

HIGGS

Hydrogen in Gas Grids

A systematic validation approach at various admixture levels into high-pressure grids

D7.6

Final summary of communication, awareness and dissemination actions

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PU **Public**

RE Restricted to a group specified by the consortium*

PP Restricted to other programme participants*

CO Confidential, only for members of the consortium*

*(including the Commission Services)



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Executive Summary

This report is a summary of the communication and awareness plans and outlines the communication activities, strategies and tools that have been developed and used towards a successful dissemination of the project and its results. The project grant agreement, through the description of action, contained the draft of this plan as part of the measures to maximise the project's impact. This document describes the dissemination goals, target audience and appropriate channels to provide a regular flow of information. The report also provides communication and dissemination activities that follow after the project ending.

Due to the project amendment and an extension by 12 months (new project end 31.12.2023 (M48)), the communication and dissemination activities were also extended. The extension of the project did not influence the content of WP7 and rather had a positive effect on the overall impact of the HIGGS project. First, since the quality and results produced in the project were more extensive and secondly since there was more time to reach out to a larger target group. Since the WP was planned over the complete runtime of the project, the activities were stretched out to fit the new end date. The project extension provided the opportunity to attend additional events and to catch up on events that have been cancelled because of the COVID-19 pandemic and its restrictions. These were additionally considered in the extension period. Activities were rescheduled to fit with the new runtime and progress of results.

Two activities in particular are noteworthy at this point. As part of the EU Hydrogen Week, the HIGGS project and the final results were presented in a closing conference as an official side event. The event was well attended by the hydrogen and gas community. Furthermore, a project brochure was produced with the aim to condense the project results and make them available in a well edited and illustrated way, even after the end of the project. This brochure was distributed both in printed and digital form at the closing conference.

1 Objectives

The communication and awareness plan aimed at defining the tools and procedures to be carried out by the project consortium to maximize the impact of HIGGS developments. This plan also took into account dissemination activities targeted to different audiences, such as workshops, conferences, and fairs. D7.6 (M48) is the fourth and final update of the communication and dissemination plan. The document aimed at defining and summarizing the methodology, stakeholders, tools, channels, and relevant actions in order to maximize the impact of the project and its results. The report also provides communication and dissemination activities that follow after the project ending.

2 Description of work

2.1 Methodology

The dissemination and communication of HIGGS to stakeholders and target groups involved were managed by the partners within WP7, led by ERIG and monitored by the project coordinator (FHA), to ensure the compliance of the Grant Agreement.

The consortium agreed to follow a basic set of rules of common understanding to help assure a good quality communication and dissemination, in accordance with the consortium agreement (CA). These were:

1. The tasks of communications and dissemination of the project were understood as tasks of common interest and due contributions and commitments from all partners applies. ERIG acted as the WP leader. In its role as project coordinator, FHA was the final resort in charge of all activities in the project and thus, also regarding communication and dissemination.
2. The project website (<https://higgsproject.eu/>) is the platform for all documentation and documents management. Using the templates and keeping a comprehensible versioning and communication is everybody's duty. The project website serves as repository for the project results and activities and will be maintained one year after the project, 2024. To guarantee further access, the website content will be incorporated in a condensed way on the ERIG website under <https://erig.eu/projects/>.
3. In order to plan, track and monitor communication and dissemination activities of the project as such, all partners reported activities to ERIG and FHA. Upcoming activities were reported as soon as possible (and before submission, according to the consortium agreement) in order to help assure possible synergies or to help avoid additional efforts. Each activity was reported to ERIG and FHA. After approval from FHA as project coordinator, each interested partner did send the communication and the event information to the consortium prior to submission. Each activity approved was incorporated in the communication and dissemination reporting by ERIG.
4. In addition, each partner that has foreseen a publication of project results informed the consortium with sufficient ahead planning (based on the CA rules) to ensure that results did not stand in conflict with potential commercial exploitation activities, confidentiality or legitimate interests of the partners.
5. Peer reviewed publications must be provided to open access according to the guidelines of the EU Horizon 2020 Manual: https://ec.europa.eu/research/participants/docs/h2020-funding-guide/cross-cutting-issues/open-access-data-management/open-access_en.htm

2.2 Target groups

An assessment was conducted on the main target audiences expected to be influenced by the results of the HIGGS project. Results from other tasks of the project, specifically related to describing pathways for integrating hydrogen into EU gas networks (WP6), provided additional input to identify new business cases and case studies, allowing for a more focused approach in disseminating efforts within the reach of the target groups.

2.2.1 Policy makers and regulatory bodies

HIGGS results were of interest in developing standards for hydrogen blends, considering technical, legal, and regulatory conditions necessary for the safe operation and maintenance of gas networks at various H₂/CH₄ admixture levels. Additionally, the evaluation of potential markets and the assessment of the potential of water electrolysis to maximize the integration of renewable energy sources into the grid served as crucial inputs for these stakeholders.

To enhance cooperation with regulation and standardization bodies, an external consulting company had been invited to join the External Advisory Board (EAB). This company aided in expanding communication activities towards RSC bodies.

2.2.2 Renewable energy stakeholders and gas grid operators

HIGGS aimed to directly impact the interaction of energy markets by increasing understanding of the impacts on the entire gas transmission infrastructure, while also addressing aspects related to regulatory codes and standards. Furthermore, the project considered cross-border issues as part of the pathway, which might arise from differences in gas quality. These efforts aimed at creating a full internal gas market, coupling electricity and gas through hydrogen production via water electrolysis.

The key message conveyed to these groups included (1) highlighting the potential benefits of hydrogen injection, especially regarding electrolysis technologies for renewable energy integration and H₂ transport within the gas grid, (2) emphasising the potential and necessity of meeting EU decarbonisation goals, particularly in gas usage, and (3) sharing results from HIGGS trials to demonstrate the feasibility of injecting hydrogen at different admixture levels into the natural gas transmission grid.

2.2.3 Technology providers/manufacturers

HIGGS trials were anticipated to enhance industrial maturity and reduce integration/manufacturing costs. Lessons learned about product development, testing platform capabilities, and potential new components were shared among this target group to facilitate the implementation of new business models and cases in the market.

2.2.4 General public

Dissemination efforts directed towards the general public focused on stressing the benefits of hydrogen and power-to-hydrogen solutions for integrating renewable energy and reducing CO₂ emissions. The aim was to substantially decrease dependence on fossil fuels and underscore the potential for local economies. Additionally, there was an emphasis on highlighting the safety of hydrogen technologies and European competitiveness.

2.2.5 Research and academia

Dissemination activities, particularly through conferences and scientific journals, predominantly engaged research and academia stakeholders. It was particularly important to engage in direct exchanges with these entities, regularly discussing and questioning results.

2.3 Communication channels

Communication activities in HIGGS were linked to a wide spectrum of communication channels to reach all the target audiences detailed previously. They supported the dissemination of results and activities for creating awareness.

2.3.1 Project website

The project’s website (www.higgsproject.eu) is the central place for the communication of all the information related to the project. It was used as a tool for partners to showcase project advances and deliverables, addressing all target groups. The website was designed to provide a general impression of the project and will be maintained for one year after the finalization of the HIGGS project, with ERIG responsible for its maintenance. The "The Project" section included all necessary specifications for a complete understanding of the project’s goals and procedures. The "Partners" section provided descriptions and backgrounds of all involved organizations and companies, including links to their websites. The "News" and "Events" sections included press releases, articles about the project’s developments, events, and achievements. The "Publications/Downloads" section served as the main hosting page for all public content generated by the project, including deliverables, presentations, reports, publications, etc. Corporate documents like flyers and press kits were also available. The "Contact" section provided a point of contact, including a form to send information to the project coordinator (FHA).

The website was visited regularly during the course of the project, as shown in Figure 1. Over the course of the entire project, the website was visited over 80,000 times.

Time	Visitors	Visits
Today	38	113
Yesterday	31	103
Last week	445	1.194
Last 7 days	381	1.175
Last 30 days	1.866	5.605
Last 60 days	3.516	9.783
Last 90 days	4.901	13.587
Last 12 months	16.243	43.635
This year (Jan-Today)	15.604	41.974
Last year	12.371	36.599
Total	29.080	81.408

Figure 1: Website statistics on visits and visitors (13th December 2023)

2.3.2 Graphic material

A visual identity was developed for the project, comprising a logo, document templates, a press kit, factsheets, posters, project identity cards and flyers. All communication and visual identity materials were available online in various formats, updated according to the project's progress. Due to the influence of COVID-19, priority was given to digital material over printing. However, printed materials were also created and presented at conferences or exhibitions. QR codes were used to provide digital access to project material, especially for exhibitions where project flags, banners, and exhibition materials were provided. The main graphic materials developed within HIGGS included the following.

