2024 Global Hydrogen Industrial Association Alliance

2024 GHIAA Annual Report

May 15, 2025

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Preface and Acknowledgment

This report is an annual report for 2024, published by the Secretariat of the Global Hydrogen Industrial Association Alliance (GHIAA), covering hydrogen trends by country over the year.

The contents of the report were made with contributions from GHIAA members, including representatives of hydrogen industrial associations from 24 countries.

The Secretariat would like to express sincere gratitude to

- H2KOREA
- Fuel Cell & Hydrogen Energy Association
- Hydrogen Europe
- Asociación Chilena de Hidrogeno
- Asociación Española de Hidrógeno
- Australian Hydrogen Council
- Canadian Hydrogen and Fuel Cell Association
- Consortium for the Development of the Hydrogen Economy in Argentina
- France Hydrogène
- Hydrogen and Fuel Cell Association of Singapore
- Hungarian Hydrogen and Fuel Cell Association
- Hydrogen Denmark
- Hydrogen Poland
- International Hydrogen Fuel Cell Association
- Japan Hydrogen Association
- La Asociación Colombiana de Hidrógeno
- Norwegian Hydrogen Forum
- Netherlands Hydrogen and Fuel Cell Association
- The German Hydrogen and Fuel Cell Association
- Hydrogen Energy Association
- Vetgas Sverige
- EnergyIN
- Costa Rica Hydrogen Alliance
- Hydrogen Egypt
- Czech Hydrogen Technological Platform (HYTEP)
- New Zeland Hydrogen Council

for their dedicated support for the publication of this report.

Greetings from the Chair

Dear Fellow Members of the Global Hydrogen Industrial Association Alliance:

During 2024 we entered the fourth year of advancement for our Alliance with continued growth in membership, actions, and mission. Each of our now twenty-six members works to advance hydrogen in our home countries. We are the advocates defining industry needs and advancing key policies. Through GHIAA we have opened added opportunities for collaboration across North and South America, Europe, Asia, and Oceania.

During this past year GHIAA took steps to project a stronger presence in the international community with resolutions to join the International Hydrogen Trade Forum (IHTF) and to take part in the Conference of the Parties (COP).

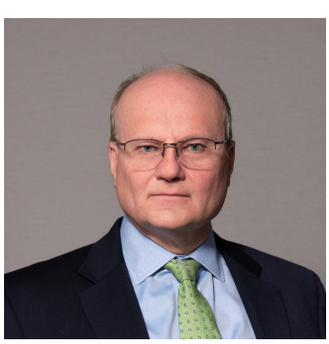
In addition to broadening our reach internationally, the Secretariat has taken steps to advance a core mission of GHIAA as a convenor of industry collaboration. The "Find Your Hydrogen Partners" tool is a platform that can grow with our global industry and assure GHIAA members have knowledge of partners and participants in every market.

While 2024 was a year of progress, global and regional challenges have tempered expectations of industry growth. Our national trade associations are more vital than ever to assess impediments and communicate actions within our governments. Our connection to GHIAA informs us of the opportunities and challenges globally so that we can have the best knowledge as we address factors in our home countries.

Success of the global hydrogen industry needs GHIAA, and the active interest of our member associations to continue to cooperate and collaborate.

I look forward to working with you to continue our progress into our fifth year and beyond.

Sincerely,



Frank Wolak

President & CEO, Fuel Cell and Hydrogen Energy Association
Chair GHIAA

Greetings from the Vice-Chair

Dear Fellow Members of the Global Hydrogen Industrial Association Alliance,

As we publish the third edition of the GHIAA Annual Report, I would like to thank our members for their continued contributions to this shared platform. GHIAA has grown as a global network and now connects hydrogen associations from twenty-six countries. This expansion reflects the growing momentum behind international collaboration in the hydrogen sector.

In 2024 and early 2025, five new countries—Egypt, Portugal, Costa Rica, New Zealand, and the Czech Republic—joined GHIAA. We hope the Secretariat's steady efforts have played a small part in creating an open and reliable platform that welcomes new members.

The Annual Report and the "Find Your Hydrogen Partners" platform are two important tools for advancing collaboration across our network. These are not simply projects; they are platforms designed to reflect our collective voice. When members participate meaningfully, these tools become the bridge between national priorities and global momentum—turning shared information into shared impact.

We sincerely thank all members who took the time to contribute valuable updates and data. At the same time, we recognize that several voices are still missing—and this must change for GHIAA to grow into a truly representative platform. Stronger participation will not only improve the quality of our tools, but also enhance GHIAA's ability to support meaningful collaboration

GHIAA was created to do what no single member could do alone: connect insights across borders, surface shared challenges, and identify opportunities that benefit all. As complexity grows, the ability to share early signals and build collective understanding becomes not just helpful—but essential.

Korea, as the Secretariat, remains fully committed to supporting this work with consistency and transparency. But GHIAA's success depends on more than coordination. It requires action, contribution, and shared responsibility from every member.

I look forward to building on this momentum with you in 2025 and beyond. Together, we can ensure GHIAA remains a trusted voice in shaping the global hydrogen economy.

Sincerely,

Jaehong Kim

President, Korea Hydrogen Alliance (H2KOREA)
Vice Chair, GHIAA

Greetings from the Vice-Chair

Dear Fellow Members of the Global Hydrogen Industry Association Alliance (GHIAA),

As Vice Chair of GHIAA and CEO of Hydrogen Europe, I am honoured to reflect on an important year for hydrogen, not only within Europe but across the global energy landscape. In 2024, hydrogen continued to move from vision to reality, becoming a cornerstone of national and regional strategies to decarbonise economies, enhance energy resilience, and bolster industrial competitiveness. Within the GHIAA network, we've seen continuous momentum and collaboration across regions with a shared global ambition.

Across Europe, 2024 was a momentous year on the political front, with institutional changes setting the stage for renewed focus on industrial transformation and energy transition. The re-election of President Ursula von der Leyen and the announcement of the "Draghi Report" on European competitiveness signalled a renewed focus on enabling innovation and advancing technologies that are critical to our collective future. Hydrogen is recognised as one of these transformative technologies—one that will shape industrial policy, decarbonisation pathways, and the EU's global competitiveness in the years ahead. In this context, our efforts as associations remain essential— bridging industry and policy, shaping frameworks, and ensuring that hydrogen's value is clearly understood and supported.

The announcement of the results of the first auction under the European Hydrogen Bank, and later the launch of a second auction, brought the Bank's total capacity to close to €2 billion in 2024. This is not just a financial boost. It's a vote of confidence in hydrogen's critical role and a signal to global markets that Europe is committed to scaling solutions. Still, this momentum must be met with sustained collaboration. Initiatives like Hydrogen Valleys and the Hydrogen Bank demonstrate the value of building on proven frameworks, but to succeed in the long term, we must work on continued cooperation on a global scale.

GHIAA remains a unique and vital platform for sharing best practices, coordinating strategies, and amplifying the voice of our industry. Its presence as a global platform is a reflection of the trust and openness that exist among its members. As our industry expands, so does the need to coordinate,exchange knowledge, and amplify what works. There are still challenges ahead, but there is also a wealth of experience within this alliance that can help address them.

I am proud to serve alongside such dedicated partners and look forward to deepening our cooperation in 2025.

Warm regards,

Jorge Chatzimarkakis

CEO, Hydrogen Europe
Vice-Chair GHIAA

Ⅰ. Introduction of GHIAA

Faced with the escalating global climate crisis, the international community is accelerating efforts to achieve decarbonization, with hydrogen emerging as a pivotal energy carrier. Recognizing the need for coordinated private-sector engagement, leading hydrogen industry associations from 24 countries agreed to establish GHIAA (Global Hydrogen Industrial Association Alliance) as a unified platform for international cooperation.

GHIAA was officially launched on May 25, 2022, with the goal of strengthening private-sector collaboration within the global hydrogen industry. Initiated by H2KOREA, the foundation for GHIAA was laid during the H2 Mobility+Energy Show in September 2021, where a Letter of Intent was signed among key associations to form a global alliance. Following six months of preparatory work, including the development of the Articles of Association and the establishment of an official website, GHIAA was inaugurated with 18 founding members. During the 1st General Meeting, the Articles of Association were formally adopted, and governance structures were established, appointing Jaedo Moon, Chair of H2KOREA, as GHIAA's first Chair, and Frank Wolak, President and CEO of FCHEA, as Vice-Chair.

