Central & Eastern Europe

Hydrogen Opportunity Map

Project on "UK – Central Europe Hydrogen Energy Collaboration in Policy and Technology"

project coordinators:

Hungarian Hydrogen and Fuel Cell Association

JEDLIK ÁNYOS KLASZTER
ELECTROMOBILITY IN HUNGARY

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compiled by:

Hungarian Hydrogen & Fuel Cell Association

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Foreword and introductory

With the support of the British Government, the „UK – Central Europe Hydrogen Energy Collaboration" project was delivered in the autumn of 2019. The project was supported by the Prosperity Fund of the British Foreign and Commonwealth Office. The coordinators of the project were the Hungarian Hydrogen Fuel Cell Association and Ányos Jedlik Hungarian E-Mobility Cluster. The Visegrád Fund was also a cooperating partner.

The flagship event of the project was the first ever UK – Central Europe Technology and Policy Workshop, which took place on September 26, 2019 in Budapest. The workshop brought together 85+ policy, industry (and research) experts from eight countries to familiarize with the UK's enabling policy landscape and technology offering in hydrogen and fuel cell technologies. The focus of the discussions centred on how collaboration across the mobility and energy sectors could help shaping the policy environment in the Central European region. The United Kingdom has considerable technology and policy experience (see in the next chapter), which can be useful for the Central European countries where hydrogen solutions are gradually gaining attention and momentum from policy makers and industry.

At the Workshop the Central European countries had the possibility to present the summary of their national hydrogen technology development strategies and the main projects they are delivering or planning. These presentations are summarized in this CE Hydrogen Opportunity Map. Gaining an overview of the hydrogen development plans across Central Europe can be the first step to facilitate partnership building and to exploit synergies, especially in the area of hydrogen refuelling station deployment, as the creation of an interconnected, "permeable" hydrogen network in the region is likely to become a priority. Besides, the re-evaluation of the Alternative Fuel Infrastructure Directive (AFID, 2014/94/EU) that has also been started in 2019, gives further actuality to this issue.

Therefore, this Hydrogen Opportunity Maps focuses basically on the hydrogen refuelling infrastructure and the plans of its development; but it also includes some other hydrogen projects, developments in the CE countries[1], and national focal points for hydrogen.

UK approach to hydrogen economy and the UK's Hydrogen and Fuel Cell Industry

UK approach to hydrogen economy

UK is developing its strategic approach to Hydrogen Economy[2]:

- improved understanding of potential to meet Clean Growth goals, with appropriate time horizons,
- whole system perspective – starting with detailed understanding of potential in each sector,
- building relationships – hydrogen industry, lead projects, key regions/clusters, international partners,
- Identifying near term opportunities to unlock deployment of low carbon hydrogen in UK context, including priorities for innovation support.

[1] Bulgaria, Croatia, Czech Republic, Hungary, Poland, Romania, Slovakia, Slovenia.

[2] UK is also member of IPHE, International Partnership for Hydrogen and Fuel Cells in the Economy. IPHE formed in 2003, is an international governmental partnership currently consisting of 19 member countries and the European Commission.

To drive this activity the government wants the UK to be a world leader in the development, manufacture and use of low carbon technologies, systems and services that will be needed for the energy transformation and allow us to seize the significant economic and business opportunities it presents. With respect to hydrogen, the UK government sees this strategically, and has formed the Hydrogen Economy team, in the Department for Business, Energy and Industrial Strategy (BEIS) in April 2018. The team works closely with colleagues across BEIS (particularly those leading on Energy Innovation, long term heat strategy and carbon capture, utilisation and storage); wider UK Government (including UK Research and Innovation, Department for Transport, Department for International Trade); and the Governments of Scotland and Wales, and regions.

Decarbonising across the UK energy system with its seasonal demand swings is a significant challenge. Solutions and technology that deliver flexibility will be highly valuable to the low-carbon transition. UK Government is exploring how hydrogen as an energy vector may play a complementary and enabling role - alongside electricity - in a deeply renewable, deeply decarbonised future UK energy system.

BEIS has announced in December 2018, "*The UK government will establish the world's first net-zero carbon industrial cluster by 2040 and at least one low carbon cluster by 2030*" with clear definitions of targets and funding (£170m) that will drive the delivery of this, and has invested significantly over the years in supporting energy innovation, R&D and early deployments including nearly £100m of specific programmes aimed at addressing routes to scaled low carbon production of hydrogen, to demonstration of the use of hydrogen in industrial heat and large scale energy storage of hydrogen. More information on low carbon hydrogen production fund see here and here.