2.3.2.1 Logo and colour schemes

The development of the Logo for HIGGS (shown in Figure 2) followed an overarching approach to create a simple yet expressive design closely related to the project's content. As the acronym "HIGGS" itself didn't provide clarity about the project's focus, it was decided early on to incorporate the short title "Hydrogen in Gas Grids" into the logo. This ensured that the essence of the project was communicated whenever the logo was displayed.



Figure 2: Hydrogen in Gas Grids logo

In visually representing the project, the design emphasized the "G"s in the acronym, extending them up and to the right to resemble "pipe-lines," thereby highlighting the project's primary focus on high-pressure gas grids. The transition from blue to green in the logo symbolizes the role of hydrogen (blue) in contributing to the greening of high-pressure natural gas grids (green). The arrangement of the "G"s facing each other and the arrow-shaped cross bars signified the positive interaction between pure hydrogen and the natural gas grids, emphasizing the symbiotic relationship at the core of the project.

Moreover, aside from the colours incorporated into the logo, additional colours were defined to be part of HIGGS' project identity, as show in Table 1.

Table 1: HIGGS extended colour scheme

	Logo Blue: 41,107,183 (RGB)
	Logo Green: 150,193,60 (RGB)
	Text White: 255, 255, 255 (RGB)
	Text Black: 0, 0, 0 (RGB)
	Background light: 238, 236, 225 (RGB)
	Background dark: 31, 73, 125 (RGB)
	Accent 1: 255, 207, 40 (RGB)
	Accent 2: 255, 207, 40 (RGB)
	Accent 3: 204, 64, 67 (RGB)
	Accent 4: 105, 48, 138 (RGB)
	Hyperlinks un-used: 41, 107, 183 (RGB)
	Hyperlinks used: 105, 48, 138

These colours were selected to complement the two main colours featured in the logo and were designated for various purposes within project documents, such as diagrams, presentations, etc. These colours were also pre-set in the project templates for Word, Excel, and PowerPoint for ease of use. The chosen logo established the basic visual appearance for the project's documents. The design aimed for a simple yet expressive logo, incorporating the short title "Hydrogen in Gas Grids" to clarify the project's content whenever the logo was displayed. Additional colours were defined to complement the logo and were used in project documents. The font chosen for project documents was Arial.

2.3.2.2 Document templates

Unified communication was ensured through a set of document templates distributed among project partners. These templates were adjusted due to changes in funding regulations, replacing former logos and acknowledgment sentences with those of the Clean Hydrogen Partnership. The templates are listed in “Annex 1 Updated templates and funding lines”.

2.3.2.3 Press kit

A press kit, available on the project website¹, assisted partners in drafting press releases and helped journalists to write about HIGGS. It contained a summary of the project, pictures, FAQs, and tweetable facts, along with logos and funding regulations of the Clean Hydrogen Partnership. The press kit was regularly updated and last in October 2022.

2.3.2.4 Factsheets and flyers

Factsheets provided general project information and preliminary results for both technical and non-technical audiences. These were designed as flyers for distribution at events and were regularly updated to reflect project progress. They were available for download on the project website² and in printable versions for partners attending various events.

2.3.2.5 Posters

Posters were developed for presentations during conferences and events, serving as support material. These posters have been presented at the EGATEC conference (2022) in Hamburg, Germany for the first time and made digitally available on the website³.

2.3.2.6 Videos

An explanatory video on HIGGS and particularly the test platform was created⁴. It aimed to communicate key messages about the project's socio-economic and environmental benefits and provided explanatory information on the testing procedures.

Additionally, two interviews of Dr. Vanesa Gil⁵ as project coordinator of HIGGS and Dr. Javier Sanchez⁶ as and WP3 leader, both from FHA, have been created and published. The aim here was to showcase the coordinator's viewpoint on the project.

2.3.2.7 Pillars

For exhibitions and conferences, experts on the subject of hydrogen and gases were interviewed as part of the ERIG community and the outcome was printed on cardboard displays with an advertising pillar look, as shown in Figure 3. For HIGGS Dr. Vanesa Gil (FHA), Dr. Virginia Madina (Tecnalia) and Dr. Javier Sanchez (FHA), were displayed. The displays were presented for the first time at EGATEC 2022 in Hamburg and subsequently at several other events with ERIG participation, e.g.

¹ <https://higgsproject.eu/higgs-press-kit-v-2-0/>

² <https://higgsproject.eu/higgs-factsheet-v-2-0/>

³ <https://higgsproject.eu/egatec2022-european-gas-technology-conference-2022/>

⁴ <https://www.youtube.com/watch?v=ob0FSlft3A>

⁵ <https://www.youtube.com/watch?v=ob0FSlft3A>

⁶ <https://www.youtube.com/watch?v=RRXIUj-b6Ik>

like the MefHySto project closing event in 2023 in Berlin or the SuperP2G parliamentary evening in 2023 in Brussels.



Figure 3: Example of HIGGS pillars presented on EGATEC conference

2.3.3 Social media and professional networks

The use of social media and professional networks was a key communication tool to disseminate information about the project. The procedure here was mainly that ERIG prepared posts on social media and website, linked them to HIGGS, e.g. via LinkedIn with “@HIGGS” and posted them through the ERIG network. Through that procedure the maximum reach out was guaranteed. Additionally, the HIGGS Partners were then encouraged to further publish that information via their own accounts in the social/professional networks to further contribute to the project's dissemination.

2.3.3.1 Social media

The main social media channel considered for the dissemination of the project was LinkedIn. Every communication activity was shared via this channel, as well as via the partners' LinkedIn. LinkedIn was used in particular to reach renewable energy stakeholders and gas sector companies, technology providers/manufacturers, and the general public. Partners were encouraged to echo the project events, news, press releases, and posts of the HIGGS project through posts in their company profiles, in the account holder's language, and also in English, linking to the article or piece of news published on the project website. A call to action (link, question, etc.) was advised to be included in every social media post. To get an overview of the reach of these social media activities, the number of ERIG post impressions is shown as an example in Figure 4 for the year 2023. During this period, the number of impressions ranged between 1,000 and 4,000. In addition to that, relevant project results, e.g., public deliverables, were shared via the Hydrogen Europe Research newsletter.

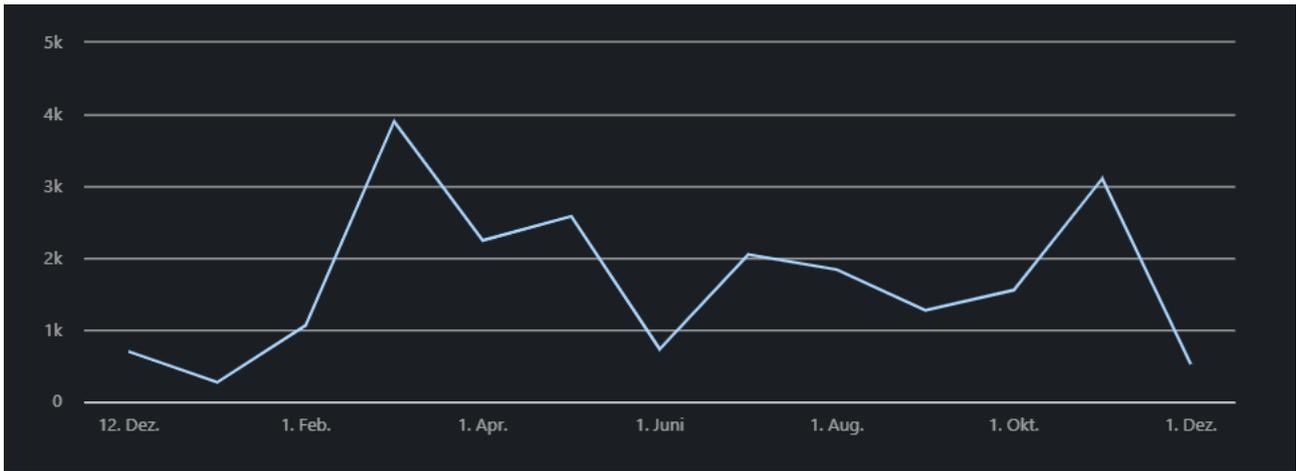


Figure 4: LinkedIn post impression shares in 2023 via ERIG LinkedIn

2.3.3.2 Professional networks and related projects cooperation

Networking opportunities allowed project partners to learn from each other, discuss common issues, and get feedback on their work. These kind of meetings also provided a chance to carry out effective communication of the project inside and outside the consortium. In this sense, but also with the idea to maximize the impact of the project and H2020 resources, HIGGS continuously identified other projects and initiatives and worked out collaborations or shared events. This also counted for workshops or deep dive events.

2.3.4 Public Relations

Press releases were published during the life of the project, directly linked to important events, achievements, or milestones of the project, such as the project kick-off meeting. The press kit supported the Public Relations (PR) activities carried out by HIGGS project partners.

