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the European Union



EUROPEAN HRS AVAILABILITY SYSTEM

Introduction to the European HRS availability system (E-HRS-AS)

An **independent free data service** commissioned by the Clean Hydrogen Partnership (previously Fuel Cells and Hydrogen Joint Undertaking)

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01.3 Real-time availability and key information

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04 How to connect to the system?

05 Useful & contact information summary

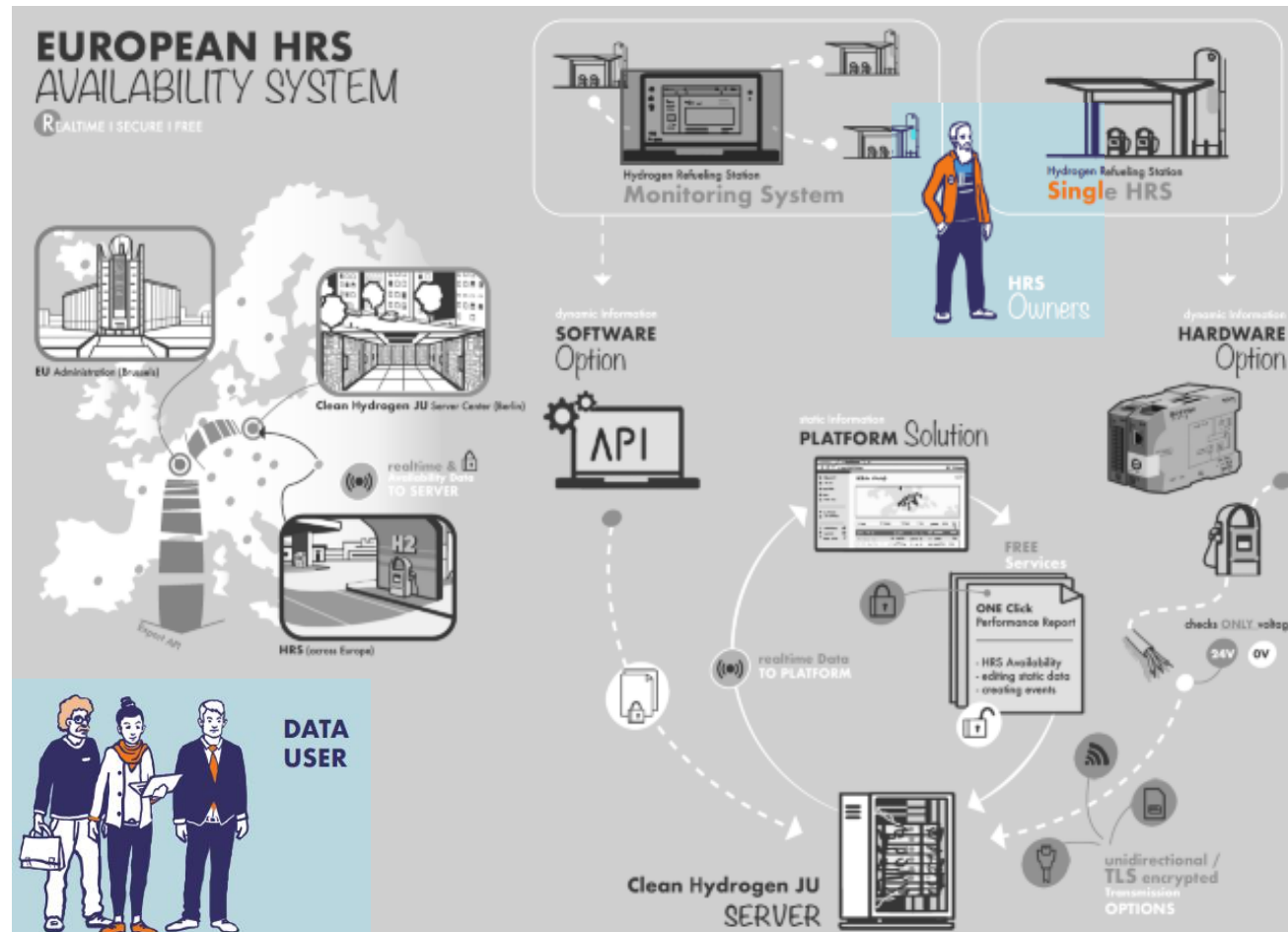
AIMS OF THE E-HRS-AS SERVICE

IMPROVING THE VEHICLES AND STATIONS END-USER EXPERIENCE BY PUBLISHING HIGH QUALITY INFORMATION ON HRS STATIONS ACROSS EUROPE ALONG WITH THEIR REAL-TIME AVAILABILITY STATES.

1 Complete and up-to-date database of all planned and operational HRS in Europe.

2 Database of automated real-time availability information of public HRS in operation.

6 Free access to the data via an export API to secure a widespread use of the information in different applications.



3 Free and non-discriminating integration of HRS sites and HRS operators throughout Europe.

4 Technical support to access and transmit HRS real-time availability information on a 60 sec. update frequency.

5 Integration via software interface or free and IT safe hardware solution.

7 Open Source based dataserver with comprehensive safety architecture, situated in Europe.

WHY A PUBLIC-FUNDED EUROPEAN HRS REAL-TIME AVAILABILITY SYSTEM?

