File repository

This menu allows to upload new images or files that will be used in different sections of the portal.
It is accessible on top from Shortcuts > File repository:



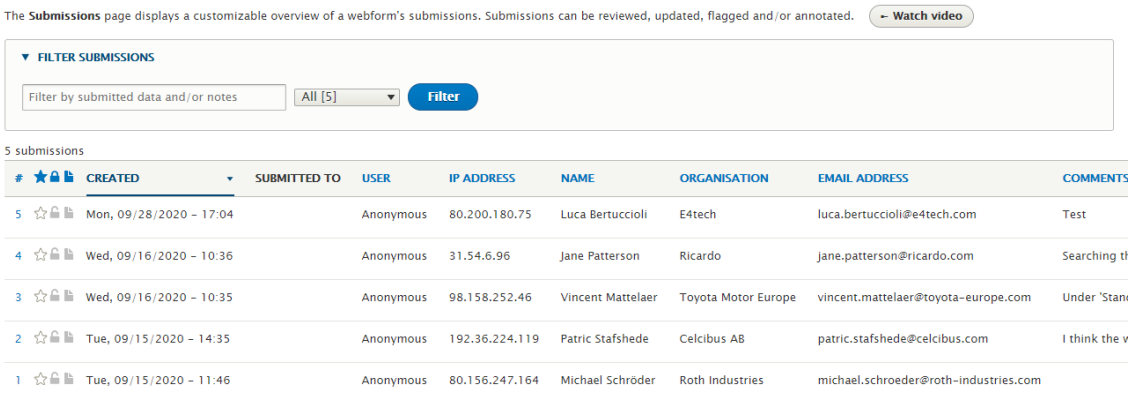
When uploading a new file or image, the name to be displayed in the portal can be chosen. Once saved, it will appear in the menu (the one in the screenshot above).



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.

2.7 Feedback results

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



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

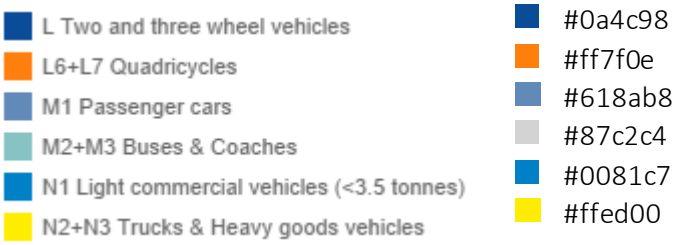
For reading this table, modifications have to be made in Excel and Tableau.
To read this table, modifications must be made in Excel and Tableau.
In Excel, at the top, complete the years so that all the columns have a year associated with them and discard the Fuel column. This column will be added later.

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:

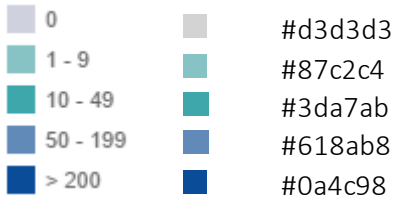


- **Total Annual New FCEVs by Type chart**
  Excel file: EAFO fleet – 2022 v2.xlsx
  Sheet: Fleet data Tableau

  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:



- **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 publicarTableau', 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

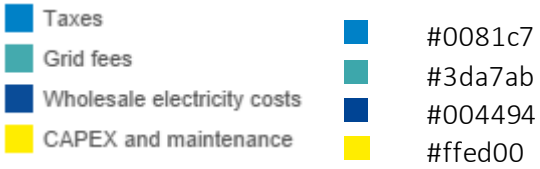
- Heat map chart

  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:



  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 expained.

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 containg 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

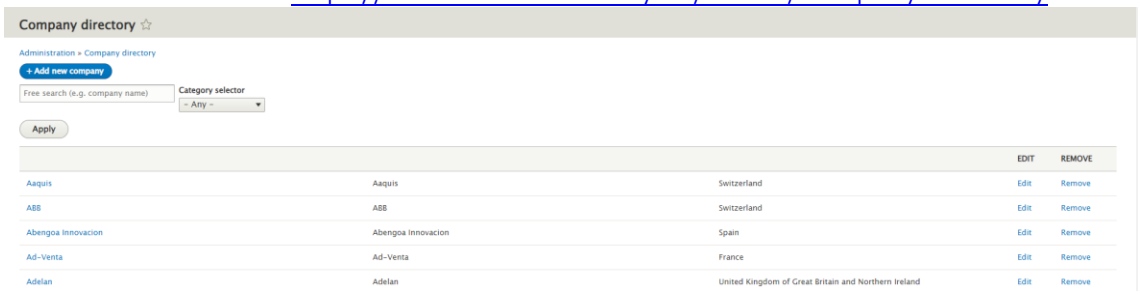
2.5 Company Directory

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



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.fchobservatory.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 ~]$
```

3. 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

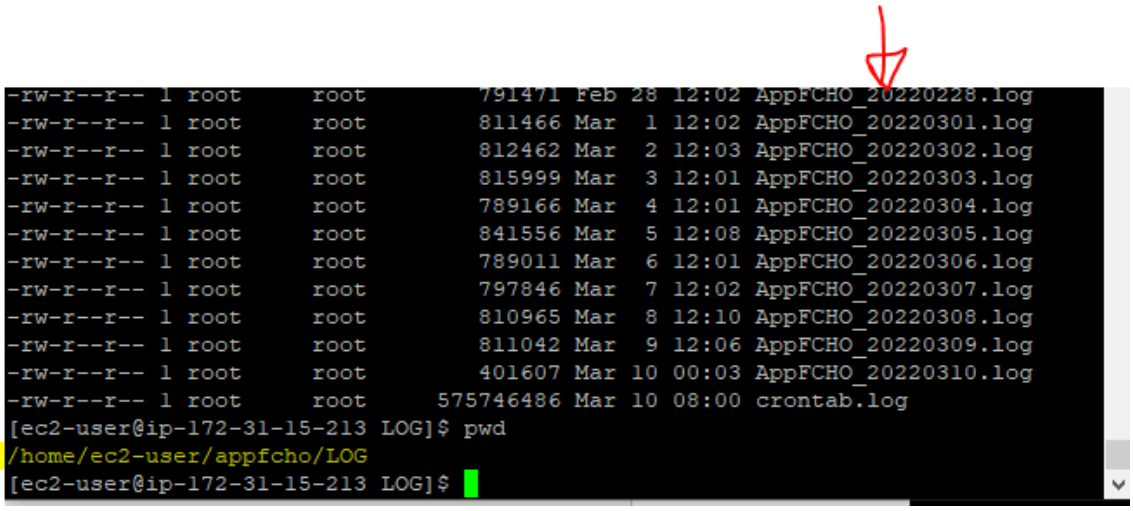
   (It is important to verify that these paths are the correct ones on the new server).

   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_pipelines (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	AlkalineElectrolysers / AlkalinesFC / H2_non_electrolysis / Onboard_Storage / PEM_electrolysers / PEM_FC / SolidOxide / SolidOxideElectrolysers
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-rcs/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-rcs/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-rcs/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-rcs/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-rcs/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.