2.3.5 Showcase and visits

A showcasing event was organized at the demo-site of HIGGS (FHA facilities). Linked to the educational and awareness activities carried out by the FHA, open visits to the demo-site were encouraged. Information about these visits was available on the HIGGS website. Due to the impact of COVID-19, the showcasing events have been postponed to a later point. A first visit to the platform at FHA in Huesca, Spain together with the External Advisory Board was conducted in December 2022.

2.4 Dissemination activities

At European level activities were especially prioritized to take place with the European Network of Transmission System Operators for Gas (ENTSOG), Hydrogen Europe Research (HER), Hydrogen Europe (HE), European clean hydrogen alliance, Ready4H2, and Marcogaz. The HIGGS consortium was represented as a member of the ENTSOG advisory Board panel for future gas grids, as well as a member of the "Prime movers Group on Gas Quality & H2 handling," facilitating regular exchanges with relevant stakeholders in the field. Furthermore, ERIG was an associated member of Marcogaz and a member of the Hydrogen Europe Research "Policy Working Group."

Two activities in particular are noteworthy and will be further described in the subchapters below. As part of the EU Hydrogen Week, the HIGGS project and the final results were presented in a closing conference as an official side event. The event was well attended by the hydrogen and gas community. Furthermore, a project brochure was produced with the aim to condense the project results and make them available in a well edited and illustrated way, even after the end of the project. This brochure was distributed both in printed and digital form at the closing conference.

Moreover, the knowledge exchange between the project team and its external advisory board (EAB) played a major role in the back and forth project results discussions. Therefore, four EAB meetings have been held. The 1st online in October 2020, the 2nd online in March 2022, the 3rd in person (hybrid) in Huesca at FHA in December 2022, and the last meeting, one day prior to the closing conference in Brussels (hybrid) during the EU Hydrogen Week in November 2023 (20th November 2023).

2.4.1 Synergies with ongoing projects

2.4.1.1 Projects with synergies

Throughout the project lifecycle, the identification of similar projects, funded in recent years, and relevant initiatives was carried out in order to discover synergies and organize common activities. During the project, the following projects have been identified with great synergies: HyDelta, THyGA, SuperP2G, MefHySto, and Heavenn. To enhance interaction with metrology-related projects, in addition to MefHySto, joint activities were expanded by the H2GAR and LivingH2 projects, which addressed metrology tasks partially.

2.4.1.1.1 HyDelta (2020-2022) and HyDelta 2.0 (2022-2023) → Part of the Generation Hydrogen-Cluster

HyDelta (<https://hydelta.nl/>) was a national research program in the Netherlands aimed at safely integrating hydrogen into the existing infrastructure for gas transport and distribution. The cooperation program aimed to remove barriers to innovative hydrogen projects. Innovations closest to market introduction were tackled first. The main objective was to collect and build on current and planned international studies and initiatives linked to the following topics:

- Technical adaptation in the natural gas network
- Safety during use
- Metering of hydrogen
- Odorization and visibility
- Standardization and norms
- Development of educational processes
- The operation of blending obligations
- Economy of the hydrogen value chain

The interaction with the HyDelta project mainly took place within the framework of the horizon results booster, the wind meets gas events in Groningen and through regular exchange with the project coordinator Dr. Julio Garcia (New Energy Coalition).

2.4.1.1.2 Super P2G (2019-2022) → Part of the Generation Hydrogen-Cluster

SuperP2G (<https://www.superp2g.eu/>) interconnected leading P2G initiatives in five countries, ensuring joint learning. Each national project focused on different challenges, where researchers teamed up with local need-owners to co-create solutions. SuperP2G focused on improving existing tools, including open access, as well as developing a new open tool based on the OptiFlow and H2IndexII tools. This was supplemented with analysis of regulation and markets, as well as stakeholder involvement.

The main objective of SuperP2G was to lower the threshold for need-owners to validate and put P2G into practice for "Smart Energy Systems", "Sectorial Integration", as well as "Local & Regional development." The sub-objectives of the consortium were to:

- Optimize P2G systems by connecting leading national projects/regions and their corresponding need-owners in the EU to utilize synergies with regard to evaluation tools and procedures
- Showcase the potential for P2G in each involved country and derive pan-European conclusions with respect to the technology, market conditions, and stakeholder adaptation
- Raise visibility and knowledge levels about the possibilities with P2G throughout Europe and especially in the involved countries.

Synergies in regard to the analysis of regulations and markets as well as a shared group of stakeholders were identified and already utilised through coordinated events like GAT | WAT and Wind meets gas. The project closing event of SuperP2G took place in Brussels in from the 22nd to the 23rd of March 2023. During this occasion, HIGGS project material was presented and stakeholders have been connected.

2.4.1.1.3 MefHySto (2020-2023) → Part of the Generation Hydrogen-Cluster

The MefHySto project (<https://mefhysto.eu/>) addressed the need for large-scale energy storage required for a shift to renewable energy supply. Such storage was necessary to supply energy at peak times when renewable sources fluctuated. A possible solution for energy storage was the large-scale use of hydrogen. Metrological traceability in the energy infrastructure for hydrogen storage was crucial. Thus, improved knowledge of chemical and physical properties of hydrogen as well as traceable measurements and validated techniques were imperative.

Main objectives of MefHySto were:

- Development of online measurement of hydrogen quality
- Improvement of Equations of state for hydrogen-enriched natural gas and pure hydrogen
- Examination of air and hydrogen quality effects on fuel cell operation
- Implementation of reversible storage methods like metal hydride storage and cryo storage, with the development of unified methods and protocols for reliable characterisation
- Addressing underground gas storage (UGS) issues in geological storage and storage in natural gas pipelines by tackling metrological and thermodynamic challenges

Synergies concerning hydrogen quality and shared stakeholder groups were identified and utilized for both projects. Workshops and project events were combined, as seen during the EGERID event or during the MefHySto closing event in Berlin from the 3rd to 5th July 2023.

2.4.1.1.4 THyGA (2020-2023)

The objective of the THyGA project (Testing Hydrogen Admixtures for Gas Appliances, <https://thyga-project.eu/>) was to study the impact of hydrogen blends in natural gas on residential and commercial

gas appliances. This assessment took into account technical, safety, lifetime, and environmental performance. The project consortium was composed of the French energy company Engie as the coordinator and eight other European partners, including laboratories, gas companies, and manufacturers representing different applications. The consortium identified and recommended the adequate codes and standards needed to address the new challenges linked to these activities. This identification was performed by:

- Screening and segmenting the portfolio of appliance technologies in the domestic and commercial sectors and assessing the impact of hydrogen admixtures.
- Testing up to 100 residential gas appliances to provide a generic protocol that could be adapted for virtually any appliance.
- Developing a validated certification protocol for different levels of H₂ in natural gas.
- Making recommendations for manufacturers and decision-makers along the gas value chain for appliance design, manufacture, and certification.

A first contact with the THyGA project coordinator was established through the HIGGS project right from the start. Synergies, especially concerning the Regulations, Codes, and Standards aspects of both projects, were identified. Furthermore, in regard to the development of the roadmap, leakage testing, and other topics, cooperation between both projects was found to be useful. Therefore, a joint workshop was held on 15.12.2021 to exchange ideas and discuss synergies. FHA, as the HIGGS coordinator and thus, the project's delegate, was invited to all EAB meetings held by THyGA for information exchange as a member of their EAB.

2.4.1.1.5 H2GAR: H₂ Gas Assets Readiness

H2GAR was a group of European gas transmitters that was formed earlier in the year to share knowledge about pipelines, compressors, separation, metering, safety, and storage. The working groups were structured as follows:

- WG1 focused on network materials, components, operation, and associated issues.
- WG2 concentrated on compressor stations.
- WG3 specialized in membranes.
- WG4 dealt with metering and other instrumentation.
- WG5 focused on safety.
- WG6 was dedicated to underground gas storage.

The HIGGS consortium had identified important areas for collaboration. HIGGS was represented during a H2GAR PSC meeting at the 18th November 2022.

2.4.1.1.6 LivingH₂ (2019-2024)

The project LivingH₂ (<https://eriq.eu/livingh2>) aims to demonstrate a complete solution for a renewable hydrogen power supply in a living laboratory environment, utilizing an H₂ fuel cell cogeneration (H₂-FC-CHP) system. The consortium was widely positioned and characterized by a French-German collaboration. The development of pure H₂-CHP could have had a drastic impact on the energy sector between the years 2030 and 2050, as renewable hydrogen was an essential solution for energy storage to increase the share of renewable energy within the sector. Pure H₂-FC-CHP could have become a CO₂-free energy solution for buildings, gradually replacing existing natural gas-based CHP solutions. Main objectives have been the following:

- Developed an all-in-one solution for regenerative H₂ energy supply in a laboratory environment using domestically approved standards.
- Generated electricity and heat through the fuel cell cogeneration system for use within the building, incorporating photovoltaic, electrolyser, and storage tanks.
- Operated with an odorized H₂ supply line using a micro-odorization station.
- Developed an odorant-resistant fuel cell membrane electrode assembly (MEA) by applying a textured catalyst layer.
- Conducted techno-economic analysis of the all-in-one solution and compared it with alternative technologies.