There is a growing network of HRS in Europe: > 180 now in operation, expected to grow to 300+ by the early 2020s.

EUROPEAN CONTEXT FOR HYDROGEN MOBILITY

Revisions to the EU regulatory framework presents a key opportunity and require solutions to support monitoring and reporting on progress e.g. Alternative Fuel Infrastructure Directive and Member States implementation.

There is a **large momentum for hydrogen in Europe through EU and national funding programs** which requires a consistent and independent approach for data collection and sharing – e.g. EU green deal, HorizonEurope, AFF etc.

SERVICES PROVIDED



Live HRS availability and static information



Free open-source export interface of non-confidential data



Automated and easy to use reporting tool (restricted access)

USERS (BESIDES HRS OWNERS)

Drivers and fleet operators, companies requiring mobility solutions

Legislators (EU and national institutions, local authorities etc.)

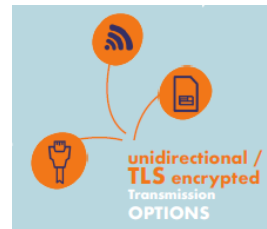
Hydrogen project developers (EU and national institutions, local authorities, associations, industry etc.)

Hydrogen sectors professionals and commentators (public and private sectors, consultants, research institutions and universities, associations, medias etc.)

MAIN FEATURES OF THE SERVICE

OPEN SOURCE APPLICATIONS, COMPLYING WITH EUROPEAN UNION
STANDARDS & REQUIREMENTS

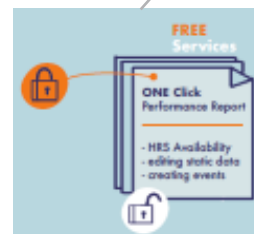
Data quality control, **secured
software architecture**



**Freely available, open source
data sets** to be integrated in
own applications (apps, car
navigation, ...)



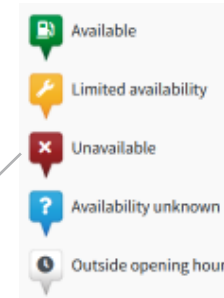
Automated reporting functions for HRS
operators / owners – secured and
confidential data use with user access
restrictions



+ FREELY AVAILABLE MAP
([HTTP://H2-MAP.EU](http://H2-MAP.EU))
(MAY BE INTEGRATED IN OWN
WEBSITES)



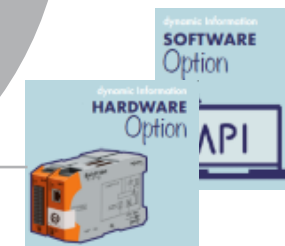
Easy update of static HRS information
via operators' access portal



Agreed, **common definitions**
on 5 states of HRS availability



**Identical origin of automated
availability data** (dispenser
readiness)



**Easy integration of real-time HRS
availability data** (via hardware
solution@low cost), compatible
to existing monitoring systems

KEY PUBLIC INFORMATION PER HRS SITE

EASY ACCESS TO HRS LOCATION, SPECIFICATIONS AND REAL-TIME AVAILABILITY (HTTPS://H2-MAP.EU)

1 HRS site information and automated real-time availability

Frankfurt | Hoechst

LIMITED AVAILABILITY

700 BAR

Last update: 14.4.2022, 17:14:27

HRS Site

Eni Deutschland GmbH

Otto-Horn-Straße

65926 Frankfurt am Main

Deutschland

Mo-Su 00:00-24:00

Services & Amenities

Shop

CEP approved

HRS-ID: FTSDY

Refuelling requirements

Access restriction

open to the public

Authorization

not required

Payment

Cash, Credit card, Invoice via custom fuel card

Additional remarks

payment also with EC; H2 price 7,69 €/kg

Operational Data

Station operator

Infraserv

Technology supplier

AIR LIQUIDE Advanced Technologies GmbH

Fuelling options

700 bar

CEP approved

350 bar

not provided

350 bar

provided

Green hydrogen

(unknown)

Capacity

large (> 500 kg/day)

Station funded by

European Regional Development Fund, Hessen Ministry of Economics, Energy, Transport and Housing

2 Customer notification¹

Porto Airport

LIMITED AVAILABILITY

700 BAR

Ongoing event: Visit by the ministry for transport. [See below for details](#)

Last update: 22.6.2020, 10:16:06

HRS Site

CEP approved

Acme Corporation

Rua do Aeroporto

4000 Porto

Portugal

24/7

Services & Amenities

HRS-ID: CS00K

Upcoming Events

event ongoing

takes place right now

ends 22.6.2020, 09:30:00

Visit by the ministry for transport

The HRS will be closed for 60 min. for a press event between 8:30 a.m. and 9:30 a.m. Fuellings are possible but need to be announced 30 minutes earlier latest. We are sorry for any inconveniences.

Refuelling will be subject to delays or restrictions for the duration of this event.