Building on this momentum, GHIAA expanded its leadership in October 2022 at the 2nd General Meeting in Belgium, appointing Jorgo Chatzimarkakis, CEO of Hydrogen Europe, as an additional Vice-Chair. Marking GHIAA's first engagement with the broader climate agenda, a joint statement was issued during COP 27, calling for enhanced action by governments and stakeholders to advance the hydrogen economy. Members also agreed to launch an Annual Report to share developments in the global hydrogen industry.

In February 2023, the 3rd General Meeting was held in California during the Hydrogen & Fuel Cell Seminar, with participation from Dolf Gielen, Hydrogen Lead at the World Bank, who introduced the Hydrogen for Development Partnership (H4D). GHIAA expanded to 20 member organizations, broadening its global footprint.

In September 2023, the 4th General Meeting and Forum were convened alongside H2MEET in Korea. Member associations from eight countries presented national hydrogen strategies and projects, culminating in the release of the Seoul Joint Declaration, emphasizing the urgent need for global coordination and financial support for the hydrogen economy. GHIAA membership grew to 21.

At the 5th General Meeting held during Hyvolution Paris in January 2024, GHIAA members agreed to publish the 2024 Annual Report and further strengthened global collaboration. Cross-continental initiatives, including support for the launch of the Three Seas Hydrogen Council, were introduced to foster regional hydrogen cooperation. GHIAA's membership expanded to 24 associations, and preparations for the 6th General Meeting began.

At the 6th General Meeting held during FCAVC Shanghai in June 2024, GHIAA members agreed to expand global engagement to emerging regions, including Brazil and Africa, and to launch a business matching platform by the end of 2024. These initiatives marked a significant step in reinforcing GHIAA's global outreach and fostering cross-regional partnerships. Preparations for the next General Meeting began, with the United States, Korea, and Europe under consideration as potential host countries.

Today, GHIAA stands as a key platform connecting the global hydrogen industry, fostering private-sector collaboration, and promoting collective action toward the realization of a sustainable hydrogen economy.

▌Members of GHIAA ▐

Korea | USA | EU | Chile | Spain

Australia | Canada | Argentina | France | Singapore

Hungary | Denmark | Poland | China | Japan

Colombia | Norway | Netherlands | Germany | UK

Sweden | Portugal | Costa Rica | Egypt | New Zeland

Czech Republic

Ⅱ. Introduction of GHIAA Members

H2KOREA
Republic of Korea

■ General Information

- Chair: Jaehong Kim, President
- H2KOREA was established in 2017 to promote hydrogen production, storage, supply and utilization. It was designated as the official hydrogen promotion agency in July 2020 under the Hydrogen Law to help advance the hydrogen economy in Korea. We serve as a bridge between government ministries and industry, driving the advancement of hydrogen energy and supporting the expansion of related sectors. Our mission is to expedite the transition to a low-carbon hydrogen economy by addressing policy challenges, strengthening institutional frameworks, and promoting private sector initiatives for hydrogen supply. Committed to innovation and collaboration, we aim to lead the global hydrogen industry and build a sustainable, future-ready ecosystem.
- 142 partners, including public/private enterprises, research institutes, local governments, etc.

Business Area

- Revision of the law and government policy, including Hydrogen Law, National Roadmap and Strategy, certification scheme, etc.
- Foster and support hydrogen-specialized enterprises; matching domestic companies with abroad, supporting domestic companies to enter overseas markets etc.
- Research on hydrogen technology, mobility and energy infrastructure, standardization, etc.
- Plan and Investigate activities for FCEV-related Projects at domestic and abroad
- Provide statistics on hydrogen, hydrogen charging stations, hydrogen electric vehicles, and related information

Fuel Cell and Hydrogen Energy Association (FCHEA) United States

Basic Information

- President & CEO: Frank Wolak
- Chairman: Kareem Afzal, CEO, PDC Machines
- The Fuel Cell and Hydrogen Energy Association (FCHEA) is the hydrogen industry association in the United States representing leading organizations advancing production, distribution, and use of innovative, clean, safe, and reliable hydrogen energy.

  FCHEA provides a consistent industry voice to regulators and policymakers, driving support at the federal and state levels. Our educational efforts promote the environmental and economic benefits of hydrogen energy and fuel cell technologies.

  FCHEA originated in 1989 as the National Hydrogen Association, which later merged with the U.S. Fuel Cell Council.

  The mission of FCHEA is to advance the commercial production, distribution, and use of hydrogen in the United States and beyond.

FCHEA Activities Areas

- FCHEA is focused on achieving our mission through three primary activities:
  - Leading national advocacy to encourage all levels of government in the United States to support fuel cell and hydrogen technology research, development, and deployment.
  - Providing a unified voice in shaping regulations, codes, and standards to enable commercial growth, while ensuring the highest levels of consumer safety and satisfaction; and
  - Educating the public and key opinion and policy leaders on the economic and environmental benefits of fuel cell and hydrogen technologies.

- FCHEA's policy priorities focus on three main pathways to further drive the industry forward:
  - Tax Incentives to drive private investment and adoption;
  - Infrastructure programs to expand deployment of hydrogen and fuel cell technologies at scale; and
  - Securing appropriations funding to advance hydrogen and fuel cell research, development, demonstration, and deployment.
- To achieve these goals, FCHEA operates a number of technical Working Groups and Committees, collaborating with our members on specific initiatives and regulatory efforts to help the industry thrive.
- FCHEA runs two committees focused on advocacy and stakeholder outreach and education: the Government Affairs Committee and the Communications and Marketing Committee.
  - The Government Affairs Committee engages and educates U.S. federal and state decision makers and opinion leaders to provide support for federal and state hydrogen and fuel cell funding, policy initiatives, incentives, and regulations.
  - The Communications and Marketing Committee is focused on expanding awareness of fuel cell and hydrogen technologies to a range of audiences, including media, potential partners, and end users.
- FCHEA operates five market sector Working Groups, each covering a major area of the hydrogen and fuel cell industry. Two groups address hydrogen production and distribution three groups cover the use of hydrogen across power generation, transportation, and commercial applications.
  - Production: Reflecting the diversity of clean hydrogen production pathways, both from traditional and renewable feedstocks.
  - Distribution: Hydrogen distribution, compression, and storage.
  - Power: Confluence of hydrogen, fuel cells, and power markets both as a production vector and end-use market.
  - Transportation: All applications of hydrogen and fuel cell transportation across land, sea, and air.
  - Commercial: Intersection of hydrogen and emerging markets for commercial processes like steel and cement production, use of hydrogen as a chemical feedstock such as ammonia, hydrogen for heating, and others.
- Each of these Working Groups is focused on not only the technical codes and standards needs for each industry segment but also provides a forum for discussion of the range of other challenges and opportunities that these sectors face, including policy needs and stakeholder outreach development. Once issues are identified, they may be raised for further action either within the working group or for action by the Government Affairs Committee or Communications and Marketing Committee.

Hydrogen Europe
European Union

Basic Information

- CEO : Jorgo Chatzimarkakis

2024 marked a significant year the European political agenda, first and foremost because of the European elections that marked the beginning of Ursula von der Leyen's second term as Commission President. The proposed ambitious new formation of the European Commission comes at a pivotal time for hydrogen and the energy transition, and it will be tasked with getting us over the line on our crucial 2030 climate targets.

The new leadership will also be tasked with implementing the Future of the European Competitiveness report, so-called "Draghi report" from the name of its author, former Italian Prima Minister Mario Draghi. The highly anticipated report, commissioned by President von der Leyen, analysed barriers to competitiveness in Europe, offering concrete recommendations to tackle obstacles to innovation, high energy prices, funding needs, regulatory simplification, and the urgent need for digitalisation and defence capacities. Hydrogen is recognised in the report as a transformative technology that will play a pivotal role in driving European competitiveness. Due to the structural changes that Europe will face in the upcoming decade, the hydrogen sector should build upon and extend frameworks that have proven to be effective, such as the Hydrogen Bank and Hydrogen Valleys, but also bring elements of novelty and rationalisation when it comes to legislation, governance and the financial firepower to achieve ambitions.