ERIG supported this project in its communication and dissemination activities. In the framework of LivingH₂, a European final event with stakeholders at DSO and TSO levels, as well as other actors from industry, research, and academia, will take place in 2024. This event will also be used to disseminate the results of HIGGS, if deemed suitable.

2.4.1.1.7 Heavenn

HEAVENN (<https://heavenn.org/>) comprises a wide range of projects with related and supporting complementary studies. Experience and best practices will be gathered, tested, and translated into a means of demonstrating the replicability of this concept in Europe and beyond. HEAVENN is a large-scale programme of demo projects bringing together core elements: production, distribution, storage and local end-use of hydrogen (H₂) into a fully-integrated and functioning “H₂ valley” (H₂V), that can serve as a blueprint for replication across Europe and beyond. The concept is based on the deployment and integration of existing and planned project clusters across six locations in the Northern Netherlands, namely Eemshaven, Delfzijl, Zuidwending, Emmen, Hoogeveen and Groningen. The main goal is to make use of renewable hydrogen across the entire value chain, while developing replicable business models for wide-scale commercial deployment of H₂ across the entire regional energy system. HEAVENN aims to maximise the integration of abundant renewable energy sources available in the region, both onshore (wind and solar) and offshore wind, using H₂ as: (i) a storage medium to manage intermittent and constrained renewable inputs in the electricity grid; and (ii) an energy vector for further integration of renewable inputs and decarbonisation across other energy sectors beyond electricity, namely industry, heat and transportation. Within the ERIG activities there was a close exchange and joint dissemination activities like on the Wind Meets Gas 2022’s parallel session on Hydrogen Transport Infrastructure. As this project is still ongoing, HIGGS results will be of importance for the project and shared at the next occasion, e.g. on the project meeting that should take place in 2024.

2.4.1.2 Horizon results booster

Additionally and in relation to synergies with ongoing projects, HIGGS had applied for the Horizon Results Booster Service, an initiative by the European Commission. This service focused on developing and executing a "Portfolio Dissemination & Exploitation Strategy." It was divided into two main streams addressing Dissemination & Exploitation strategies, activities, and goals. The aim of the Dissemination services (Module A and B) was to strengthen the capacity of Project Groups (PGs) in disseminating and maximizing the dissemination of a portfolio of results, offering a wider and more comprehensive view to potential users. The aim of the Exploitation service (Module C) was to support single projects in exploiting their research results and enhancing beneficiaries' capacity to improve their exploitation strategy. Within the HIGGS project, Module A and Module C (FHA) were conducted. Module B was scheduled to be carried out in September 2022. As Module C focused on the

exploitation of results, this was detailed in D7.5 "Update2 of the plan for dissemination and exploitation of results." In Module A, and as illustrated in Table 2, a project group was formed (Generation Hydrogen Cluster - decarbonizing the gas sector through hydrogen). It comprised the following members:

Table 2: Project group: Generation Hydrogen Cluster

Project	Organization
HIGGS	European Research Institute for Gas and Energy Innovation (ERIG a.i.s.b.l.) Aragon Hydrogen Foundation (FHa)
MefHySto	European Research Institute for Gas and Energy Innovation (ERIG a.i.s.b.l.)
HyDelta	New Energy Coalition
SuperP2G	European Research Institute for Gas and Energy Innovation (ERIG a.i.s.b.l.)
Energy Storage	DGC- Danish Gas Technology Centre

The Project Group proceeded with Module A of Service 1 within the Horizon Results Booster, formalizing their collaboration. The outcomes of the analysis conducted during Module A shaped the primary objectives for the Project Group's dissemination efforts. These objectives encompassed various project goals:

Firstly, they aimed to address knowledge gaps surrounding the potential impact of elevated hydrogen levels on gas infrastructure, its components, and management. Secondly, they focused on mapping technical, legal, and regulatory barriers and enablers. Thirdly, the projects aimed to conduct tests, validate systems, and perform safety assessments for hydrogen transportation.

Moreover, the initiatives sought to provide tools and procedures to promote the implementation of P2G (Power To Gas) in planning and operational aspects within integrated energy systems. They also aimed to showcase stakeholder opportunities and potential pitfalls regarding P2G within the regulatory framework.

Furthermore, these efforts addressed metrological and thermodynamic issues related to large-scale hydrogen storage in underground gas storages (UGS) and the conversion of existing UGS from natural gas to hydrogen. They aimed to facilitate the adoption of technology and measurement infrastructure developed in the project by various entities in the measurement supply chain, standard development organizations, end users, and energy research sectors.

The key stakeholders identified for the Project Group included large enterprises, start-ups, SMEs, distribution system operators (DSOs), transmission system operators (TSOs), gas infrastructure companies, policy makers, funding agencies (including EU and national digital agencies).

The document presented the primary output of HRB Module B Portfolio Dissemination Plan, designed for planning and execution. This plan aimed to identify, coordinate, and converge on practical dissemination actions for the Project Group to collectively undertake.

Taking Module A findings and recommendations into account, the Portfolio Dissemination Plan (PDP) had several objectives:

- Identify a joint mission statement for the Project Group's activities.
- Identify collective dissemination activities based on a series of dissemination Expert packages.
- Develop a simple but detailed action plan for implementation.

- Determine target stakeholders for these activities.
- Create dissemination assets, such as a factsheet and a video brief, for the Project Group.
- Design and provide online training modules on dissemination for Project Group members as part of Module B.

Lastly, the Project Group had planned specific joint dissemination activities:

- Creating a text about the cluster for inclusion on the ERIG website and other project websites.
- Drafting a news release to announce the cluster's establishment and the webpage's official launch.
- Generating multiple social media posts to promote the news release across the project's existing social media channels.

Joint communication and dissemination activities have already taken place within the project group as part of conferences and events. The branding created by the service has not yet been officially launched as the timeline did not seem convenient. However, the project group has kept itself open to using the branding for the continuation of C&D activities after the end of the projects.

2.4.2 Publications and media impact

2.4.2.1 Brochure

With the aim of summarising the main results from HIGGS and presenting them in a graphically prepared and attractive document, a brochure was produced at the end of the project. The cover is shown in Figure 5. This brochure was distributed together with the final HIGGS event on the 21st November in Brussels. The brochure was printed for distribution on site as well as during and after the project. The brochure is also available digitally (website⁷). When the brochure was created, particular care was taken to condense the content to the most important points and to draw attention to the far more detailed reports and papers with appropriate graphics. The brochure summarises key outcomes and provides links to reports, publications, and deliverables.

Among other aspects, the brochure emphasised the three main topics within HIGGS:

1. Material and component testing under a hydrogen atmosphere.
2. Techno-economic modeling of repurposing European gas grids.
3. Potentials, barriers, and enablers of hydrogen injection in Europe.

⁷ <https://higgsproject.eu/higgs-project-brochure/>



Figure 5: HIGGS brochure cover

2.4.2.2 Scientific papers and other communications

Publications in high-impact scientific journals were planned, along with dissemination in dedicated journals, magazines, and associations like Hydrogen Europe, HYER, and others. For all participants in the Horizon 2020 program, it was necessary to meet a number of requirements related to disseminating any project results. These requirements included ensuring open access to all peer-reviewed scientific publications and attempting to provide open access to other types of publications such as monographs, books, reports, etc. Since most of the results were expected to be achieved by the end of the project, scientific publications would be written at a later stage or are even planned after the end of the project. One paper was written with the initial results of the testing loop and was published in the International Journal of Hydrogen Energy (special issue EHEC22) in June 2023.

<https://www.sciencedirect.com/science/article/abs/pii/S0360319923025880>

Additionally there is one paper estimated to be published after the end the project and that includes the outcomes from WP4.

2.4.2.3 General media impact

The HIGGS project was set to execute various Public Relations (PR) actions, and multiple press releases were planned for distribution. It was anticipated that several articles, interviews, or news pieces would be published in mainstream media throughout the project's duration. The initial press release yielded media impact results, including:

1. **20 minutos:** [Aliaga subraya que HIGGS es un proyecto clave para impulsar la descarbonización en Europa y que Aragón puede liderar](#) (Alexa Rank in Spain 56, aprox 64.5 million monthly visits).
2. **Heraldo:** [Aragón lidera desde Walqa un proyecto clave para la descarbonización en Europa](#) (Alexa Rank in Spain 317, aprox 8.7 million monthly visits).
3. **EuropaPress:** [Aliaga subraya que HIGGS es un proyecto clave para impulsar la descarbonización en Europa y que Aragón puede liderar](#) (Alexa Rank in Spain 187, aprox 7.8 million monthly visits).
4. **El Periódico de Aragón:** [Aragón lidera un proyecto para descarbonizar la economía](#) (Alexa Rank in Spain 403, aprox 3.2 million monthly visits).