Refuelling requirements

Operational Data

(1) Example on how to use the customer notification (HRS does not exist)

REPORTING FUNCTIONALITIES

SUPPORT DATA ANALYSIS FOR HRS OPERATORS AND OWNERS

Search

Sign out

Availability status report for HRS: Porto Airport

Create new report

HRS Availability Status Report

700 bar

350 bar

SUBJECT

HRS-ID:

CSGGK

HRS:

Porto Airport

Fuelling option:

700 bar

Observation period:

Jan. 1, 2020, midnight – June 22, 2020, 12:27 p.m.

Transmission system(s):

- Type A (transmission ID: 714411)
in use: Jan. 1, 2020, midnight – March 20, 2020, 10:53 a.m.
- Type B (transmission ID: CA27E1)
in use: March 20, 2020, 10:53 a.m. – June 22, 2020, 1:27 p.m.

KEY PERFORMANCE INDICATORS

Indicator	Value
number of unavailability events	25
HRS availability	77.9 %
mean unavailability event duration	1 day, 12 hours
mean time between unavailability events	5 days, 5 hours
unavailability event rate	0.008/h
HRS-ATS reliability	99.3 %

AVAILABILITY STATUS DISTRIBUTION

Total elapsed time per HRS status:

Status	Percentage	Total time
not monitored	0.0 %	0 seconds
unknown	0.7 %	1 day, 3 hours
limitedly available	0.0 %	0 seconds
available	77.9 %	135 days, 2 hours
failure	0.5 %	18 hours, 59 minutes
in maintenance	21.0 %	36 days, 11 hours

Total elapsed time shown only includes that within the opening hours of the station.

not monitored

unknown

in maintenance

limitedly available

available

failure

AUTOMATED HRS AVAILABILITY REPORTING:

Download PDF report

The PDF version of the report contains both the availability distribution and the key performance indicators separately for each available refuelling option. The list of unavailability events may be appended to the PDF report by selecting the option „include list of unavailability events“ below.

This report is suitable to be handed in to FCH JU to fulfil reporting obligations.

OPTIONS

Include photo

Include list of unavailability events

Include section to add comments for each unavailability event

ACCEPTED BY

European Union

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THE EUROPEAN HRS REAL-TIME AVAILABILITY SYSTEM (E-HRS-AS)

01 Introduction

02 Progress to date

02.1 Timeline

02.2 Retrospective: Phase 1 (2017 - 2018)

02.3 Retrospective: Phase 2 (2019-2020)

02.4 Utilisation by 3rd parties and integration with other platforms

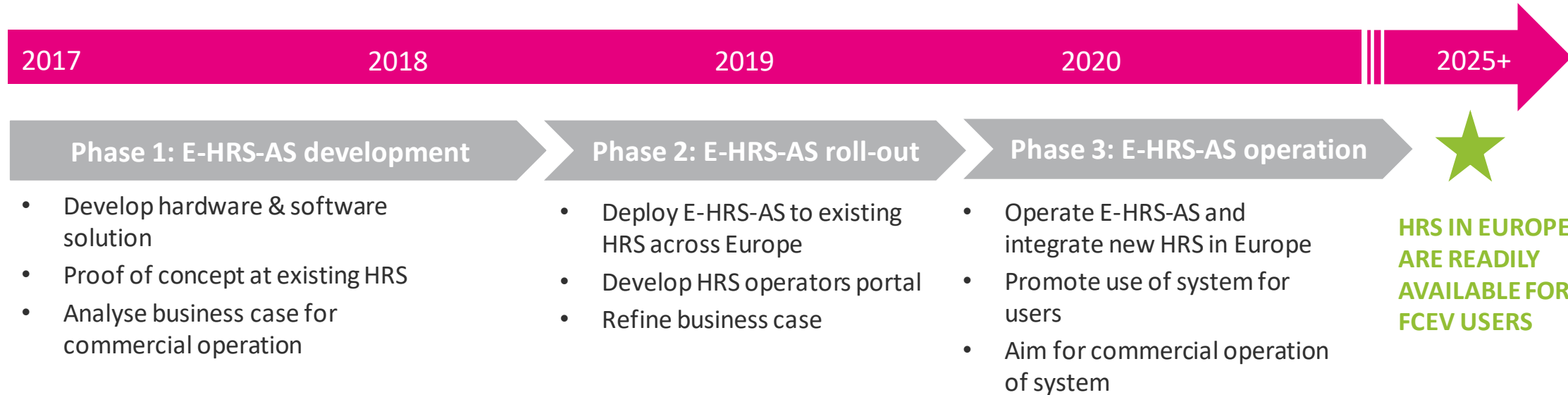
02.5 Reporting and data input functionalities for users

03 The E-HRS-AS hardware and software

04 How to connect to the system?

05 Useful & contact information summary

E-HRS-AS PLATFORM TIMELINE



The Clean Hydrogen Partnership supported the development and proof of concept of the HRS availability system and the deployment of the system across Europe to date. The platform operation will run until 2025, as the Clean Hydrogen Partnership has an ambition to see continued operation and expansion of the system (including via the connection of new stations) to provide independent free data services.