Hydrogen sector in the UK and major hydrogen projects

There is a significant hydrogen economy in the UK today, based around the petrochemicals sector – it needs to understand how far it can realistically expand, decarbonise and enter other parts of the economy. The UK has strengths in hydrogen – in production via methane reformation and gas infrastructure – in fuel cells and electrolysis – in automotive, rail and boiler manufacture. The UK is well positioned to take advantage of the opportunities of hydrogen - but scaling up is a key challenge.

Over the last ten years major R&D, demonstration and deployment of hydrogen and fuel cell projects have successfully delivered:

- a network of nearly 20 hydrogen refuelling stations around the country alongside soon to be 100's of vehicles using them from fuel cell buses, to passenger cars, refuse trucks, panel vans and even road sweepers,
- several buildings in London powered by fuel cell CHP systems,
- two train development projects being led by industry to deploy hydrogen on the railways,
- several integrated hydrogen "whole system energy" demonstrations such as the 1 MW scale production from wind, and marine in Orkney being used in fuel cells and on the ferry, and an off grid standalone facility in Fife.

International activity

The UK is actively participating in the Mission Innovation Renewable and Low Carbon Hydrogen Challenge, in IPHE and new IEA led activity. UK delegation attended the Japan Hydrogen Ministerial in October '18 and supported the Tokyo Statement on Hydrogen. The UK has also actively participated in discussions on hydrogen through EU Energy Council discussions and through initiatives such as FCH JU and Accelerating Carbon Capture Technologies (ACT) programme. Carbon Capture, Usage and Storage (CCUS) could support cleaner hydrogen production.

UK Hydrogen & Fuel Cell Association (UK-HFCA)

Following the merger of Fuel Cells UK and the UK Hydrogen Association, the UK Hydrogen and Fuel Cell Association was launched in the summer of 2010. The Association acts on behalf of its members to accelerate the commercialization of fuel cell and complex hydrogen energy solutions. Its members include the leading UK fuel cell and hydrogen companies as well as organisations from the academic community and a range of other stakeholders with an interest in these clean energy solutions and the associated elements of the supply chain.

Members of UK-HFCA

UK-HFCA gave a valuable professional contribution to the UK-CEE Regional Hydrogen Workshop hold in Budapest on 26 September 2019, including a presentation from the Chair (Amanda Lyne).

Further information: www.ukhfca.co.uk

Illustration:
(l) hydrogen fuel cell bus in London public transport system;
(r) hydrogen refuelling station using on-site electrolysis: Rotherham wind hydrogen station
(Pictures: H2-International.com)

Notices and abbreviation

The information provided in this Hydrogen Opportunity Map was collected through a questionnaire filled in by the country representatives who participated in the UK-CEE Hydrogen Energy Collaboration Project. Answers were provided mostly by national hydrogen associations, platforms, and/or competent ministries, or experts from the R&D / University sector. With this, we intend to make sure that the inputs – especially on the main projects – do not reflect just the priority projects of some companies, and they really provide a national overview. Nevertheless, it has to be mentioned that the answers and the information provided in this document do not represent the official position of the given states or governments.

For a better understanding of the data in the tables below, please consider the following explanation. In each of the "hydrogen refuelling stations (HRS)" tables, for every answer there is a "reliability" ("probability") status information, because it is important to know how solid the commitment is. In these tables you can find the terms "*uncertain"* or *"probable"* or *"sure*", which are reflecting the following:

(1) „uncertain": roughly outlined plan only, realization is uncertain at the moment.
(2) „probable": recorded goal in a strategic plan (e.g. included in AFI/National Policy Framework; or in its revised version; or in NCEP).
(3) „sure": concrete plan, e.g. planning, authorization or purchase in progress, a highly probably development.

In these tables „n.k." means "not known". In the table headlines we tried to follow – more or less – the main five-year milestones formulated in the Alternative Fuel Infrastructure Directive (AFID): 2020, 2025, 2030, with one exception to the first (present and near future) period between 2019 and 2023.