H2Chile
Chile

H2 Chile - Chilean Association of Hydrogen

Founded in 2018 as a non-profit association, it seeks to accelerate the energy transition by promoting the use of renewable hydrogen (H2R) and its derivatives in industrial, commercial, residential, and mobility applications that enable the decarbonization of the economy.

Our vision is to be a promoter of zero-emission development in Chile and the world, and it aims to position Chile as one of the leading countries in the production and export of renewable hydrogen.

Our members come from the private, public, and academic sectors, with 40 professional partners and around 100 leading companies. With the current partners, H2 Chile can cover the entire value chain of renewable hydrogen.

Our strategic focuses

To achieve our mission, we work on five strategic focuses to strengthen the hydrogen ecosystem:

1. Collaborate in the creation of public policies
2. Facilitate the availability of financing
3. Stimulate the concretion of projects
4. People awareness and capacity building
5. National and international collaboration networks

Our value proposal

- Support the coordination of a strategic agenda that allows the transition to a renewable hydrogen economy.
- Public-private collaboration with academia.
- Promote the production and use of renewable hydrogen in all its forms: storage, transportation, energy, and fuel.
- Be part of a network of companies and professionals linked to the value chain of renewable hydrogen.
- Provide networking opportunities among various key players in the national and international renewable hydrogen industry.
- Encourage and participate in instances that enable collaboration among various international actors.

The map of renewable hydrogen projects in Chile

AeH2
Kingdom of Spain

■ Basic information

Representatives of the Board

Chairman: Mr. Javier Brey

Vicechair: Mr. Antonio González

Secretary: Mr. Miguel A. Peña

Representatives of the Managing Team

General Manager: Ms. Inés Gómez de Iturriaga

Technical Director: Ms. Marina Holgado

Contact: info@aeh2.org

The Spanish Hydrogen Association (AeH2) is the voice of the hydrogen industry in Spain. It represents almost 300 entities from across the hydrogen value chain. Among its partners are Spain's most active companies, institutions, and researchers regarding these technologies. The AeH2, positioned as a reference agent within the hydrogen sector, has been working since its foundation in 2002 to promote and encourage the development and growth of hydrogen technologies in Spain and to strengthen and enhance the national industrial fabric.

AeH2's promoting members are the following:

And AeH2's institutional members:

Main goals

The objectives of the AeH2 are to foster the development of hydrogen as an energy vector and its use in industrial and commercial applications. To that end, AeH2 works in these areas:

- Cluster: gathering sectors, bringing together companies, institutions, technology and research institutes, and universities, with activity in hydrogen technologies.
- R&D: support for research and development in hydrogen production, storage and distribution applications, and its use in various applications. As well as the promotion of startups and technological knowledge.
- Development: promoting the production, storage, and distribution applications of hydrogen.
- Education: offering professional education through specific courses already consolidated with various universities and training centers.

- Legislation: promoting laws and rules for the regulation of hydrogen as an energy vector.
- Dissemination: making hydrogen acknowledged as an energy vector by our society.

International collaboration

AeH2 fosters international cooperation at five different levels:

- Research, Development and Innovation (R&D&i): including joints efforts between universities, research centers and academic institutions from Spain and the partner country(ies), knowledge exchange between researchers, collaborative technology development, forming consortia to respond to international funding calls for hydrogen R&D projects, among others. This level of cooperation is usually coordinated through the PTeH2 (AeH2's initiative focused on R&D).
- Product: at this level, entities from each country work together on product commercialization. One develops or owns a product and the other supports its entry into the foreign market.
- Business – Level: this involves companies from both countries working together to jointly develop a new product or service. It emphasizes partnerships to leverage each other's expertise and resources.
- Project – level: companies from one country participate in specific projects within the other country. This could involve joint ventures, partnerships, or collaborations on large-scale hydrogen-related projects.
- Investment and Financial: financial investments where capital from one country supports companies or projects in the other. This includes funding hydrogen projects, investing in technologies or providing financial backing.

The AeH2 strongly collaborates with CDTI (for low – mid TRL international collaboration) and ICEX (for higher TRL and commercially ready solutions).

Additionally, AeH2 fosters bilateral collaboration relationships with over 20 countries, having signed 27 MoUs (by December 2024), sharing best practices, information on hydrogen technologies development, as well as national policies and funding opportunities.

AeH2 initiatives

- The Spanish Technological Platform of Hydrogen (Pte H2), managed by the AeH2, is funded by the Spanish Ministry of Science, Innovation and Universities. Its objective is to promote technological R&D in the hydrogen sector in Spain. The Platform is in continuous contact with the Public Administration to convey the needs of the sector and the priority lines of action in R&D to promote the development and implementation of these technologies in our country.

- The EHEC (European Hydrogen Energy Conference) is the leading European conference in the field of hydrogen energy. Hosted every two years, EHEC is organised by the Spanish Hydrogen Association (AeH2) and brings together experts, researchers and industry leaders in the field of hydrogen, providing a platform to share the latest advances, innovations and developments in hydrogen-based technologies. Following the great success of EHEC 2024, which had more than 1300 attendees from over 35 countries and more than 250 speakers from across the hydrogen value chain. The next edition of EHEC 2026 will be held in Seville (Spain) on 11, 12 and 13 March 2026.
- The Census of hydrogen projects is one of the most important initiatives of the AeH2 that shows hydrogen projects both in operation and planned from TRL 3 and up either led or participated by an AeH2 member. Through the interactive map and the analysis of the Census (annual report), the activity of the hydrogen sector in Spain can be easily visualized and tracked. The 2024 analysis of the Census, conducted in November, reported 361 presented by 83 AeH2 members showing a potential of electrolysis capacity to be installed aligned with Spanish NCEP goal of 12 GW in 2030. This report also includes the main barriers identified by project promoters, specific challenges and suggestions for improvement, stressing the importance of reducing or eliminating these barriers for the hydrogen sector in Spain to reach its full potential.

- The Association also participates in the project GREEN HYSLAND, which aims to deploy a fully functioning Hydrogen (H2) ecosystem on the island of Mallorca, Spain, turning the island into Europe's first H2 hub in Southern Europe. AeH2 mainly participates in the communication and dissemination of the project, Work Package 7 (WP7).

Australian Hydrogen Council
Austraila

General Information

CEO: Dr Fiona Simon

The Australian Hydrogen Council, or AHC, is the peak body for the clean and green hydrogen industry in Australia. With over 100 members, we represent the emerging hydrogen industry, connecting its stakeholders to collectively create a clean and resilient energy future that has hydrogen as a key part of the energy mix. AHC members are companies from the energy, transport, technology, consulting, and financial sectors. We work closely with all levels of government to develop the policy, funding, and regulatory settings to enable the hydrogen industry.

Please see
https://h2council.com.au/our-members/
for a full list of members.

Business Area

- Advancing Australia's development as a global hydrogen leader
- Promoting policies that fast-track the transition to clean and renewable hydrogen technologies
- Enhancing domestic and international collaboration across industry, government, academia, and the broader community
- Becoming the recognised and influential authority in the clean hydrogen sector.

Canadian Hydrogen and Fuel Cell Association Canada

Basic Information

- President and CEO: Ivette Vera-Perez

  The Canadian Hydrogen and Fuel Cell Association (CHFCA) is a national association that supports industry, academia, government agencies, financial organizations, and other stakeholders focused on hydrogen and fuel cell technologies and products. As the collective voice of Canada's world-leading hydrogen and fuel cell sector, the CHFCA's mission is to strengthen Canadian leadership, raise awareness of the benefits of the technology, and accelerate the adoption of its members' products and services in Canada and abroad. The CHFCA currently has 160+ members across Canada and regional affiliates in British Columbia, Alberta, Ontario and Quebec

  160+ members, including industry companies, government agencies and academic and research institutions

Business areas

Our mission is to champion the Canadian hydrogen and fuel cell sector and accelerate the adoption of our members' products and services, in Canada and abroad, by:

Enhancing business opportunities for members through networking and market development opportunities;

Promoting the economic, environmental and societal benefits of hydrogen and fuel cell energy solutions with policy makers to create an enabling environment for their increased adoption;

Supporting the development of regulations, codes and standards to ensure the safe and widespread application of hydrogen and fuel cell products; and, Increasing the literacy of hydrogen and fuel cells through relevant communications channels so businesses, investors, media, the general public and other stakeholders understand their relevance and opportunities within the energy sector.