RETROSPECTIVE: PHASE 1

SYSTEM DESIGN, DEVELOPMENT AND PROOF-OF CONCEPT OF A TECHNICAL SOLUTION TO TRANSMIT, PROCESS AND PUBLISH REAL-TIME AND AUTOMATED AVAILABILITY INFORMATION

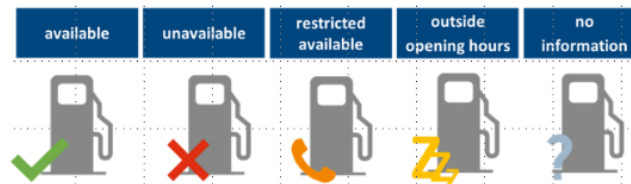
DURING THE FIRST PHASE OF DEVELOPMENT OF THE PLATFORM,

- a group of stakeholders was assembled and developed a common definition of HRS availability based on the customers' experience
- a technical solution was developed to allow the real-time availability of HRS to be communicated publicly (map)
- the system was demonstrated via a proof-of-concept trial
- a registry of HRS in Europe (existing / planned) was collated
- the costs of implementing the system across all stations, and explored potential business models for on-going operation of the system were assessed

TECHNICAL SOLUTION



COMMON DEFINITION



HRS AVAILABILITY MAP



RETROSPECTIVE: PHASE 2

DEVELOPMENT OF AN OPEN-SOURCE BASED PLATFORM SOLUTION FOR THE ROLL-OUT OF THE SYSTEM, INCLUDING DATA EXPORT API AND REPORTING FEATURES FOR OPERATORS

DURING THE SECOND PHASE OF DEVELOPMENT OF THE PLATFORM,

- the platform was developed and launched in May 2019.
- the system's rollout out was organized with the aim to connect existing stations and start providing real-time availability information.
- a total of 48 users (HRS owners, operators, or technology suppliers) were connected to provide static data for their stations and access the reporting functionalities.
- improvements were conducted to the operators' portal and reporting functionalities with dedicated information and training for users of the platform from April 2020.



E-HRS-AS Portal

Search HRS

Dashboard

CURRENT PROBLEMS

Beaconsfield	failure	700 bar H ₂ for cars is unavailable, 350 bar H ₂ for cars is unavailable
Birmingham	failure	700 bar H ₂ for cars is unavailable, 350 bar H ₂ for cars is unavailable
Stuhr	failure	700 bar H ₂ for cars is unavailable
Dresden	failure	700 bar H ₂ for cars is unavailable
Frankfurt Hoechst	limitedly available	In maintenance with limited availability, 700 bar H ₂ for cars is unavailable, 350 bar H ₂ for buses is unavailable
Rainham	failure	700 bar H ₂ for cars is unavailable, 350 bar H ₂ for cars is unavailable

ADMINISTRATION

- User administration
- Statistics

OTHER APPS

Create report

Configure report parameters

HRS

HRS*

Working selected

Please select the HRS to include in the status report.

Observation Period

Single month

Month

Span of months

Single year

Custom period

Note: All data and items shown are to be specified in the local time of the HRS.