Abbreviations used in this document:

AFID:	Directive 2014/94/EU on Alternative Fuel Infrastructure	PEM FC:	Proton Exchange Membrane Fuel cell
CHP:	Combined Heat & Power (production)	PtG:	Power-to-Gas
FC:	Fuel cell	PV:	Photovoltaic (panels)
FCEV:	Fuel cell electric vehicle	SOE:	Solid oxide electrolysis
HRS:	Hydrogen refuelling station	TCO:	Total Cost of Ownership

Country codes of the participating CEE countries:

Bulgaria:	BG
Croatia:	CR
Czech Republic:	CZ
Hungary:	HU
Poland:	PL
Romania:	RO
Slovakia:	SK
Slovenia:	SL

Bulgaria

Hydrogen refuelling stations (HRS), infrastructure

Number and location of hydrogen refuelling stations	2019-2023	2025	2030
I.a) number of HRS for **passenger cars** (700 bar, public)	-	n.k.	n.k.
I.b) *reliability status*[3] of I.a) data	-	uncertain	uncertain
II.a) location(s) of HRS for **passenger cars**	-	Sofia, probably extension of the bus HRS	Stara Zagora, probably extension of the bus HRS
II.b) *reliability status* of II.b) data	-	probable	probable
III.a) number of HRS for **busses** (350 bar, public)	1	2	2
III.b) *reliability status* of III.a) data	probable	probable	probable
IV.a) location(s) of HRS for **busses**	Sofia	Stara Zagora, Burgas	Sofia, Plovdiv
IV.b) *reliability status* of IV.a) data	probable	probable	probable

Most relevant hydrogen project(s) - Bulgaria

Short project description	Timing	Owner / coordinator
Retro fitting of trolleybuses. The project is part of the National Research Programme„Low carbon Energy for Transport and Household E+“ (2019 – 2021) granted by the Ministry of Education and Science. A trolleybus of the Sofia municipality will be converted with range extender battery/fuel cell to reach an autonomous run of 100 km (about 80 kW FC to be installed). A TCO analysis will be completed and if the result is positive 50 more trolleys will be converted. In parallel a the Sofia Municipality has been awarded financial support for an application to purchase of hydrogen buses (20 units) in the JIVE2 Project.	2021	Project coordinator: – Bulgarian Academy of Sciences; Coordinator of the Task „Range Externder Battery/Fuel Cell of Trolleybus“: Daria Vladikova (IEES-BAS) d.vladikova@bas.bg
Demonstration of micro CHP unit. The project is part of the National Research Program „Low carbon Energy for Transport and Household E+” (2019 – 2021) granted by the Ministry of Education and Science. The task aims at demonstrating for the first time in Bulgaria the operation of this unit. It should increase public awareness and ensure accumulation of experience. The CHP unit will be mounted in the Showroom of Overgas – one of the big distributors of natural gas in Bulgaria. A tender for the purchase of the unit is in progress.	2020	Project coordinator – Bulgarian Academy of Sciences; Responsible for the task: Daria Vladikova (IEES-BAS) d.vladikova@bas.bg

[3] See explanation in chapter „*Notices and abbreviation*”.

Focal points for hydrogen in Bulgaria

Organization	Website	Contact
Bulgarian Hydrogen, Fuel Cells and Energy Storage Association (BGH2A)	www.bgh2a.bg	Prof. Daria Vladikova d.vladikova@bas.bg
Institute of Electrochemistry and Energy Systems - BAS	http://iees.bas.bg	Prof. Evelina Slavcheva eslavcheva@iees.bas.bg

Croatia

Hydrogen refuelling stations (HRS), infrastructure

Number and location of hydrogen refuelling stations	2019-2023	2025	2030
I.a) number of HRS for **passenger cars** (700 bar, public)	1	2	25
I.b) *reliability status* of I.a) data	probable	probable	probable
II.a) location(s) of HRS for **passenger cars**	Zagreb	Rijeka	Split
II.b) *reliability status* of II.b) data	uncertain	uncertain	uncertain
III.a) number of HRS for **busses** (350 bar, public)	1	2	25
III.b) *reliability status* of III.a) data	uncertain	uncertain	uncertain
IV.a) location(s) of HRS for **busses**	Zagreb	Rijeka	Split
IV.b) *reliability status* of IV.a) data	uncertain	uncertain	uncertain