5. **Diario del Alto Aragón:** [Arturo Aliaga asiste en Huesca a la presentación del proyecto HIGGS de la Fundación Hidrógeno](#) (aprox 2.62 million monthly visits)
6. **Energy News:** [HIGGS, un proyecto de hidrógeno clave para impulsar la descarbonización en Europa](#) (No public traffic data available)
7. **PV Magazine:** [La Fundación Hidrógeno Aragón coordina un proyecto para impulsar la descarbonización en Europa](#) (No public traffic data available)
8. **Interempresas:** [El proyecto HIGGS, de la Fundación Hidrógeno Aragón, presentado en sociedad](#) (No public traffic data available)
9. **APPICE:** [HIGGS, un proyecto de hidrógeno clave para impulsar la descarbonización en Europa](#) (No public traffic data available)
10. **Aragón Hoy:** [Arturo Aliaga asiste a la presentación del proyecto HIGGS de la Fundación Hidrógeno](#) (No public traffic data available)

2.4.2.4 Online repository

The dissemination had foreseen to make results publicly available following the Guidelines on FAIR Data Management in Horizon 2020 and the guidance concerning the Open Research Data Pilot at the European Research Council under Horizon 2020. The platform "Zenodo" was selected as the online repository to deposit the scientific data from HIGGS. Every aspect of managing this data was supported by Deliverable D1.5 Data Management Plan. This plan describes a dynamic document that was regularly updated and uploaded to the project website, allowing access for anyone interested in accessing the data generated within the project framework. Continuous reporting of the research data are provided on the HIGGS website⁸.

2.4.3 Organized Events

In this section the major events organized and executed by the HIGGS consortium are listed.

2.4.3.1 External Advisory Board (EAB) meetings

In order to increase the impact of the project and to have a direct exchange with external stakeholders, an external advisory board (EAB) was formed and maintained during the project. With a total of 18 different companies, associations and institutes the EAB was composed of potential end users, TSOs, DSOs, manufacturers, and policy makers. This advisory board mainly had an advisory role and created an important feedback loop between the consortium and stakeholders.

In total and during the course of the project four EAB meetings have been organized:

- 1st EAB Meeting: 20th October, 2020 online
- 2nd EAB Meeting: 25th April, 2022 online
- 3rd EAB Meeting: 1st of December at FHA, Huesca, Spain
- 4th EAB Meeting: 20th of November 2023, Brussels Belgium during EU Hydrogen Week

These events were mainly centered around an exchange on the HIGGS methodology and the results obtained. Therefore, there was one meeting at the beginning of the project to discuss the methodology and three at the middle and end of the project, as most of the results were available at this point. The focus was always on discussing the results and getting feedback from the board. The meeting in Huesca is particularly noteworthy. Although this meeting took place as a hybrid meeting, most of the board members were present in person, as FHA presented the test platform used in the project.

⁸ <https://higgsproject.eu/public-data-in-zenodo-repositories/>

The board members also had the opportunity to present their activities at this event and to get to know each other, which was very well received. Impressions from the meeting are displayed in Figure 6.



Figure 6: Impressions from the 3rd EAB meeting

The last and fourth meeting finally took place in Brussels and one day before the HIGGS closing event. Here, the Board was once again given a detailed insight into the results before they were presented to the public at the conference.

2.4.3.2 HIGGS online Event

In M10, a public online event was conducted to compensate for the absence of opportunities to promote and showcase the project at other events in 2020, which were cancelled or postponed due to COVID-19. During the event, the project was presented, along with the progress achieved within each active work package (WP), as shown in Figure 7.

The workshop saw participation from ca. 100 attendees representing all target groups. Information from the event have been shared on the website⁹.

⁹ <https://higgsproject.eu/higgs-online-event/>

Agenda		
Total Event Duration 10:00-12:00		
1. Introduction to Fuel Cells and Hydrogen Joint Undertaking		Alberto Garcia (Project Officer - FCHJU)
2. Introduction to HIGGS		Vanessa Gil Hernández (Project Coordinator – FHA)
3. Legal, regulatory and technical aspects		Alberto Carezo Alarcon & Lola Storch de Gracia (Redexis)
4. Testing Facilities		Javier Sánchez Lainez (FHa)
5. Techno-Economic Modelling		Luiz Carlos Reichenbach de Sousa (OST)
6. Pathway towards integrating H ₂ in EU gas networks		Michael Walter (DVGW)
7. Conclusion		Felix Künkel (ERIG)

Figure 7: Agenda of HIGGS online event

2.4.3.3 EGERID 2021

The European Gas and Energy Research Innovation Days (EGERID), organized by ERIG, were held online from November 15th to 19th, 2021. Over the course of five days, various stakeholders participated in six hours of presentations, ten hours of deep dive workshops, and nine hours of discussions, encompassing the entire hydrogen value chain - production, transport, metrology, storage, and utilization (s. agenda in Figure 8).

The European Gas and Energy Research and Innovation Days					
	15th Nov Opening Day - National research and European approach	16th Nov P2G in the regional context Day	17th Nov H2 tolerance of the gas infrastructure Day	18th Nov H2 Handling and Metrology Day	19th Nov Closing Day – Review, summary and outlook
Morning Session	10:00-12:00 Conference • Opening by ERIG President, Dr Linke • Keynote by DG Regio, Helene Chiray • Keynote by H2 Network North Rhine Westphalia, Dr Kattenstein • Highlight research relating to ERIG Country Members	09:00-12:00 Conference • Opening by SuperP2G coordinator, Prof Marie Münster, DTU • Keynote by ERA-NET, Fredrik Lundström, Swedish Energy Agency • Keynote by EVIDA, Peter Kristensen • The business case for P2G – HEAVEN and SuperP2G • SuperP2G region WIVA P&G and the Potential for H2 for Industry – JKU-Linz • Panel discussion	09:00-12:00 Conference • Opening by HIGGS coordinator, Dr Vanessa Gil, FHA • Keynote by Hydrogen Europe Research, Luigi Crema • Keynote by ENSTOG, Thilo von der Grün • Hydrogen in the transport grid – HIGGS and H2 Backbone • Hydrogen in gas utilisation - ThyGA • Panel discussion	09:00-12:00 Conference • Opening by MeHySto coordinator, Dr Michael Maiwald, SAHJ • Keynote by European Metrology Network Energy Gases, Annarita Baldan • Keynote by Open Grid Europe, Tobias van Almsick • Hydrogen metrology and underground storage – Gasunie and MeHySto • Hydrogen metrology and refueling stations – H2Mobility • Panel discussion	09:00-12:00 Conference • Reflections from the ERIG Research Community • Summary and review of the Deep Dives • Summary and review of the conference by SuperP2G, HIGGS and MeHySto
Lunch	12:00-13:00	12:00-13:00	12:00-13:00	12:00-13:00	
Afternoon Session	13:00-15:00 • Further highlight research relating to ERIG Country Members • Panel discussion with the leading scientists of the ERIG Community	13:00-15:00 Deep Dive • Focus on: Allocation, size and operation of P2G in the future energy system • Focus on: Economics of power-to-gas: Imports and offering flexibility	13:00-15:00 Deep Dive • Focus on : - Legal, regulatory and technical aspects of H2 admixing - Techno-economic modelling and validation, enablers and interoperability H2/NG grids	13:00-15:00 Deep Dive • Focus on: Online ppb – Quality influence along the value chain • Focus on: (closed) Focus on: Equation of State	
Virtual Fair	10:00-16:30 Continuous	09:00-16:30 Continuous	09:00-16:30 Continuous	09:00-16:30 Continuous	

Figure 8: EGERID agenda with the HIGGS event on 17th of November

On the third conference day, dedicated to the overarching topic of hydrogen tolerance within the gas infrastructure, the HIGGS project was featured. As the project coordinator, FHA explained how HIGGS contributes to facilitating the decarbonization of the gas grid and its usage by addressing

knowledge gaps regarding the potential impact of high hydrogen levels on the gas high-pressure grid, its components, and management. Representatives from Hydrogen Europe Research and ENTSOG welcomed the project, and expert speakers linked it to the European Hydrogen Backbone initiative by OGE (Open Grid Europe) and the hydrogen utilization project THyGA (ENGIE). A subsequent deep dive session focused on intermediate results of the HIGGS project, covering legal, regulatory, and technical aspects of hydrogen admixing, techno-economic modeling and validation, enablers, and interoperability of hydrogen/natural gas grids.