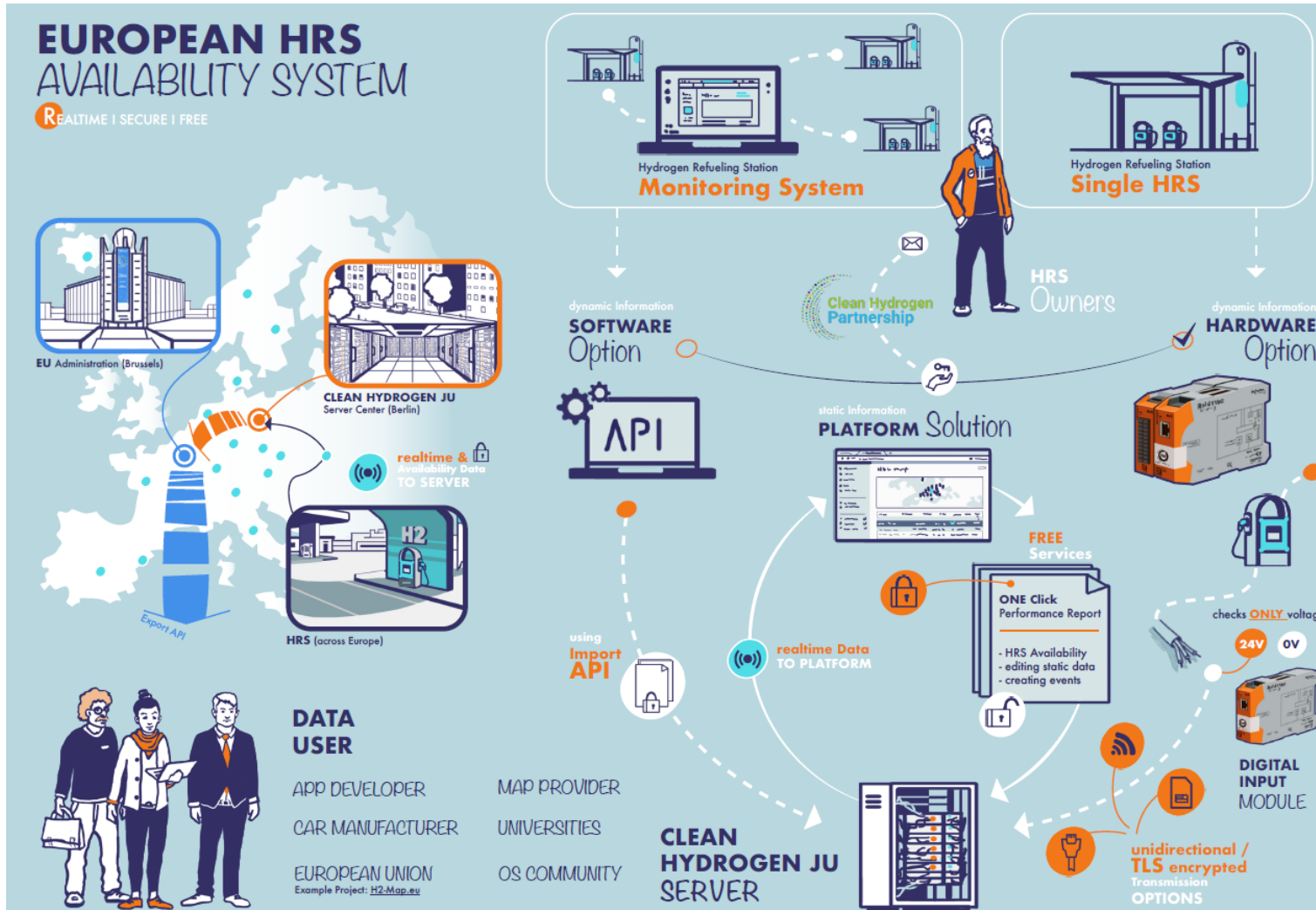
Create

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 - 03.1 Overview
 - 03.2 Technical approach
 - 03.3 Pros & cons of the connectivity concepts
- 04** How to connect to the system?
- 05** Useful & contact information summary