Most relevant hydrogen project(s) - Croatia

Short project description	Timing	Owner / coordinator
Croatia Mirai Challenge 2019: Zagreb-Brussels drive of the first hydrogen FCEV on Croatian roads, joint UNIZAG FSB-Toyota Croatia d.o.o. project for hydrogen mobility promotion in Croatia.	September 2019	Ankica Kovač, Ph.D., UNIZAG FSB, Zagreb http://hydrogen.hr/en
First Croatian Hydrogen Powered Bicycle and first Croatian Hydrogen Refuelling Station (only for bicycles)	2019	
Hydrogen fuel cells and electrolyzers of advanced properties	2007-2012	Mihajlo Firak, Ph.D., UNIZAG FSB
Honda ATV (All-terain vehicle) redesigned for use of hydrogen fuel and fuel cell stack	2010	Frano Barbir, PhD., Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture, Split https://www.fesb.unist.hr/

Short project description	Timing	Owner / coordinator
Autonomous Power Supply System for mobile telephony	2011	Končar Electrical Engineering Institute, Zagreb https://www.koncar-institut.hr/en/solutions/hybrid-box/

Focal points for hydrogen in Croatia

Organization	Website	Contact
Faculty of Mechanical Engineering and Naval Architecture (HRS, FCEV vehicles, hydrogen production via water electrolysis using renewable energy sources)	https://www.fsb.unizg.hr/index.php?fsbonline_en&lang=en http://hydrogen.hr/en	Assist. Prof. Ankica Kovač, Ph.D. ankica.kovac@fsb.hr
INA d.d. (oil and gas company, hydrogen producer)	www.ina.hr	Vesna Kučan Polak vesna.kucan-polak@ina.hr

Czech Republic

Hydrogen refuelling stations (HRS), infrastructure

Number and location of hydrogen refuelling stations	2019-2023	2025	2030
I.a) number of HRS for **passenger cars** (700 bar, public)	6	15	80
I.b) *reliability status* of I.a) data	sure	probable	uncertain
II.a) location(s) of HRS for **passenger cars**	Prague, Ostrava, Brno	all regional centres	all regional centres, TEN-T infrastruc-ture/other motorways
II.b) *reliability status* of II.b) data	sure	probable	uncertain
III.a) number of HRS for **busses** (350 bar, public)	included in I.a) answers		
III.b) *reliability status* of III.a) data	n.k	n.k	n.k
IV.a) location(s) of HRS for **busses**	Ostrava, Ústí n. Labem	-	-
IV.b) *reliability status* of IV.a) data	sure/prob.	-	-

Most relevant hydrogen project(s) – Czech Republic

Short project description	Timing	Owner / coordinator
Deployment of hydrogen refuelling stations in Prague, Brno and Litvinov (This project was supported by the granting scheme of Ministry of Transport (MoT). Total cost of the project is 4,3 mil Euro. Grant of MoT is 85%.)	2021 - 2022	UNIPETROL RPA, s.r.o. - BENZINA
Deployment of a hydrogen refuelling station in Ostrava (This project was supported by the granting scheme of Ministry of Transport (MoT). Total cost of project is 2, 7 mil Euro. Grant of MoT is 85%.)	2022	Public transport operator of Ostrava city

** Note: Under the 2nd call of the granting scheme of Ministry of Transport for support of deployment of hydrogen stations 3 projects (with the aim to deploy 4 hydrogen stations) were submitted. However, since these projects go beyond the allocation capacity of this call, it is still not clear which projects would be supported. It is possible that another call would be launched at the end of this year.*

Focal points for hydrogen in the Czech Republic

Organization	Website	Contact
HYTEP Czech Hydrogen Technology Platform	https://www.hytep.cz/cs/	Aleš Doucek ales.doucek@hytep.cz
UNIPETROL RPA, s.r.o. - BENZINA	https://www.unipetrolrpa.cz	Jiří Lachout Jiri.Lachout@unipetrol.cz
Toyota Central Europe - Czech	https://www.toyota.cz	Martin Peleška martin.peleska@toyota-ce.com

Hungary

Hydrogen refuelling stations (HRS), infrastructure

Number and location of hydrogen refuelling stations	2019-2023	2025	2030
I.a) number of HRS for **passenger cars** (700 bar, public)	2	5	14
I.b) *reliability status* of I.a) data	probable	probable	probable
II.a) location(s) of HRS for **passenger cars**	n.k	n.k	n.k
II.b) *reliability status* of II.b) data	-	-	-
III.a) number of HRS for **busses** (350 bar, public) *	-	-	-
III.b) *reliability status* of III.a) data	-	-	-
IV.a) location(s) of HRS for **busses**	-	-	-
IV.b) *reliability status* of IV.a) data	-	-	-