During EGERID, the HIGGS consortium also conducted a workshop titled "Hydrogen Tolerance Deep Dives," delving into specific content from WP2 and WP5. Exclusively for experts in this field, the workshop provided a platform for sharing in-depth knowledge and mutual learning. Each workshop lasted up to two hours and featured two insight presentations by experts from both inside and outside the HIGGS project team. Interested parties could suggest topics for future Deep Dive Sessions. The application process for participants, speakers, and suggested topics was managed through the project website and selected by the consortium beforehand. Workshop videos and presentations were recorded and uploaded on YouTube, disseminated at events such as the EGATEC conference, and displayed on screens at the exhibition stand to increase visitor awareness. Plans were also made to publish these materials via the HIGGS website¹⁰.

2.4.3.4 Workshops on Hydrogen Tolerance

HIGGS had the goal of organizing at least two workshops following the project kick-off. These workshops were specifically designed to target key stakeholders in the field, particularly high-pressure natural gas grid operators. In 2020 and 2021, two workshops were organized, with one held in close collaboration with two related projects (THyGA and SuperP2G).

Furthermore, there was a workshop conducted during the EGERID event in M23. The HIGGS consortium hosted a workshop titled "Hydrogen Tolerance Deep Dive," focusing on the specific content of WP2 and WP5. Furthermore, a major workshop was conducted during the HIGGS final conference. This concluding event aimed to present all final results, addressing all relevant stakeholders.

2.4.3.5 HIGGS Closing event during the European Hydrogen Week

The European Hydrogen Week is one of the biggest annual events dedicated to hydrogen under the leadership of the Clean Hydrogen Partnership and its members, the European Commission, Hydrogen Europe, and Hydrogen Europe Research. With over 5 000 participants the event focused on the following:

- A policy conference (hybrid) focused on Research and Innovation activities in the EU.
- A High-Level Conference centering around global, European, and national hydrogen developments and including policy decision-makers, C-suite industry representatives, and experts across the hydrogen value chain as speakers.
- A Business-to-Business Conference that served as a source of inspiration for stakeholders, covering a wide range of aspects related to technology, market, and finance developments in the hydrogen sector.
- Hydrogen Europe's Flagship Event and Expo took place in person in Brussels in parallel.

¹⁰ <https://higgsproject.eu/higgs-at-the-european-gas-and-energy-research-and-innovation-days/>

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In 2023 the event took place from the 20th to the 24th of November and HIGGS was represented with 3 activities.

On November 20th, 2023, the HIGGS project hosted an external advisory board meeting. This session was not public but allowed the project team to share preliminary results and gather feedback from the external experts and stakeholders. Their insights and suggestions contributed to refining the project's direction and conclusions.

This event was followed by the official closing conference held on November 21st, 2023. This event marked the end of the project and served to publish its research outcomes. Attended by ca. 60 experts, stakeholders, and industry representatives, the conference presented the topics stated in the agenda, as shown in Figure 9.

No.	Topic	Who	Duration
<i>Welcoming-Breakfast (8:30-9:00)</i>			
TOP1	Introduction to the project	Dr. Javier Sánchez Laínez (Aragon Hydrogen Foundation)	9:00
	Joint Undertaking programm overview and projects on gas grids	Dionisis Tsimis (Project Officer Clean hydrogen Partnership)	9:25
TOP2	Keynote: H₂ suitability of steels (SyWest H₂)	Tillmann Wiegold (Open Grid Europe)	9:25
	Behavior of the gas grid to hydrogen admixing. Results of the experimental campaign	Dr. Virginia Madina (Tecnalia) Dr. Javier Sánchez Laínez (Aragon Hydrogen Foundation)	- 10:25
	Discussion and questions	ERIG / Audience	
<i>Break (10:25-10:55; Coffee)</i>			
TOP3	Keynote: Growing Hydrogen in the EU	René Schutte (Gasunie)	10:55
	Technoeconomic validation and modelling, enablers and interoperability considerations	Salvatore Oricchio (Eastern Switzerland University of Applied Sciences)	- 11:55
	Discussion and questions	ERIG / Audience	
TOP4	Keynote: Perspectives on Hydrogen in the EU	Alberto Cerezo Alarcón (Redexis)	11:55
	Pathway towards integrating H₂ in EU gas networks	Dr. Michael Walter (DVGW German Technical and Scientific Association for Gas and Water)	- 12:55
	Discussion and questions	ERIG / Audience	
TOP5	Closing	Dr. Javier Sánchez Laínez (FHA)	12:55-13:00
<i>Break (13:00-14:00; Business Lunch together with the Hydrogen Europe Research General Assembly)</i>			

Figure 9: Agenda for the closing conference

The agenda covered the systematic and experimental test results of components and materials, techno-economic evaluations on repurposing and admixing of H₂ in the European gas grid, and a strategic pathway for hydrogen integration. The HIGGS topics were introduced by keynote speakers from the industry, who also participated in the discussion. Participants were engaged in the discussions as well and during the breaks and networking sessions. Impressions are shown in Figure 10 and results are available on the HIGGS website¹¹.

¹¹ <https://higgsproject.eu/higgs-closing-conference-during-eu-hydrogen-week-on-november-21st-2023-in-brussels/>

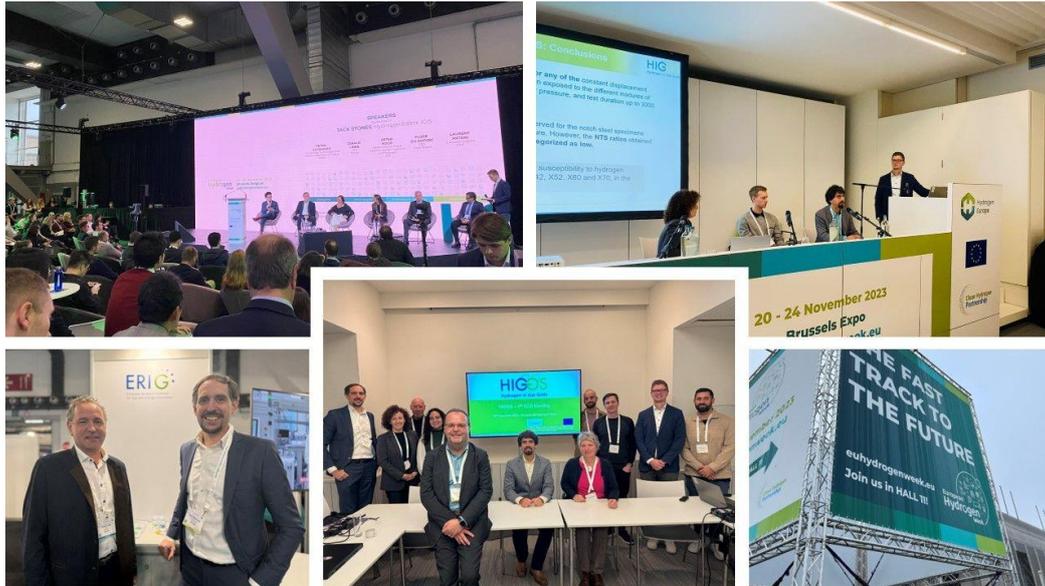


Figure 10: Impressions from the HIGGS closing event

Furthermore, throughout the entire European Hydrogen Week, ERIG's exhibition stand served as a platform to showcase the HIGGS project. Visitors had the chance to explore project materials and the official project brochure, gaining insights into the project's objectives, methodologies, and significant outcomes related to hydrogen integration into gas grids.

2.4.4 Attended conferences, events and fairs

HIGGS partners have presented the results obtained during the project at conferences, fairs and events related to the target groups stated on section 2.2. A list of attended conferences, events and fairs is provided in Table 3. The list provides over 60 activities attended or organized by the HIGGS consortium. In the event of cancellations, alternative events were identified, and replacements found.

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Table 3: Conferences, events and workshops organized or attended during the project.