H2ar Consortium Argentina

Basic Information

- Leading company: Y-TEC
- H2ar Consortium is a collaborative workspace between companies that are interested in developing the hydrogen economy in Argentina. It was established in October 2020. It is organized in 8 working cells, led by Y-TEC.
- 60 companies, as well as 10 public entities acting as collaborators.

Our main goals are:

- To unify a medium- and long-term common view to align efforts and reduce uncertainty for new implementations and business opportunities
- Create techno-economical models to calculate costs related to hydrogen production, transport, and end use.
- To promote pilot projects to boost the early uptake of these new markets.
- To collaborate with public entities in terms of regulation, normative and new developments, leading the voice of the industry

CURRENT MEMBERS

Further information: https://y-tec.com.ar/#/somos-y-tec/en/h2ar
Point of contact: H2ar@ypftecnologia.com

France Hydrogène
France

General Information

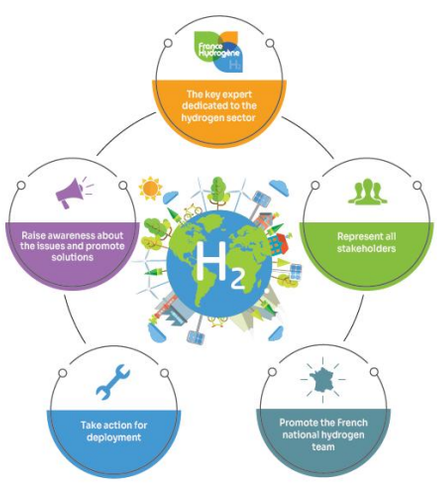
- President: Philippe Boucly

  With around 460 members, France Hydrogène brings together the stakeholders of the French hydrogen sector across the entire value chain: major industrial groups developing large-scale projects, innovative SMEs and start-ups supported by laboratories and research centres of excellence, associations, competitiveness clusters and local authorities committed to the deployment of hydrogen solutions. France Hydrogène is working closely to French region and provinces. The association has 14 local delegations, in the 12 metropolitan region and 2 French overseas territories".

Our mission

Acting together to develop all uses of hydrogen and making it a sustainable solution for the ecological transition.

Our main activities



Our objectives

France Hydrogène is working to:

- Structure an efficient, competitive and innovative French hydrogen sector,
- Share and promote the challenges of the sector,
- Communicate on the benefits and features of technologies,
- Facilitate societal consultation around national objectives and local initiatives,
- Develop the regulatory framework to support the deployment of hydrogen technologies in France.

Hydrogen and Fuel Cell Association of Singapore (HFCAS) Singapore

The Hydrogen and Fuel Cell Association of Singapore (HFCAS) was formed in Nov 2019 in response to Singapore's plan to decarbonize the energy sector through the introduction of a 4th switch focusing on low carbon alternative energy with green hydrogen as one of the options. HFCAS serves its members by providing a platform where they can explore networking and collaboration opportunities, both locally and overseas.

■ HFCAS has 6 strategic thrusts to guide our workplans.

First and foremost, there is a need to establish codes and standards for the import of green hydrogen and its downstream uses to support pilot trials and future deployment, regardless of the energy carrier. The scope will include the import of green hydrogen (in the form of ammonia, liquified hydrogen or liquid hydrogen organic carrier), off-loading and bunkering, processing, distribution and transportation and the various use cases such as fuel cell electric vehicles (FCEVs), power to gas, and stationary fuel cell systems.

Secondly, the green hydrogen economy will lead to many new jobs being created. Current jobs may be made redundant with the switch from internal combustion engines (ICE) vehicles to FCEVs for example, and new processes created with the gasification of liquified hydrogen and cracking of ammonia. It is therefore crucial for our workforce to acquire new skills to take on these new jobs. HFCAS will support this by developing courses either in partnership with 3rd party providers or by developing our own content that is relevant to Singapore context.

Furthermore, HFCAS will also engage the schools to explore the injection of hydrogen related content into the curriculum, partner with its members to provide internship opportunities to students from institutes of higher learning and support them in international events such as the Shell Eco-Marathon for greater exposure. HFCAS believes that for green hydrogen to be a critical factor in Singapore's decarbonization plans, it needs to be accepted by the public. We aim to create greater public awareness through events and roadshows to share about the properties of hydrogen, how it can be used safely and why is it important to Singapore, with the eventual goal of making hydrogen part our daily lives. In preparation for a green hydrogen economy, there are opportunities for Singapore to identify and support R&D projects that could help to improve the efficiencies in the green hydrogen production processes leading to reduction in overall cost. This is essential to provide economic justification for the use of green hydrogen. HFCAS will be able to work with the industry members who are keen to test-bed these solutions once they are ready. Our industry members have benefited from our webinar series where experts have shared information about the latest trends and projects in hydrogen. We have also partnered and supported with various international hydrogen event organisers such as the Singapore International Energy Week (SIEW) to expand our network. HFCAS will be planning for our 1st flagship event to bring together international experts and established organsiations to share on the latest trends and set up business opportunities with our local enterprises. Lastly, it is important for HFCAS to be plugged into the international network of hydrogen players. We have signed more than 10 MOUs with other hydrogen associations and organizations to establish opportunities for our industry members to work with overseas companies. With the launch of the Global Hydrogen Industrial Association Alliance (GHIAA) by H2 Korea, the various country hydrogen associations would come under one umbrella to discuss cross cutting issues and how we could collaborate on common themes.

Hungarian Hydrogen Association Hungary

In recent years it has become obvious that hydrogen – primarily green hydrogen (types of hydrogen produced in an environmentally-friendly way) – and hydrogen technologies will play a significant role in sustainable energy and transportation systems of the future. These technologies are essential for reaching decarbonisation objectives, integrating renewable energy resources and they also count potential from aspects of industrial development and economic growth. Based on this recognition the National Hydrogen Technology Platform (a Hungarian project organisation active in 2020-2021) turned itself into an independent legal entity: the Hungarian Hydrogen Technology Association from the 3rd November, 2021 (following the official registration of the Court of Company Registration in Hungary).

Strategic goals of the Association are comprehensive: from providing professional framework to industrial, economic and scientific cooperation in favour of establishing a hydrogen economy in Hungary, through facilitating organized cooperation of institutions and companies in the Hungarian market to all of these efforts establishing and strengthening the national hydrogen sector.

Our main objectives include:

- active participation in implementing the National Hydrogen Strategy including coordination of implementing the Green Hydrogen Truck Programme,
- keeping contact with members of the Association in favour of assessing professional needs and recommendations through the process of spreading hydrogen technology,
- professional support of setting up the necessary regulatory systems and conditions to disseminate hydrogen and hydrogen technology in Hungary,
- proactive contribution to generating pilot projects in the industry,
- organising conferences and professional events,
- establishing world-wide professional connections with hydrogen associations and companies and at the same time supporting Hungarian companies in initiating cooperation with first of all regional and EU contacts in various hydrogen projects,
- spreading knowledge, technology and shaping people's attitude connected to hydrogen and hydrogen technologies in the society by featuring the advantages of hydrogen in aspects of environment, climate protection and economy development.

In recent years, the Association has taken on an important role in the Central European region for the sake of professional consultation, technological and tender partnership.

These goals are served by the international events organized by the Association every year. One of these particularly important international events is the Central European conference starting the year Hydrogén Open.

The Hungarian Hydrogen Technology Association continuously monitors international developments related to hydrogen technology, updates the industry white book on developments in Hungary, and supports the work of its members.

In Hungary, carbon-free, so-called green hydrogen production started in three places.

With its 10 MW electrolyzer unit, MOLGROUP produces 1,600 tons of green hydrogen per year with

electricity from renewable sources, which it uses in its own hydrogen network during fuel production at the Danube Refinery.