** The original (2016) National Policy Framework (under AFID) included only HRS with 700 bar (for passenger cars), and none for buses. During the NPF revision process it can be changed.*

Most relevant hydrogen project(s) - Hungary

Short project description	Timing	Owner / coordinator
Kontakt-Elektro: PEM fuel cell developments for inland shipping and uninterruptable power units (UPS). PEM FC capacity range is between 300 W-15 kW, so from boats to small vessels, yachts.	ongoing	Kontakt-Elektro Ltd. http://www.kontakt-elektro.hu/en/kontakt.html
Power-to-Gas Hungary: proprietary process converts low-cost and stranded electricity and carbon dioxide into pipeline-grade renewable gas for direct injection into the existing natural gas grid, using bio-methanation process.	ongoing	Power-to-Gas Hungary Ltd. https://p2g.hu/
Energy Container: continuous and 100% renewable energy supply to a remote (off-grid area located) hunting lodge, using 10 kW photovoltaic (PV) panels, and battery plus hydrogen technology for energy storage (electrolyser and fuel cell) enough for 10+ days continuous power supply if PV does not produce energy at all.	2016 -	E.ON Hungary https://www.youtube.com/watch?v=q76fp0M80k0

Focal points for hydrogen in Hungary

Organization	Website	Contact
Centre for Natural Sciences (ELKH)	http://www.ttk.hu/aki/en/	András Tompos, Ph.D, tompos.andras@ttk.mta.hu
Hungarian Hydrogen & Fuel Cell Association	www.hfc-hungary.org	Zoltan Mayer info@hfc-hungary.org

Romania

Hydrogen refuelling stations (HRS), infrastructure

Number and location of hydrogen refuelling stations	2019-2023	2025	2030
I.a) number of HRS for **passenger cars** (700 bar, public)	-	-	-
I.b) *reliability status* of I.a) data	-	-	-
II.a) location(s) of HRS for **passenger cars**	-	-	-
II.b) *reliability status* of II.b) data	-	-	-
III.a) number of HRS for **busses** (350 bar, public)	-	-	-
III.b) *reliability status* of III.a) data	-	-	-
IV.a) location(s) of HRS for **busses**	-	-	-
IV.b) *reliability status* of IV.a) data	-	-	-

Most relevant hydrogen project(s) - Romania

Short project description	Timing	Owner / coordinator
R&D project(s) coordinated by National Centre for Hydrogen and Fuel Cell. The activities in the National Centre include both mobility and energy related projects.	2009-present	ICSI Rm. Valcea Mihai Varlam
The HyUnder project (for 24 months), which started in the summer of 2012, addressed the issues of underground hydrogen storage, paving the way to future demonstrations and deployment throughout Europe.	2012 - 2014	ICSI Rm. Valcea Ioan Iordache
HyLaw project for the removal of legal barriers to the deployment of fuel cells and hydrogen applications. It aimed boosting the market uptake of hydrogen and fuel cell technologies providing a clear view of the applicable regulations, whilst trying to remove legal barriers.	2017 - 2018	ICSI Rm. Valcea Ioan Iordache

Focal points for hydrogen in Romania

Organization	Website	Contact
National Centre for Hydrogen and Fuel Cell	www.icsi.ro	Elena Carcadea elena.carcadea@icsi.ro
Romanian Association for Hydrogen Energy	www.h2romania.ro	Ioan Iordache office@h2romania.ro

Poland

Hydrogen refuelling stations (HRS), infrastructure

Number and location of hydrogen refuelling stations	2019-2023	2025	2030
I.a) number of HRS for **passenger cars** (700 bar, public)	2	5	5
I.b) *reliability status* of I.a) data	sure	uncertain	uncertain
II.a) location(s) of HRS for **passenger cars**	Gdańsk Warsaw	Gdańsk Warsaw Gdynia Poznań Katowice	Gdańsk Warsaw Gdynia Poznań Katowice
II.b) *reliability status* of II.b) data	sure	uncertain	uncertain
III.a) number of HRS for **busses** (350 bar, public)	2	5	5
III.b) *reliability status* of III.a) data	sure	uncertain	uncertain

Number and location of hydrogen refuelling stations	2019-2023	2025	2030
IV.a) location(s) of HRS for **busses**	Gdańsk Warsaw	Gdańsk Warsaw Gdynia Poznań Katowice	Gdańsk Warsaw Gdynia Poznań Katowice
IV.b) *reliability status* of IV.a) data	sure	uncertain	uncertain