Nr.	Type	Title	Who	Where	When	Action	Main Target group	Attendants	Status
1	Conference	Spanish Renewable Gas Conference	Redexis	Madrid, Spain	03.03.2020	Presentation	Scientific Community	>200	Participated
2	Workshop	ENTSOG WS 1	ERIG	online	10.03.2020	Participation	Industry	<50	Participated
3	Conference	Green Gas Mobility Summit 2020	Redexis	online	01.04.2020	Presentation	Industry	<100	Participated
4	Workshop	ENTSOG WS 2	ERIG	online	21.04.2020	Participation	Industry	<50	Participated
5	Workshop	ENTSOG WS 3	ERIG	online	29.04.2020	Participation	Industry	<50	Participated
6	Event	THyGA Webinar	FHA	online	06.05.2020	Participation	Scientific Community	<50	Participated
7	Internal	1st External Advisory Board Meeting	All	online	20.10.2020	Presentation	Industry	<50	Participated
8	Internal	HIGGS Online Event	All	online	27.10.2020	Presentation	Scientific Community	<50	Participated
9	Conference	GAT WAT	All	Cologne, Germany	24.11.2020	Exhibition	Industry	<500	Participated
10	Internal	WP2 Workshop	All	online	22.02.2021	Presentation	Scientific Community	<50	Participated
11	Conference	World Hydrogen Iberia	FHA	online	23.03.2021	Presentation	Scientific Community	<100	Participated
12	Event	Hannover Fair H2FC	ERIG	Hannover, Germany	12.04.2021	Exhibition	General Public	Ca 5 000	Participated
13	Event	2nd International Hydrogen Symposium	ERIG	Hamburg, Germany	14.06.2021	Presentation	Industry	<100	Participated
14	Workshop	Entsog Prime Movers Group	FHa/ERIG	online	17.06.2021	Presentation	Industry	<50	Participated
15	Event	World Hydrogen Technologies Convention (WHTC)	FHA	online	20.06.2021	Presentation	Scientific Community	3 000	Participated
16	Conference	Renmad Hydrogen 2021	Redexis/FHA	online	14.09.2021	Presentation	Policy Makers	100	Participated
17	Conference	Wind Meets Gas	ERIG	Groningen, Netherlands	07.10.2021	Presentation	Policy Makers	300	Participated
18	Conference	EGERID	All	online	15.11.2021	Presentation	Industry	200	Participated
19	Event	Programme Review Days (PRD) 2021	FHA	online	02.12.2021	Presentation	Policy Makers	2 500	Participated

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20	Event	THyGa Workshop	FHA	online	15.12.2021	Presentation	Scientific Community	30	Participated
21	Workshop	1st Task Force industrial needs Hydrogen Quality	FHA/ERIG	online	22.02.2022	Participation	Industry	50	Participated
22	Workshop	2nd Task Force industrial needs Hydrogen Quality	FHA/ERIG	online	16.03.2022	Participation	Industry	50	Participated
23	Conference	9th Session of the Group of Experts on Gas	FHA	online	24.03.2022	Presentation	Scientific Community	100	Participated
24	Workshop	3rd Task Force industrial needs Hydrogen Quality	FHA/ERIG	online	07.04.2022	Participation	Industry	50	Participated
25	Internal	2nd External Advisory Board Meeting	All	online	25.04.2022	Presentation	Industry	30	Participated
26	Workshop	READY4H2: Steering Group meeting 14	ERIG	online	02.05.2022	Presentation	Scientific Community	30	Participated
27	Conference	EHEC 2022	FHA/Redexis	Madrid, Spain	18.05.2022	Presentation	Scientific Community	1 000	Participated
28	Workshop	4th Task Force industrial needs Hydrogen Quality	FHa/ERIG	online	31.05.2022	Participation	Industry	50	Participated
29	Conference	EGATEC	ERIG	Hamburg, Germany	13.06.2022	Poster	Industry	400	Participated
30	Conference	World Hydrogen Energy Conference (WHEC)	FHa	Istanbul, Turkey	26.06.2022	Presentation	Scientific Community	3 000	Participated
31	Workshop	Steuerungskreis H2VorOrt	ERIG	Online	30.08.2022	Presentation	Scientific Community	30	Participated
32	Conference	Iber-REN and World Hydrogen Iberia	FHA	Madrid, Spain	13.09.2022	Participation	Scientific Community	250	Participated
33	Conference	Hydrogen Dialogue 2022	ERIG	Nuremberg, Germany	21.09.2022	Presentation	Industry	800	Participated
34	Conference	Wind Meets Gas	ERIG	Groningen, Netherlands	07.10.2022	Exhibition	Policy Makers	500	Participated
35	Conference	GAT WAT	ERIG	Berlin, Germany	18.10.2022	Exhibition	Industry	1 000	Participated
36	Conference	European Hydrogen Week	ERIG	Brussels, Belgium	24.10.2022	Exhibition	Policy Makers	3 200	Participated
37	Meeting	PSC meeting of H2GAR project	FHA	online	18.11.2022	Presentation	Scientific Community	20	Participated

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38	Workshop	Sustainable integration of Green hydrogen on island electrical systems	Redexis	Gran Canarian	28.11.2022	Presentation	Industry	84	Participated
39	Workshop	3rd External Advisory Board Meeting	All	FHA, Huesca, Spain	01.12.2022	Presentation	Industry	30	Organized
40	Workshop	Presentation of WP6 on Knowledge Exchange workshop - Hydrogen production in Europe	DVGW	online	06.12.2022	Presentation	Scientific Community	20	Participated
41	Workshop	Presentation of WP5 on Topic Group Smart Energy Systems Meeting	OST	online	14.12.2022	Presentation	Scientific Community	20	Participated
42	Meeting	H2 Think Tank Event	Redexis	Murcia, Spain	15.12.2022	Presentation	Policy Makers	13	Participated
43	Workshop	Plant Engineering Workshop	FHA	Zaragoza, Spain	12.01.2023	Presentation	Industry	30	Participated
44	Workshop	Hydrogen and renewable gases: grid distribution and regulatory aspects	Redexis	Hybrid, Zaragoza Spain	09.02.2023	Presentation	Scientific Community	56	Participated
45	Conference	CIM 21st International Metrology Congress	ERIG	Lyon, France	07.03.2023	Exhibition	Scientific Community	<10 000	Participated
46	Event	Hy2Market Kick-Off and SuperP2G Closing + Policy Evening on the relevance of P2G	ERIG	Brussels, Belgium	22.03.2023	Exhibition	Industry	200	Organized
47	Workshop	Gas Infrastructure Think Tank, Face to face meeting at FHA	FHA	Huesca, Spain	29.03.2023	Presentation	Industry	15	Organized
48	Conference	MefHySto Project closing conference	ERIG	Berlin, Germany	03.05.2023	Conference	Scientific Community	200	Organized
49	Conference	World Congress of Chemical Engineering - WCCE	FHA	Buenos Aires, Argentina	04.06.2023	Presentation	Scientific Community	>3 000	Participated
50	Conference	GAT WAT	ERIG	Cologne, Germany	06.09.2023	Exhibition	Industry	<1000	Participated
51	Conference	Wind Meets Gas	ERIG	Groningen, Netherlands	12.10.2023	Exhibition	Industry	<500	Participated
52	Conference	Programme Review Days (PRD) 2024	FHA	online	15.11.2023	Conference	Scientific Community	<500	Participated
53	Workshop	4th External Advisory Board Meeting	ERIG/All	Brussels, Belgium	20.11.2023	Presentation	Scientific Community	25	Participated

D7.6 - Final summary of communication, awareness and dissemination actions

54	Event	Hydrogen Week and Programme Review Days (PRD) 2023	All	Brussels, Belgium	20.11.2023	Conference	Policy Makers	3 200	Participated
55	Event	HIGGS Closing conference during EU Hydrogen Week	ERIG/All	Brussels, Belgium	20.11.2023	Conference	Policy Makers	3 200	Organized
56	Event	Hydrogen Dialogue 2023	ERIG/DVGW	Nuremberg, Germany	06.12.2023	Exhibition	Industry	<1 000	Participated
57	Conference	European Hydrogen Energy Conference (EHEC) (2 presentations)	FHA/Redexis	Bilbao, Spain	06.03.2024	Presentation	Scientific Community	1 000	Upcoming
58	Conference	EGATEC	ERIG	Hamburg, Germany	18.06.2024	Exhibition	Industry	5500	Upcoming

A few highlighted activities are presented in the following and more in detail.

2.4.4.1 WHTC, EHEC, and WHEC

The World Hydrogen Energy Convention, the European Hydrogen Energy Conference, and the World Hydrogen Energy Conference were events of very high international importance regarding the topic of hydrogen. They brought together researchers, academicians, industrial professionals, and all individuals interested in the field of hydrogen energy to contribute to the development of low-carbon/carbon-free solutions with hydrogen. The HIGGS project and its results were presented at each of these conferences in 2021 and 2022, and will be presented again in 2024.

2.4.4.2 ENTSOG Workshop

Within a total of 3 workshops, HIGGS participated in the ENTSOG workshops: “Roadmap for gas grid 2050”. In detail they tackled the following topics:

- 10th March, 2020 - Workshop 1: EU Gas Market for New Gases
- 21st April, 2020 - Workshop 2: Innovative Regulatory Approach for the Energy Transition - Sector Coupling & Regulatory Sandbox
- 29th April, 2020 - Workshop 3: Principles for EU Gas Qualities, handling of Hydrogen and CO₂ Transportation

HIGGS also participated in the ENTSOG Prime Movers Group on the 17th June 2021.