The Bükkábrányi Energy Park is home to one of Hungary's largest solar parks, with a peak output exceeding 22MWp. Connected to this is the PEM electrolyzer equipment, which produces pure green hydrogen, with a nominal output of 1 MW, and which they want to support the use of green hydrogen for transport purposes.

Magyar Földgáztároló Zrt. operates a 2.0 MW electrolysis system at Kardoskút Underground Gas Storage. The electrolyser produces hydrogen by using the excess electricity, which is mixed with natural gas and delivered to end consumers through the natural gas supply system.

The Bükkábrány Energy Park


Magyar Földgáztáló Zrt. Aquamarine project

Further information: www.hh2.hu

- Application for membership or any inquires: office@hh2.hu
- Office address: Hungarian Hydrogen Association, H-1117 Budapest, Magyar Tudósok krt. 2.
- Executive Director: Csaba Vigassy, Mobile: +36.30.947.84.91

Hydrogen Denmark
Denmark

Brintbranchen
Hydrogen Denmark

Basic Information

CEO: Tejs Laustsen Jensen

Hydrogen Denmark brings together all hydrogen and Power-to-X (PtX) stakeholders in Denmark. We are a business organization, and represent the entire value chain from research to business, and from the production of renewable energy and energy technology such as fuel cells and electrolysis, to the use of hydrogen, methanol, ammonia and other electrofuels in the transport sector.

Our members together form a network that spans all parts of the industry. Our members consist primarily of companies but also research institutions, public institutions and network organizations. They all work with hydrogen, electrolysis and

fuel cells in connection with the transport, energy storage or production of green fuels.

As a member of Hydrogen Denmark, you become part of this network, you have an influence on the work of Hydrogen Denmark and can at the same time draw on the secretariat's expertise. You also get access to Hydrogen Denmark's weekly newsletter, which ensures insight into the latest initiatives, legislation, political development, technology and production — both in Denmark and internationally.

Hydrogen Poland
Republic of Poland

General information:

- CEO: Paweł Piotrowicz
- Vice CEO: Krzysztof Kochanowski
- Board Member: Beata Superson — Polowiec
- Board Member: Tomoho Umeda

Hydrogen Poland, an industry organization established in 2021, unites enterprises in the hydrogen economy, prioritizing the representation of Polish business interests globally.

Business Area:

- Advisory Services:
  Hydrogen Poland provides expert advisory services to enterprises involved in the hydrogen economy.
- Investment Support:
  The organization actively supports and facilitates investments in hydrogen technologies to drive innovation.
- Sector Synergy Identification:
  Hydrogen Poland identifies and fosters sector synergies to improve project efficiency and collaboration.
- Legislative Engagement:
  Actively participates in the legislative process, contributing to the shaping of regulations for hydrogen and fuel cell technologies.
- Expertise in Fund Acquisition:
  Excels in securing European investment funds to accelerate the implementation of hydrogen and fuel cell technologies in Poland.

Brief Introduction:

- In the face of unprecedented energy challenges, our association has tirelessly strived to contribute to the sustainable energy landscape and promote hydrogen as a key player in the global energy transition.

- Amidst the complexities of a changing energy paradigm and the geopolitical tensions arising from the conflict in Ukraine, Hydrogen Poland has remained steadfast in its commitment to innovation, collaboration, and a cleaner, more sustainable future.
- The organization's significant contributions, acknowledged by influential leaders in energy transition, climate action, and environmental improvement, highlight the impactful role played by its Board of Directors and dedicated employees. Notably, Hydrogen Poland's Board Members actively engage in shaping the industry landscape in Poland and Europe, offering expertise and counsel to Prof. Jerzy Buzek (former Prime Minister of Poland (1997-2001), the Member of European Parliament, rapporteur for the key regulation on the EU market for hydrogen, natural gas and renewable gases.
- Among many core competences performed by Hydrogen Poland's board members is to create more value to the hydrogen market by engaging in key industry events both in Poland and globally, leveraging their expertise to share valuable insights and contribute to constructive programs. From the European Economic Congress in Katowice to the Rotterdam World Hydrogen Congress, Connecting Green Hydrogen Europe 2023 in Madrid, and concluding with COP 28 in Dubai, these events serve as platforms for collaborative knowledge-sharing and strategic development within the hydrogen sector. Through their participation, Hydrogen Poland remains at the forefront of shaping industry discourse and fostering innovation.
- This brief report summarizes our most important efforts and the notable influence of our initiatives on the hydrogen sector in Poland and internationally.
- The year 2023 proved to be a time of increased work for Hydrogen Poland, starting at the beginning of the year with activities on regulatory and legal grounds.

Point of Contact:

Hydrogen Poland Association

Address: 40 Smolna Street, 00-375, Warsaw, Poland

Tax Identification Number (NIP): 6751745293

E-mail: biuro@h2pol.org

International Hydrogen Fuel Cell Association (IHFCA) People's Republic of China

Basic Information

Chairman: Ouyang Minggao

- Launched by China SAE, FORVIA, Toyota, Hyundai, SAIC, Sinopec, AngloAmerican & other leading companies and organisations, IHFCA is an international non-profit organization, promoting worldwide hydrogen collaboration and FCV rollout and commercialization.
- By the end of July 2023, the number of members has reached 86, covering 14 countries.
- Members cover the entire hydrogen and fuel cell industry chain.
- 78% enterprises, 22% research institutes, universities and NGOs.

Mission

- To promote exchanges and cooperation in the field of hydrogen energy and fuel cells
- To build an international exchange and cooperation platform covering the entire industry chain
- To optimize international technical standards and rules
- To promote information sharing and open science
- To promote global hydrogen energy and fuel cell technology progress and promotion
- To cultivate a market environment that promotes the large-scale application of hydrogen energy and fuel cells
- To promote the realization of carbon peaking and carbon neutrality goals

Business System and Scope

Business System	Hydrogen	Fuel Cell	Fuel Cell Vehicle
Industry and Policy Studies	Research on industry policies, strategies and plans		
Standards & Regulations	Develop national and international hydrogen, fuel cell and FCV standards		
International Cooperation	Strengthen worldwide cooperation with various activities and effective platforms		

Business Scope

Academic Exchange	Industry Research	IHFCA Standards	Collaborative Innovation	Member Service
Cooperation Mechanism and International Programs	Promote Policy and Regulation Formulation	Industry Promotion and Popularization	Facilitate the Transformation of Technological Achievements	Customized Project, and Build Cooperation Platform

■ Point of Contact:

International Hydrogen Fuel Cell Association

Address: Level 2, Xingzhi Building, No.37 of Rongxing North 3rd Street, Beijing Economic and Technological Development Zone, Beijing.

Telephone: +86(0)10 5091 1068

Email: IHFCA@ihfca.net

Japan Hydrogen Association Japan

■ Basic Information

Co-chairman :

- Takeshi Uchiyamada, Executive Fellow, Toyota Motor Corp.
- Takeshi Kunibe, Chairman of the Board, Sumitomo Mitsui Financial Group
- Akiji Makino, Chairman and CEO, Iwatani Corporation

The Japan Hydrogen Association (JH2A), was established in December 2020 with 88 private companies. Our unique feature is that companies from wide range of industries are participating in this organization. JH2A became an incorporated organization in April 2022 with 19 secretarial members seconded from various companies..

JH2A has five committees, Commercialization, Regulatory, External Relations, CO2 Free H2, and Finance. We work through five committees to identify and resolve issues for the development of hydrogen value chain.

We now have 376 members, including 25 executive members.

Executive Board Members	25 companies AsahiKASEI, Iwatani, INPEX, ENEOS, OBAYASHI, Kawasaki, Kansai Electric Power (power with heart), Kubota, KOBELCO, SHIONOGI, Sumitomo Corporation, CHIYODA CORPORATION, J-POWER, TOSHIBA, TOYOTA, Air Liquide, Panasonic, Marubeni, MS&AD Mitsui Sumitomo Insurance, SMBC, MITSUI&CO., MITSUBISHI KAKOKI KAISHA, LTD., MITSUBISHI GAS CHEMICAL, MUFG Mitsubishi UFJ Financial Group
Members	376 Companies/Organizations (as of July 2023)

Hydrogen Colombia
The Republic of Colombia

Executive Director: Monica Gasca

POC : monica.gasca@hidrogenocolombia.com

The Colombian Hydrogen Association is the official representative of the hydrogen industry in Colombia. Its mission is to promote a low-emission economy by accelerating the adoption of low-emission hydrogen and its derivatives as energy carriers, storage solutions, and industrial inputs.