Most relevant hydrogen project(s) - Poland

Short project description	Timing	Owner / coordinator
Pure H_2 - Hydrogen Purifying Unit and Filling Infrastructure: LOTOS now has 4 hydrogen producing installations: - three steam gas reforming installations, - one installation for recovery from other technological processes. The purifying installation will be built under the Connecting Europe Facility (CEF). After the construction of the hydrogen recovery node installation, the production capacity will be >16.5 t/h. Two hydrogen refuelling points will be built: one in Gdańsk and one in Warsaw.Together with the hydrogen purification and distribution installation, they form the PURE H_2 project.	– December 2021	Consortium of LOTOS S.A. and LOTOS Paliwa Sp. z o.o.
Development of micro-CHP systems with solid oxide fuel cells (SOFC) for residential applications and utility buildings	05.2019-04.2022	IEn Institute of Power Engineering
Construction of a prototype P2G system based on high temperature electrolysis with reversible solid oxide electrochemical cells (rSOC) in kilowatt-scale	01.2019-12.2023	IEn Institute of Power Engineering

Focal points for hydrogen in Poland

Organization	Website	Contact
Ministry of Energy (public policy, regulation concerning Alternative Fuels)	https://www.gov.pl/web/energy	Szymon Byliński, director Daniel Musiał, senior expert Daniel.musial@me.gov.pl
IEn Institute of Power Engineering, Department of High Temperature Electrochemical Processes (PtG, hydrogen production, RES to SNG/CNG, SOFC, SOE)	https://ien.com.pl/cpe	Jakub Kupecki jakub.kupecki@ien.com.pl Marek Skrzypkiewicz marek.skrzypkiewicz@ien.com.pl

Slovakia

Hydrogen refuelling stations (HRS), infrastructure

Number and location of hydrogen refuelling stations	2019-2023	2025	2030
I.a) number of HRS for **passenger cars** (700 bar, public)	4	9	18
I.b) *reliability status* of I.a) data	probable	probable	probable
II.a) location(s) of HRS for **passenger cars**	Bratislava, Zilina, Kosice	Motorways and main transit roads close to cities	
II.b) *reliability status* of II.b) data	probable	probable	probable
III.a) number of HRS for **busses** (350 bar, public)	4	8	12
III.b) *reliability status* of III.a) data	probable	uncertain	uncertain
IV.a) location(s) of HRS for **busses**	Cities with public transport, combined HRS		
IV.b) *reliability status* of IV.a) data	probable	uncertain	uncertain

Most relevant hydrogen project(s) - Slovakia

Short project description	Timing	Owner / coordinator
Black Horse project: development, installation and operation of a HRS network in Slovakia (and other V4 countries). Altogether more than 200 HRS in V4 countries (Czech Republic, Hungary, Slovakia, Poland) determined to provide necessary infrastructure for the heavy road transport, lorries.	2020 - 2030	Bioway s.r.o. www.bioway.co
Slovnaft a.s. (MOL Group) – new production line (capacity) for the production of hydrogen.Hydrogen will be produced by the steam power reformation of gas and petrol. Hydrogen will be used for the internal production processes of chemical production as well as a potential fuel for the transport sector. Carbon capture technologies and renewable energy sources are considered to be used by the production processes as well.	2019 - 2025	Slovnaft, a.s. www.slovnaft.sk

Focal points for hydrogen in Slovakia

Organization	Website	Contact
Slovak National Hydrogen Association (NVAS)	www.nvas.sk	Peter Hegeduš (p.hegedus@nvas.sk) Ján Weiterschutz (j.weiterschutz@nvas.sk)

Slovenia

Hydrogen refuelling stations (HRS), infrastructure

Number and location of hydrogen refuelling stations	2019-2023	2025	2030
I.a) number of HRS for **passenger cars** (700 bar, public)	5	15	n.k.
I.b) *reliability status* of I.a) data	sure	probable	-
II.a) location(s) of HRS for **passenger cars**	Kranj, Ljubljana, Maribor, Postojna, Cerklje ob Krki	country-wide	n.k.
II.b) *reliability status* of II.b) data	sure	n.k.	-
III.a) number of HRS for **buses** (350 bar, public)	5	15	n.k.
III.b) *reliability status* of III.a) data	sure	probable	-
IV.a) location(s) of HRS for **buses**	same as for passenger cars above	country-wide	n.k.
IV.b) *reliability status* of IV.a) data	sure	n.k.	-