2.4.4.3 Task Force industrial needs hydrogen quality

To enhance interaction with standardization groups, the project actively participated in the Task Force industrial needs hydrogen quality workshops. This task force regularly deliberated on the necessary quality criteria for H₂, engaging partners from standardization bodies, gas network operators, and industrial H₂ producers and consumers. This topic held significant importance for HIGGS, particularly concerning injection and extraction criteria and the development of the H₂ roadmap in WP6. Consequently, HIGGS consistently engaged in meetings organized by DVGW.

2.4.4.4 Joint Project Online Event

In M3, a public online event was conducted in collaboration with the THyGA and the SuperP2G project to host a public presentation for all projects to reach relevant stakeholders. The primary objective was to enhance general awareness of the projects and their respective objectives. The workshop comprised a general pitch session for all projects and separate breakout sessions for the HIGGS and the SuperP2G project. Overall, ca. 200 individuals participated in the workshop, with over 50 attendees in the HIGGS breakout session.

2.4.4.5 Workshop on inventory and legal/regulatory framework of hydrogen in the transmission grid (WP 2)

In M14, a closed workshop was conducted to facilitate the work and required data collection in WP 2. A total of 38 individuals were directly invited, of whom 25 took part in the workshop. The event specifically targeted European TSOs and gas associations at the EU level. During the workshop, the current status of the work package was presented, and the necessity for thorough data collection to fulfil the tasks in WP 2 was reiterated to the participants.

2.4.4.6 Hydrogen Dialogue 2022 and 2023 in Nuremberg

This event brought together decision-makers from business, politics, and science across the entire hydrogen value chain and provided a space to present new technologies in the accompanying expo area. It focused on the following main topics:

- The Opportunity of the Century H2: Germany as a Hydrogen Country
- Scaling Up & Speeding Up the Market
- Framework for a Successful Hydrogen Business
- Lessons Learned Worldwide
- Applications: Industry, Energy, Mobility & Transport
- Ramp-up of the European Hydrogen Infrastructure & Role of H2 Imports

Considering the topics and the audience, this event was well-suited for the HIGGS project, which was planned to be presented by ERIG, representing the project. This conference was attended twice with an exhibition stand in 2022 and 2023 and a project presentation in 2023.

2.4.4.7 Wind Meets Gas 2022 and 2023

The Wind meets gas event is a yearly invite only event with over 500 participants from the European hydrogen community. In 2022 the focus was on the North Sea energy challenges and hydrogen valleys connected. In 2023 the focus was on Northwestern Europe, the North Sea(s) countries in particular and their joint responses to the challenges posed by the European Green Deal Industrial Plan.

Specific offshore challenges have been addressed from various stakeholder perspectives, such as, how to integrate sustainable energy electrons and molecules. Many representatives of Hydrogen Valleys and involved stakeholders will share their hands-on experiences, seek for modalities to align mutual interest and to create lasting cross-border alliances.

In 2022 and 2023, the HIGGS project was presented with project material at and exhibition and in matchmaking session with interested parties.

2.4.4.8 European Hydrogen Week in Brussels (EXPO)

The European Hydrogen Week is one of the biggest annual events dedicated to hydrogen under the leadership of the Clean Hydrogen Partnership and its members, the European Commission, Hydrogen Europe, and Hydrogen Europe Research. With over 5 000 participants the event focused on the following:

- A policy conference (hybrid) focused on Research and Innovation activities in the EU.
- A High-Level Conference centering around global, European, and national hydrogen developments and including policy decision-makers, C-suite industry representatives, and experts across the hydrogen value chain as speakers.
- A Business-to-Business Conference that served as a source of inspiration for stakeholders, covering a wide range of aspects related to technology, market, and finance developments in the hydrogen sector.
- Hydrogen Europe's Flagship Event and Expo took place in person in Brussels in parallel.

The event took place from the 24th to the 28th of October 2022, HIGGS was represented with project material at the exhibition stand as well as during networking occasions.

2.4.5 Planned activities after project end

The following activities are planned to ensure that the results of the project and the project itself continue to generate impact after the end of the project.

2.4.5.1 Website

The website will continue to operate for one year after the end of the project, namely the year 2024, to ensure continued access to the data, events and reports stored there. After that, the HIGGS website will be backed up on the ERIG homepage in condensed form and limited to the most important information. A sub-category will be created there under the Projects tab, as has been done for other projects in the past.

2.4.5.2 Events

Finally, the HIGGS results will continue to be disseminated at events where appropriate. Specifically, the following can be mentioned here:

1. European Hydrogen Energy Conference (EHEC), 6th of March 2024, Bilbao, Spain.
Two abstracts have been submitted by FHA and Redexis and both have been selected for oral presentation.
2. EGATEC, 18th to 19th June, 2024 Hamburg, Germany
Co-Hosted by ERIG and results will be distributed
3. European final stakeholder event for the project LivingH2 in 2024

Further opportunities will arise in the course of time. In addition, ERIG is currently preparing a digital platform via which project results and findings from the ERIG network can be made available at trade fairs and events. This platform will also include the HIGGS results in the future.

2.4.5.3 Brochure

The brochure will serve as a further medium for disseminating the HIGGS results. To this end, it was printed in at least 100 copies for each partner and of course also made available digitally¹². This means that it can be distributed to interested parties at events or other suitable opportunities.

¹² <https://higgsproject.eu/higgs-project-brochure/>

3 Conclusions

The present document summarises the communication and awareness plans in its previous versions and the methodology, target groups, communication channels and dissemination activities throughout the course of the HIGGS project and what is planned beyond the project lifetime.

As the project was severely affected by the COVID-19 restrictions, particularly in the first 2.5 project years, the focus of the communication and dissemination strategy was distributed differently. At the beginning of the project, the creation and provision of digital media was prioritised. This made it possible to draw attention to the project even though there were few to no physical activities and events. In addition, online activities were prioritised and focused on. This enabled the dissemination stream of information to be maintained despite COVID-19 restrictions. Following this phase and with the easing of restrictions, there was an increased focus on physical meetings and events. The entire consortium increased its participation in local events, exhibitions and conferences. This was beneficial for dialogue with stakeholders and also made impact generation even more effective.

Acknowledgements

This project has received funding from the Fuel Cells and Hydrogen 2 Joint Undertaking (now Clean Hydrogen Partnership) under Grant Agreement No. 875091 'HIGGS'. This Joint Undertaking receives support from the European Union's Horizon 2020 Research and Innovation program, Hydrogen Europe and Hydrogen Europe Research.



Annex 1 Updated templates and funding lines



Presentation Title, Arial 28pt Bold

Optional Subtitle, Arial 18 pt

Speaker, Arial 18pt
Name of Orga

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www.HIGGSproject.eu

Figure 11: Adjusted template for power point presentations

MEETING OCCASION

DATE	VENUE	ATTENDANTS
	(FHA)	Vanesa GIL (VG), Manuel MUNIESA (MM), Laura ABADIA (LA), Rodrigo PEREZ (RP), Teresa VILLUENDAS (TV), Javier SANCHEZ (SJ), Rubén CANALEJAS (RC), Paula LLORET (PL), Pedro CASERO (PC)
	(DIVGW)	Michael WALTER (MW), Armin BOLLLEN (AB)
	(TECNALIA)	Pablo BENGURIA (PB), Ekain FERNANDEZ (EF), Virginia MADINA (VM)
	(OST)	Markus FRIEDL (MF), Luiz Carlos DE SOUSA (LS)
	(REDEXIS GAS)	Maria Dolores STORCH DE GRACIA CALVO (MG), Marcos LOPEZSERRA (ML), Agustín PASQUAL (AP), Alberto CEREZO (AC)
	(ERIG)	Hans RASMUSSEN (HR), Felix KUNKEL (FK)

AGENDA:

Topic	Presented by
TOP 1 Title of the topic	N.N. (Come)
TOP 2 Content	
TOP 3	
Coffee break	
TOP 4 Background, roles and expectations	
TOP 5	

Disclaimer: The information shared in the KOM meeting (presentations, discussions), both orally and in written form, has to be considered and treated as confidential unless the disclosing party considers it as no confidential information.

Lunch break

MINUTES:

Topic	What	Who	When
TOP 1 Presented by			
TOP 2 WP2 presented by			
TOP 3 presented by			
TOP 4 presented by			
TOP 4 presented by			

Disclaimer: The information shared in the KOM meeting (presentations, discussions), both orally and in written form, has to be considered and treated as confidential unless the disclosing party considers it as no confidential information.

Other				
* I - Information	A - Action	U - Done		

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Figure 12: Adjusted template agenda and minutes



Figure 13: Adjusted funding line on the HIGGS website (<https://higgsproject.eu/>)