Founded in May 2021, and launched alongside the Colombian Hydrogen Roadmap, Hidrógeno Colombia fosters the development of a robust hydrogen ecosystem through strong public-private collaboration. It brings together industry leaders, non-profit organizations, academic institutions, government agencies, international partners, and professionals committed to advancing Colombia's national decarbonization goals.

Today, the association comprises more than 40 members and strategic allies. These include:

Hydrogen Colombia's activities are focused on the following strategic objectives:

- Foster Networking: Facilitate collaboration between industry, academia, and public authorities to align collective efforts toward the development and effective implementation of sustainable hydrogen technologies and their derivatives.
- Disseminate Knowledge: Promote best practices and the benefits of hydrogen by building and sharing a strong knowledge base, both among members and with the public, to strengthen technical capabilities and human talent nationwide.

- Support Regulatory Framework Development: Advocate for legal adaptations and regulatory advancements necessary to position hydrogen as a key enabler of industrial decarbonization.
- Strengthen International Partnerships: Establish connections and alliances with regional and international organizations to exchange best practices and lessons learned, enabling the proper development of the local hydrogen market.
- Mobilize Investment in the Sector: Facilitate coordination between national and international entities managing funds to support project development and the deployment of sustainable hydrogen technologies.

Norwegian Hydrogen Forum (NHF)
Kingdom of Norway

Norwegian Hydrogen Forum

- General Secretary: Ingebjørg Telnes Wilhelmsen
- 100 members from industry, sub-contractors, the R&D sector, organisations and authorities.
- NHF is the national members' association for hydrogen and ammonia and was founded in 1996. Its members represent the entire hydrogen value chain, from producers, via distributors to end users, including both small and large energy companies, technology suppliers, research and authorities. NHF promotes the advantages of hydrogen and ammonia as energy carriers and seeks to establish a substantial home market for hydrogen and ammonia and to strengthen Norway's position as an international supplier of hydrogen, hydrogen technologies and competence.
- NHF works actively to disseminate key information in Norway on hydrogen and ammonia research and technology commercialization, market trends and international policy making.
- Actively promoting member's interests towards public authorities and decision makers in Norway and the EU.
- Fostering international collaboration by representing Norway hydrogen and ammonia industry abroad.
- Close collaboration since 2006 on knowledge sharing in the Nordic Hydrogen Partnership (NHP) to boost cross-sector implementation of hydrogen and fuel cell technologies with Nordic partner organisations Vetgass Sverige in Sweden, Brintbranchen in Denmark, VTT Technical Research Center of Finland and Icelandic New Energy on Iceland.
- Coordinating County Governor's Network: Sharing knowledge and exchanging information about regional plans and hydrogen strategies, cooperation on projects and public procurement.
- Email: post@hydrogen.no.

Dutch Hydrogen & Fuel Cell Association (NWBA)
The Netherlands

Basic Information

- Chairman: Arjan van Ginkel
- 60 members in total

Our members:

Objective

- The aim of the NWBA is to promote the application of hydrogen and fuel cell technology in the Netherlands as far as possible in order to make society more sustainable.
  - COMBINING STRENGTHS: The NWBA helps to improve Dutch competitiveness in the field of hydrogen and fuel cell technology and supports the implementation of hydrogen and fuel cell applications in the Netherlands.
  - SHARING KNOWLEDGE: The NWBA promotes the collection and generation of relevant knowledge, the provision of information, education and training, the provision of expertise, the national and international dissemination of the Dutch vision and expertise in the field of hydrogen and fuel cell technology, the stimulation of the development of hydrogen and fuel cell technology and the provision of advice in the field of hydrogen and fuel cell technology.
  - REPRESENTING: Representing the Netherlands in European initiatives in the field of hydrogen and fuel cells

The team and its working groups

The NWBA is organized in 3 pillars and each pillar has its own working groups and activities

- Pillar Government and international contacts
  The NWBA is currently in regular consultation with the government and thus represents its members towards the government.
- Human Capital Agenda
  For the members, the human capital question is an important subject for the near future.The 'Young NWBA' has been launched. It is the first hydrogen retaled platform in The Netherlands focusing on students and Young Professionals. A specific student membership is introduced and being a succes already.Additionally, there is being worked on NWBA certifications of trainings, courses and research programs.

- Innovation, knowledge exchange and promotion of end-use
  This pillar focusses on organizing events for members providing interaction and contacts between the members.
  This involves participation in exhibitions, organising activities, small conferences and networking drinks.

German Hydrogen and Fuel Cell Association (DWV)
The Federal Republic of Germany

Basic Information

Chairman: Werner Diwald

The German Hydrogen and Fuel Cell Association (DWV) is the umbrella organisation in Germany for all concerned with the general application of hydrogen as an energy carrier. We also advocate that hydrogen be produced from renewable energies for a sustainable energy economy.

Our challenges and mission

Together our member firms employ more than 1.5 million people in Germany; the association therefore represents a considerable section of the German economy. These companies need a suitable economic and legal framework that enables them to continue developing as sustainably as possible under the changing environmental conditions.

As the leading lobby group for the special interest of reliable, affordable and emissions-free transportation fuels and energy supplies, we make our voice heard in politics as well as the media and we campaign for fair competition.

We formulate the justifiable interests of the branch in order to secure the business environment needed by our industry.

In regular contact with political decision-makers, by targeted lobbying activities we ensure that our positions and arguments are considered during the development of legislation.

We expound to the public the advantages of using hydrogen and fuel cells, and their relevance to the system in a sustainable energy economy, by targeted activities in the media and at national and international events.

Due to climate change, increasing competition for minerals and political upheavals in countries that supply them, the challenges for a secure and economic provision of energy for the mobility, stationary power and heating sectors will continually mount for the economies in Germany and Europe. The energy transformation will thus become a key factor in safeguarding our economic strength.

Our duties therefore include contributing towards a successful energy transformation in the interests of the German economy. Together we analyse the current situation and formulate proposals to further develop the legislative framework for an integrated energy concept. As an advocate group since 1996, the German Hydrogen and Fuel-Cell Association (DWV) has focused on the call for a rapid market introduction of hydrogen as an energy carrier and of fuel-cell

technology. The aim is to prompt an objective debate on all aspects of hydrogen, its production and energy use — in particular an energy switch to fuel cells — the technology and prospects for a future supply infrastructure, as well as help in shaping the development of the market.

We provide an extensive network for the exchange of information and ideas. Providing a common link for all our members — from the smallest own-er-managed enterprise to the largest stock-market listed multinational. We offer the best preconditions for our members to establish and maintain contacts — for example at our general meetings and numerous parliamentary events. Over 20 volunteer experts from our member companies contribute their technical knowledge to the work of our committee. Not only does the industry profit from this. Above all our mem-bers obtain an advantage, because they receive vital industry information first hand.

In addition to regular industry information in our comprehensive DWV updates, members also have access to the results of the association's work in an exclusive password-protected section of the DWV website. Through our Expert Commission 'performing energy' we offer our member companies the possibility to participate actively in shaping the underlying legislative environment. We also offer special expert knowledge to member companies for example in the fields of: Vocational training, Business economics, Energy economics, European politics (FQD, RED), Sustainability, and Statistics & market research.

Hydrogen Energy Association The United Kingdom

Basic information:

CEO & Founder : Celia Greaves

As the UK leader in advocating for and accelerating the transition to Net Zero through the deployment of hydrogen solutions, the HEA supports stakeholders across the entire value chain. Our work drives change at home and abroad, and positions the UK at the forefront of hydrogen globally. Our100+ members represent over 200,000 employees worldwide with combined revenues of £400bn. We are a key focal point for national and international engagement on hydrogen and its activities for UK plc and UK businesses. As part of this activity, we convene the Hydrogen Coordination Forum, which brings together UK national and regional groupings with interests in hydrogen to build consensus and share good practice.

Mission:

Our Mission is to support the growth of our members and wider industry, and deliver policy outcomes that accelerate the progress of hydrogen in the UK and support UK business growth.