Most relevant hydrogen project(s) - Slovenia

Short project description	Timing	Owner / coordinator
RESHUB: Defence RESilience Hub Network in Europe	2020 - 2035	MOD SI (Ministry of Defence)
Zero Emission Mobility Corridor Slovenia: Simultaneous development with RES HUB project – infrastructure for civil use and further extention to other civil locations	2020 - 2027	ECUBES
Project Velenje: Fleet of hydrogen Buses	2020 - 2025	Velenje

Focal points for hydrogen in Slovenia

Organization	Website	Contact
Development Centre for Hydrogen Technologies (DCHT)	http://rcvt.si/en/	info@dcht.eu
ECUBES Technologies	www.ecubes.eu	Aleksander Gerbec info@ecubes.eu

Miscellaneous

In the following table the participating country representatives could answer with “yes” or “perhaps” to indicate whether they intend to apply the listed hydrogen technologies in the short or in medium term. In some (rare) cases supplementary information can be seen in brackets, eg. number of fuel cell vehicles (pcs.), or capacity (kW/MW), where this information was provided. Not each participating country has answered this question, so only those are indicated below who provided answers (“yes” or “perhaps”). Of course, these answers are based on future development plans, often solely on conceptual plans with no binding character. Therefore, in many cases there are no concrete parameters (pcs, MW, etc.) for every country in the brackets. So this chapter serves mainly as an indication of which country intends to install what kind of hydrogen technologies.

Please note that the following information are not official statements from the countries in question or their governments, but they represent the opinion of those experts who have participated in this project. For this issue please see also chapter “*Notices and abbreviation*”.

Country codes used below are the following:

Bulgaria: BG	Czech Republic: CZ	Poland: PL	Slovakia: SK
Croatia: CR	Hungary: HU	Romania: RO	Slovenia: SL

No.	Name of hydrogen technology or application	intention to realize	Short-term (2019-2023)	Medium-term (2024-2030)
1.	Installation of Hydrogen fuel cell busses	YES	SL (5); BG (20); CZ (95)	PL; CR; BG (100); CZ (870)
		PERHAPS	PL; HU	SL (150); SK; RO; HU
2.	Installation of Hydrogen fuel cell passenger cars	YES	SL (5); CZ (5000)	SK; PL; CZ (40 000-50 000)
		PERHAPS	SL (20), SK; PL; BG (5); HU	RO; CR; BG; HU
3.	Installation of other Hydrogen fuel cell vehicles (lorries, trolleys, ships, trains, etc.)	YES	BG	SK; BG
		PERHAPS	SL (10); SK; CR; HU	RO; PL; CR; HU
4.	Installation of Hydrogen Refuelling Stations (HRS) using on-site electrolysis	YES	SL	SL
		PERHAPS	SK; PL; CR; BG	SK; RO; PL; CR; BG; HU
5.	Hydrogen production with renewable energy especially for transport and traffic applications	YES	SL	SL, PL
		PERHAPS	SK; PL; CR; BG	SK; CR; BG; HU
6.	Hydrogen production with renewable energy especially for non-traffic applications, like power grid stabilization, energy storage, Power-to-Gas , hydrogen production as raw material for chemical processes, etc.	YES	SL (5x2,5MW); PL	SL (10x2,5MW); SK, PL
		PERHAPS	SK; CR	BG (1-3MW); CR; HU

No.	Name of hydrogen technology or application	intention to realize	Short-term (2019-2023)	Medium-term (2024-2030)
7.	Installation of a Power-to-Gas plant for Hydrogen production only	YES		SK; PL; BG
		PERHAPS	SK; PL; HU	SL; HU
8.	Installation of a Power-to-Gas plant for Hydrogen production and further on for synthetic methane (SNG) production	YES	PL; HU	SK; PL
		PERHAPS	SK	SL; BG; HU
9.	Fuel-cell power plants (small and normal ones) for energy production (electric power /cogeneration (CHP)/ trigeneration [CHHP[4]])	YES	SL (5x400kW); PL; BG	SL (15x1MW); PL; BG
		PERHAPS	CR	SK; CR; HU
10.	Other hydrogen technology projects not listed above: - SL: Development of All Terrain Hydrogen vehicles			

[4] CHHP: Combined Heat, Hydrogen and Power Production, possible with high temperature fuel-cell technology, e.g. MCFC.