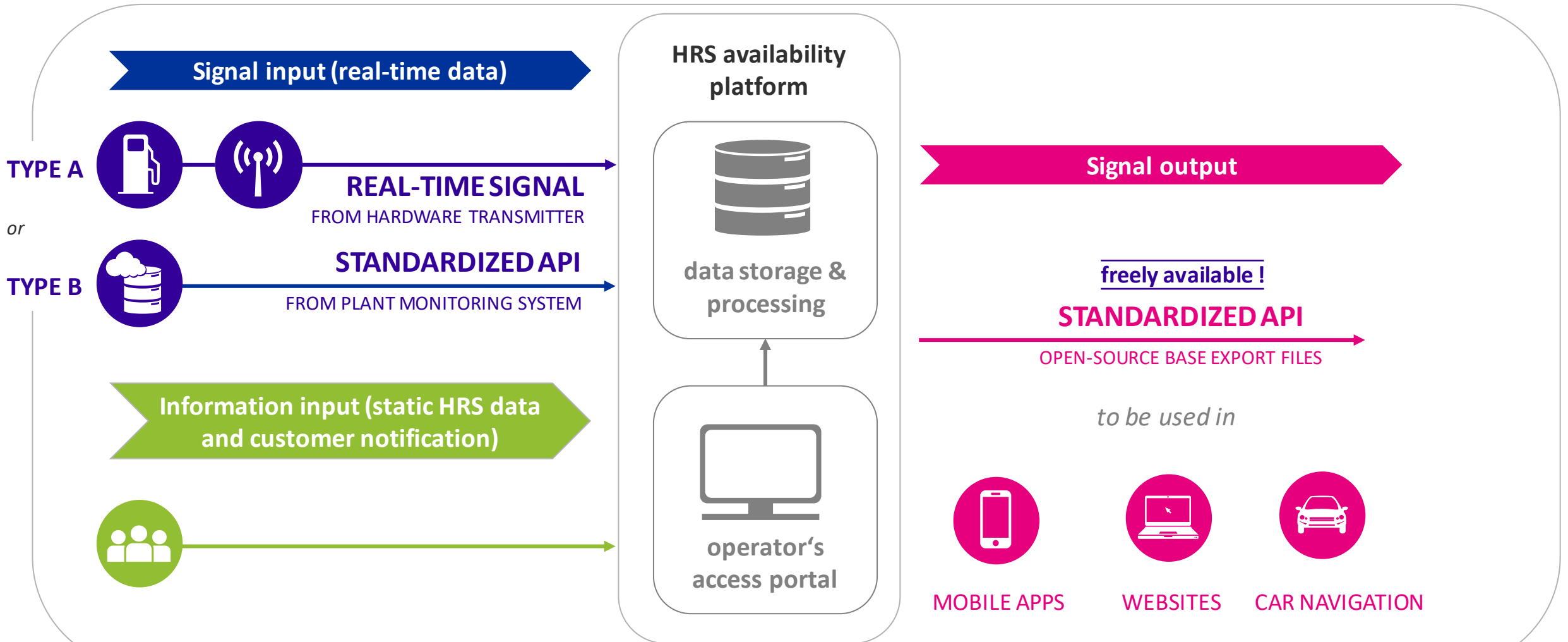
OVERVIEW



- (1) HRS operators may connect their stations via easy-to-install transmitter unit or send automated real-time signals from their monitoring systems via a **standardized import API** (<https://h2-map.eu/import/api/v1/doc/>).
- (2) HRS operators maintain the datasets of their own stations and may notify customers on planned events or download availability statistics.
- (3) Data users may access HRS site information, customer notifications and automated real-time availabilities via a **standardized export API** (<https://h2-map.eu/api/v1/doc/>).
- (4) The platform and API are OpenSource-based, the servers are located in the EU and all services are free for use.

THE EUROPEAN HRS AVAILABILITY SYSTEM

TECHNICAL APPROACH



PROS & CONS OF THE CONNECTIVITY CONCEPTS

COMPARATIVE CONSIDERATIONS



- reliable hardware system
- Industry standard technologies
- comparable data sets, guaranteed to conform all definitions
- signal update every 60 seconds possible
- easy and transparent trouble-shooting



- only HRS supplier or electrician is allowed to install the hardware
- pre-configuration required,
- high organizational efforts for system roll-out

Implementation may start promptly, depending upon technician capacities



- compatible to plant monitoring systems (via standardized API)
- large amounts of HRS can be connected with one API (economies of scale)
- no extra hardware to be installed on site



- unclear, if signal updates every 60 minutes can be realized (from monitoring system)
- quality of signals can not be verified
- risk of high cost for external programming of standardized API
- trouble-shooting in responsibility of HRS operator

Implementation requires programming of API per operator / supplier first

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 - 04.1 Free access to all users
 - 04.2 How to connect (HRS operators)
 - 04.3 How to connect (data users)
- 05** Useful & contact information summary

FREE ACCESS TO ALL USERS



The Clean Hydrogen Partnership has supported the development and deployment across Europe since 2017 and seeks continued operation and expansion of the system (new features, new stations, new users) to provide independent free platform and open data services until 2025 to the HRS community.

FURTHER ADVANTAGES TO HRS OPERATORS AND OWNERS



No need to maintain information in different platforms thanks to the standardized export API, widely used by different platforms and apps, e.g. [FCHObservatory](#), [h2.live](#), [European TENtec Interactive Map Viewer](#), [European Alternative Fuels Observatory](#) and more.