Areas of work:

Our policy work is shaped via our working groups which cover areas such as electrolytic hydrogen production, CCUS enabled hydrogen production, nuclear enabled hydrogen, hydrogen transportation and storage, hydrogen mobility, planning for hydrogen projects and hydrogen refueling infrastructure.

We work closely with Government to drive policy change, participating in a range of Government Advisory Groups and similar, as well as producing Action Plans and responses to consultations.

Our newly published UK projects map shows the depth and breadth of project in the UK – https://ukhea.co.uk/
uk-hydrogen-project-map/

Vetgas Sverige
Sweden

Chairman: Anders Lundell

Vätgas Sweden started as a national organization on January 1, 2007 with the aim of functioning as an initiator, coordinator and spreader of knowledge. The business is conducted in the form of a non-profit, politically unbound industry and membership organization. Our view of hydrogen's role as an energy carrier is balanced and long-term. On behalf of our roughly 120 members, we work to promote the role of hydrogen gas in Sweden and spread knowledge.

We are a committed and experienced organizer who spreads knowledge in various channels such as lectures, events, conferences and digital channels. We have extensive experience in running both national and international hydrogen projects with the aim of developing business models for part or the entire hydrogen value chain.

We have an exciting, diversified and active network with partners from the business world, authorities and academia both globally and nationally.

Vätgas Sweden's overall goals:

- Promote hydrogen as an energy carrier in Sweden to support the Swedish innovation system for hydrogen and contribute to a sustainable development in industry and society, with lower emissions and more renewable energy and increased resilience.
- To be the central hub for hydrogen issues in Sweden and to be a point of contact and Swedish coordinator in international contexts.
- Together with the members, with joint forces, convey the potential of hydrogen use and to be the voice of hydrogen use in society. The board and the office work in consultation to best promote these purposes in long-term strategies and action plans.

We are a constantly growing association and now consist of over 120 members. Our members are represented in small and large companies, academia, regions and municipalities.

EnergyIn Portuguese

ENERGYIN PT
COMPETITIVENESS AND TECHNOLOGY CLUSTER FOR ENERGY

EnergyIN, the Competitiveness and Technology Cluster for Energy, is a non-profit cluster association established in 2008, working for the energy sector in Portugal, namely on Renewable Energies, Energy Efficiency, Energy Storage, Fuel Cells and Hydrogen.

EnergyIN was founded by four major Portuguese large companies in the energy sector,

EDP – Energias de Portugal, GALP Energia, Efacec and Martifer, plus the MIT Portugal Program, all involved in the development of Hydrogen projects in Portugal and worldwide.

Our mission is to promote collaborative works between companies, namely small and medium size, and research institutions, in order to foster technological innovation and competitiveness.

EnergyIN has an annual work programme to implement activities in line with these action programmes and priorities, including networking activities, an annual conference, information on financing programmes for collaborative projects in energy, bilateral meetings for thematic discussions and collaborative project design, and international activities (trade missions and fairs).

In the Hydrogen sector EnergyIN has participated and organized workshops and seminars since 2009, together with several entities, namely with AP2H2, the Association for the Promotion of Hydrogen in Portugal, a member of our cluster association Consultive Council.

In Europe, EnergyIN has been a regular participant in the FCH JU, the Fuel Cells and Hydrogen

Joint Undertaking (nowadays Clean Hydrogen Europe), activities.

EnergyIN has been a supporting organisation of several international events in the Hydrogen sector like the World Hydrogen Summit & Exhibition 2023, in Rotterdam, the Hydrogen & Fuel Cells Energy Summit 2023, in Lisbon, the World Hydrogen Latin America 2023, in Santiago de Chile, and the Energy Storage Global Conference since 2014.

In order to develop the hydrogen ecosystem for Portugal and Korea, to meet hydrogen demand for both countries needs, September 2023, EnergyIN has also signed a Memorandum of Understanding (MoU) with H2KOREA, and, together with other H2GLOBAL partners, another MoU with four Technoparks in Korea.

More recently, in January 2024, EnergyIN has signed two other MoUs with ABH2, the Brazilian Hydrogen Association and with H2 Chile, to promote bilateral collaboration between the three countries, developing a clean hydrogen ecosystem and improving international hydrogen industry cooperation.

At European level, EnergyIN is also a partner in two undergoing projects in the area of Hydrogen, H 2GLOBAL and H2Excelence, both sponsored by the European Commission, under COSME and ERASMUS + Programs, respectively.

H2GLOBAL: **European Green Hydrogen Cluster Alliance for Internationalisation**

H2GLOBAL aims to contribute to positioning Europe as the world's technological and industrial leader in the hydrogen economy, namely in the area of green hydrogen.

The main objective of the project is to build-up a partnership of European leading clusters to configure a "European Strategic Cluster Partnership – Going International" focused on cluster cooperation and internationalization tailored to supporting and promoting hydrogen-related businesses, technologies and services.

Building on the European Union's Green Deal goals and the recently adopted EU hydrogen strategy, H2GLOBAL will constitute a springboard for European companies to compete in the global economy, while promoting an effective green energy transition and helping the EU recover from COVID-19's economic impact.

Following this motivation, we will start with a selected group of hydrogen frontrunners' clusters/regions that will shape the development of a true pan-European cluster plaVorm for green hydrogen. The consortium will structure a collaborative internationalization strategy focused on intensifying cross-sectoral collaboration between European clusters and transnational cooperation within and beyond Europe.

We will investigate and develop by means of peer learning and best-practices exchange new approaches in internationalization of clusters in order to support and foster the commercialization of European hydrogen-related innovations internationally, while seeking opportunities to explore synergies for long-term partnerships and collaboration with third countries.

The action will target a series of international regions and markets identified as high potential growth markets and key contributor players in the (green) hydrogen ecosystem, in particular Asia (Japan, South Korea or Singapore), South America (Chile and Brazil) and Maghreb (Morocco).

The H2GLOBAL meta-cluster is composed of 5 organisations, covering 5 COSME and EU Member States: The Foundation for the Development of New Hydrogen Technologies in Aragon – Spain; CapEnergies – France; EnergyIN: Competitiveness and Technology Cluster for Energy – Portugal;

Energy and Sustainable Development Cluster of the Emilia-Romagna Region – Italy; Regional Pomeranian Chamber of Commerce: Cluster of Hydrogen Technologies – Poland. This consortium represents a collective members base of over 750 members, with more than 300 SMEs, with various expertise and interests across the fuel cells and hydrogen value chain from hydrogen production, storage, transportation and distribution to downstream Fuel Cell and Hydrogen (FCH) applications.

It has been strategically established to combine the supporting technical and internationalization clusters' capabilities and at the same time to maximize business opportunities and knowledge exchange among clusters partners and their members, by leveraging their practical experience at national and regional level in the implementation and development of large-scale demonstration and commercial hydrogen projects.

This action has five general project objectives:

- To intensify cluster and business network collaboration across borders and sectoral boundaries, analysing the thematic areas of the green and renewable hydrogen and which specific industries and sectors are needed to deliver on a shared vision. Targeted sectors and applications include power generation and energy storage and those sectors with strong needs for decarbonization such as mobility and transportation; energy-intensive industries such as steel production, refining and chemicals; industrial, commercial and residential heating;
- To promote the pan-European Strategic Cluster Partnerships to lead international cluster cooperation in new areas of clean hydrogen technologies. This should create a solid trigger for stimulating and positioning Europe as a key player in international value chains, while opening opportunities for collaboration projects towards international green hydrogen production applications and trade on a global scale;
- To help SMEs to contribute to the emergence of new value chains and take a leading position globally, H2GLOBAL will be an open alliance to support and promote European SMEs technology, innovation demonstration projects or developed technologies in (green) hydrogen and respective key enabling and related technologies such as fuel cells, electrolysers, hydrogen storage systems, gasifiers and synthetic green chemicals and fuels.
- To better support SMEs in global competition: this COSME project will stimulate SMEs by offering novel activities and joint services such as COSME branding, international brokerage events and trade missions, promotion and marketing, technology transfer and R&D&I international project development support, joint entering to foreign markets, and co-development with clusters and SMEs from third countries.
- To implement the basis of a permanent plaVorm for mutual exchange, project development and technology transfer, policy learning, and cooperation to achieve excellence among European clusters with hydrogen and related technologies at the core of their priorities towards a climate neutral economy.