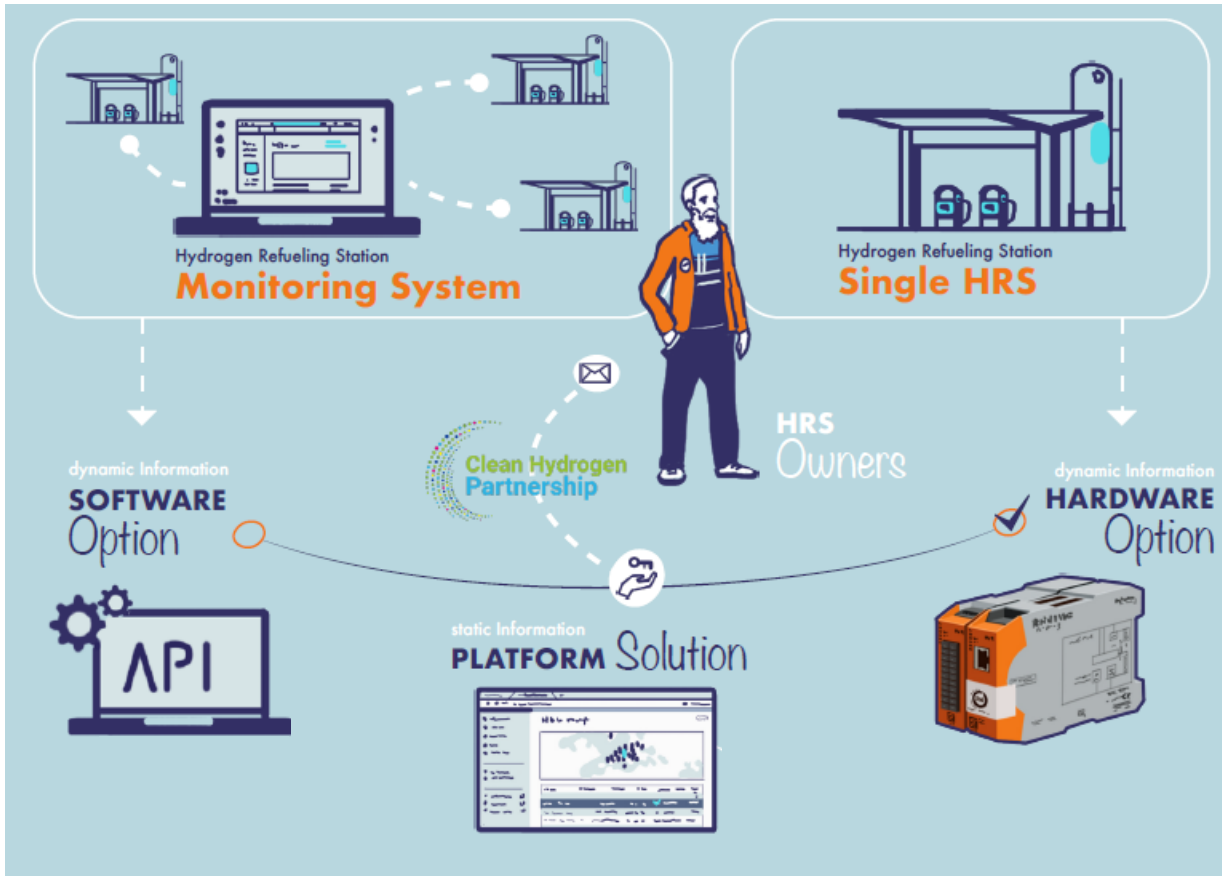
FURTHER ADVANTAGES TO DATA USERS



Central European database
Modular architecture to implement different update frequencies per dataset and reduce data transfer volume.
Real-time availability
information updated every 60 seconds.

HOW TO CONNECT?

HRS OPERATORS



1

Provide a list of the HRS to be connected (City, Street Address, operation state / planned start of operation, offered fuel types and number of dispensers)

2

Decide on preferred solution to connect. If you don't know, the E-HRS-AS team may help in decision making. A later switch from type A to type B integration is always possible (temporary solutions).

3

Name one or two colleagues to be registered as users in the operator's access platform (maintain datasets, launch customer notifications, create reports).

4 SEND US AN EMAIL WITH THE ABOVE INFORMATION TO DECLARE YOUR INTEREST: E-HRS-AS@CLEAN-HYDROGEN.EUROPA.EU

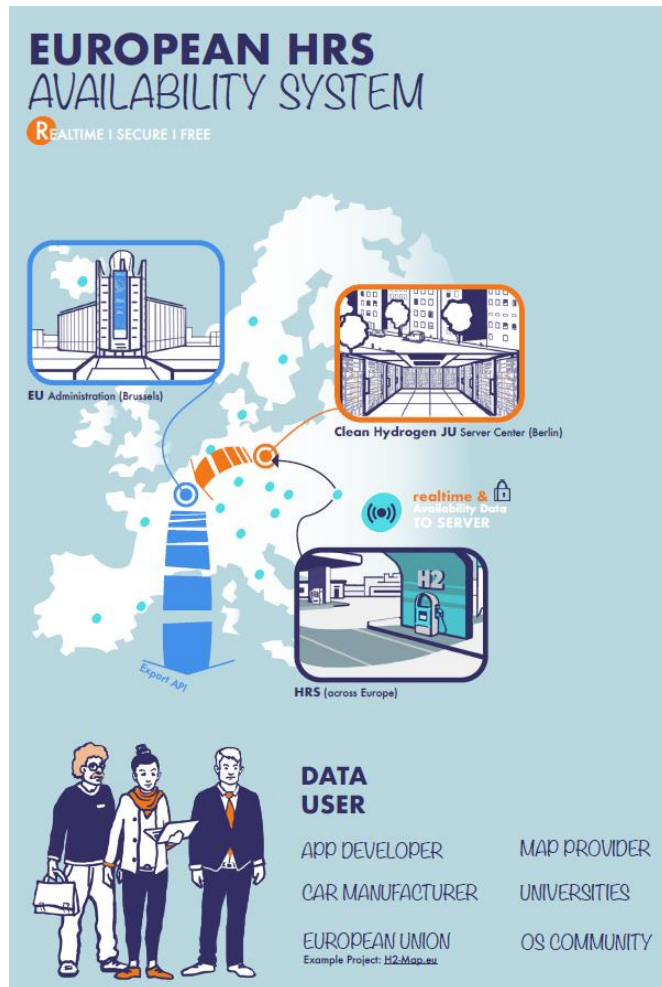
HOW TO CONNECT?

DATA USERS

- 1 Check the OpenAPI specifications: <https://h2-map.eu/api/v1/doc/>
- 2 Request a token by an informal email (please specify your intended use of the data): **E-HRS-AS@CLEAN-HYDROGEN.EUROPA.EU**
- 3 Implement your website, app, platform and please share a link so we can follow up and inform on the variety of products and services around HRS site and availability information.

TESTIMONIALS - DATA EXPORT INTERFACE

UTILISATION BY THIRD PARTIES AND INTEGRATION WITH OTHER PLATFORMS



Hype is a pioneering zero-emission mobility company which operate the largest fleet of hydrogen-powered taxis in the world and build Hydrogen Refuelling Stations in Europe.



"As both a hydrogen station developer and a hydrogen mobility user, **Hype** support E-HRS-AS as a necessary tool to:

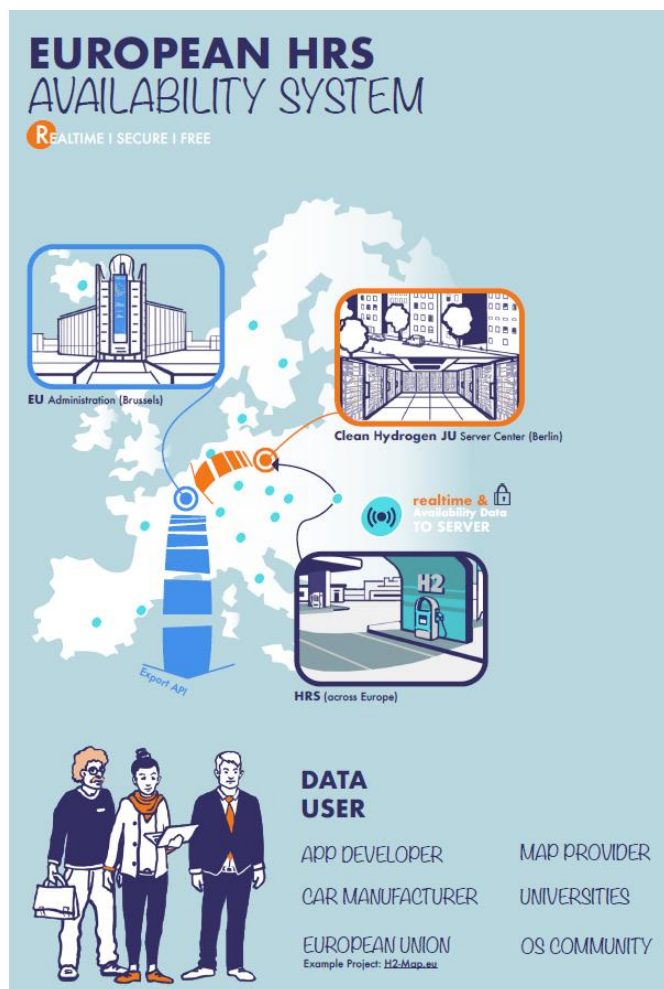
- Catalyse the development of future hydrogen fleets, by showing potential customers the location of stations in regards to their needs;
- Enable our affiliate taxi drivers to know in real time where to charge;
- Start considering longer routes linking ecosystems and regions together, in line with Hype's ambitions of a dense and mature network of stations all over Europe.

This is a very useful tool for accelerating hydrogen mobility in Europe and it is free of charge."

MATHIEU GARDIES, FOUNDER AND PRESIDENT

TESTMONIALS - DATA EXPORT INTERFACE

UTILISATION BY THIRD PARTIES AND INTEGRATION WITH OTHER PLATFORMS



Supporting ecosystem with streamlined data processes and seamless interactions.

Digital sales for clean energy refilling

We believe that clean energy vehicle must be simple to use. As a software development company, here is our contribution : making the refilling experience digital. We designed a solution that brings value to each stakeholder involved in the transaction.



"At **FillnDrive**, we've been among the early users of the API developed by the HRS availability system platform - and keep connected live ever since. For a player like us leveraging digital tools to simplify drivers and fleets operations, this open-source service is definitely a strong asset to provide accurate overview on H2 refilling alternatives available. This definitely supports the rollout of Hydrogen mobility use cases, making end-users much more comfortable in their journey and encouraging roaming services such as those developed by FillnDrive"

GILLES BOURRAT, CHIEF OPERATING OFFICER

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USEFUL & CONTACT INFORMATION SUMMARY

Gain access to data (free after registration)	Connecting new HRS	Quarterly training workshops (free online participation)	Existing members - HOW TO
<p>Check export API access website on data format and contents: https://h2-map.eu/api/v1/doc/</p> <p>Request access token to freely use the data by contacting e-hrs-as@clean-hydrogen.europa.eu (+ inform on the intended use of the datasets).</p>	<p>Free integration of your HRS into the system or confirmation of a contact point:</p> <p>Please contact the project team Nadine Hoelzinger T: +49 30 536 796 24 E: nadine.hoelzinger[@]spilett.com</p>	<p>We hold quarterly introductory and training workshops.</p> <p>Link to register interest will be available shortly on the website.</p>	<p>A quick start presentation on how to use the functionalities of the operator's platform area will be sent on request.</p> <p>How to-videos will be available shortly on the website.</p> <p>For any questions on reporting functionalities, please contact the project team</p> <p>Nadine Hoelzinger T: +49 30 536 796 24 E: nadine.hoelzinger[@]spilett.com</p>



European Commission services and Member States hotline: E-HRS-AS@clean-hydrogen.europa.eu

SUPPORT

IN CASE YOU HAVE ANY QUESTIONS OR NEED SUPPORT PLEASE CONTACT



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E-HRS-AS@clean-hydrogen.europa.eu

An independent free data service commissioned by the Clean Hydrogen Partnership (previously Fuel Cells and Hydrogen Joint Undertaking)