H2Excellence: Fuel Cells and Green Hydrogen Centers of Vocational Excellence towards affordable, secure and sustainable energy for Europe

H2Excellence project aims to establish a plaVorm of centres of vocational excellence (CoVEs) in the field of fuel cells and green hydrogen technologies, that will provide a collaborative educational, training and development program to narrow and close the existing industry skills' gaps. The CoVEs will bring together stakeholders such as universities, industrial partners, and governmental bodies, forming strong links at European, national, and regional level.

It is envisaged that different local clusters will be set up across countries with strong potential in

the industry (e.g., Portugal, Spain, France, Finland, and Italy), with envisioned extension across Europe and a joint focus on different aspects of the hydrogen value chain, from production to applications and cross-cutti ng issues.

H2Excellence aims at creating world-class reference points for training in green hydrogen technologies for both initial training of young people, engineers as well as for continuing up-skilling and re-skilling of adults, through flexible and timely offer of training for the skills needs of companies in the green hydrogen sector.

The VET clusters will undertake activities such as developing transnational, joint curricula, and lifelong trainings; interaction with universities to understand the current state-of-the-art technologies; exchange of VET teachers, students, and staff; partnerships between companies and professionals; regional ecosystems mapping and integration within the national/regional economic and innovation ecosystems.

H2Excellence brings together 21 partners from seven different Erasmus+ EU countries. Fully in line with the EU Green Deal goals and energy transition targets, it intends to create the infrastructure necessary to embed vocational excellence in the European hydrogen sector. It will contribute to promote the sector towards quality employment, career-long opportunities, while meeting the needs of an innovative, inclusive, and sustainable economy.

The Portuguese National Hydrogen Strategy (EN-H2)

Portugal established the National Hydrogen Strategy (EN-H2) which appears in the annex to Resolution of the Council of Ministers nº 63/2020, of 14/08/2020 and of which it forms an integral part.

This Strategy aims to contribute to the national and EU decarbonization objective, introducing an element of incentive and stability for the energy sector, promoting the gradual introduction of hydrogen as a sustainable pillar and integrated into a more comprehensive transition strategy to a decarbonized economy, as well as as a strategic opportunity for the sector/country.

It aims to promote and boost both supplies and consumption, in the various sectors of the economy, creating the necessary conditions for a true hydrogen economy in Portugal.

The objective is to guarantee, in the long term (2050), a decarbonization of the entire Natural Gas network and Power Plants and contribute significantly to the decarbonization of the transport and industrial sectors.

In addition to the hydrogen incorporation targets, the strategy also establishes other objectives that reveal its ambition until 2030, such as installed H2 production capacity, number of H2 vehicles (passengers and goods), creation of 50 to 100 hydrogen refueling stations, 2 GW to 2.5 GW of installed capacity in electrolyzers.

The Government is promoting an industrial policy around hydrogen and renewable gases, which is based on the definition of a set of public policies that guide, coordinate and mobilize public and private investments in projects in the areas of production, storage, transport and consumption of renewable gases in Portugal.

The action measures proposed within this strategy aim to:

- Preparation of legislation, regulations and normative structure that allows the promotion of this new paradigm in Portugal; legislative change on the injection of Renewable Gases;
- Incentive on a national scale, based on priority H2 value chains, considering hydrogen as an energy vector and as a product;

- Promote, develop and monitor projects, in different sectors and scales, taking into account national priority value chains, technological maturity, cost reduction and renewable energy sources;
- Simplification of innovative projects;
- Monetize the stock of existing assets in the energy system and in the national industry;
- Strengthen national skills and R&I, promote cooperation and support hydrogen-related innovation;
- Analysis of the H2 industrial project in Sines covering the entire value chain;
- H2 Collaborative Laboratory.

Important Projects of Common European Interest (IPCEI) HYDROGEN IPCEI

It is intended to implement a large anchor project on an industrial scale for the production of green hydrogen in Sines, a port hub in the southwest coast of Portugal, with the capacity to integrate, simultaneously, the dimensions of industrial scale production, processing, storage and transport, and internal and external consumption, through export, based on strategic partnerships, both national and European.

This project constitutes an important strategic opportunity for the country and is considered to have the potential to constitute or integrate an Important Project of Common European Interest (IPCEI), promoted within the Portuguese Government by the Ministry of Environment and Climate Action, contributing to the emergence of a hydrogen market and make its export a reality.

Bearing in mind the great interest triggered by the Sines project, which is an integral part of the National Hydrogen Strategy, it is important to highlight that the European Commission may consider eligible, for recognition as IPCEI, a group of unique projects included in a common structure, or in a program that pursues the same objectives, contributing to the complementarity and achievement of an important European objective.

Considering the advantages to complement and reinforce the integrated value chain, the country opened the opportunity to participate in projects in the hydrogen sector, provided that national and European strategic coherence in this field is guaranteed.

The process of submitti ng expressions of interest took place between June 17 and July 17, 2020.

H2MED

At a meeting of eight EU member states with borders to the Mediterranean and Portugal (MED9) in Alicante in December 2022, transmission system operators GRTgaz, Teréga, Enagás and REN, alongside the heads of state of Portugal, Spain and France reached an agreement on the implementation of a great undertaking to support decarbonisation of European industry: the H2MED hydrogen project, which Germany joined at the end of January 2023.

Following the announcement made by Portugal, Spain and France heads of governments, energy operators in these countries are mobilising to make the project H2MED a reality.

The gas transmission system operators Enagás (Spain), GRTgaz and Teréga (France) and REN (Portugal) have signed a memorandum of understanding (MoU). This MoU formalises their commitment to co-ordinately collaborate on the joint development of H2MED. The objective of this

partnership is to make the infrastructure operational from 2030.

H2MED will have the capacity to transport up to 2 million tonnes per year of renewable hydrogen, which will represent 10% of Europe's expected consumption by that time, according to REPowerEU.

The four transmission system operators have warmly welcomed this green energy corridor project linking Portugal, Spain and France to the European Union's energy network. It includes the development of a hydrogen interconnection between Portugal and Spain (Celórico-Zamora) as well as a maritime pipeline linking Spain and France (Barcelona-Marseille) to transport renewable hydrogen from the Iberian Peninsula to Central Europe.

The energy groups have been cooperating since October 20 to provide technical advice to their respective governments on the development of H2MED. Enagás, GRTgaz, Teréga and REN will also jointly submit these projects on December 15, 2022, for labelling as Important Project of Common European Interest (IPCEI) under the new Trans-European Energy Networks (TEN-E) Regulation (EU/2022/869).

More recently, Germany has been also interested in H2MED, seeing it as a solution to improve its own energy security. In recent months, Germany has been affected by a reduction in gas supplies and high energy prices. The country has consumed less gas than in previous years, thanks to gas demand destruction, unusually mild weather, voluntary reduction and/or replacement of gas consumption, as well as electrification in some sectors such as heat pumps being installed in residential areas. Therefore, the interconnection with H2MED will be of critical importance to Germany energy needs.

H2Sines. RDAM

The project H2Sines.RDAM aims to produce green hydrogen on a unit located in Sines, convert it to liquefied hydrogen and export it to Rotterdam via a dedicated liquid hydrogen carrier.

The goal is to deliver the first shipment of liquid hydrogen from Sines to Rotterdam by 2028. Hydrogen will be used as fuel for heavy transport.

The partners, ENGIE, Shell, Vopak and Anthony Vede, signed a memorandum of understanding (MoU) concerning the project on 16 December 2022

In addition to ENGIE, Shell, Vopak and Anthony Vede, supporting partners of the project are REN, Port of Sines, Port of Rotterdam, Gasunie and ABN AMRO.

The new agreement follows the signing of an MoU in 2020 between the Portuguese and Dutch governments to develop strategic maritime hydrogen corridors.

Besides the H2Sines.RDAM project, the ports of Sines and Rotterdam have also been working together on the MAGPIE Project – sMArt Green Ports for Integrated Efficient multimodal mobility, a call framed within the European Green Deal – Horizon 2020.

GreenH2Atlantic

GreenH2Atlantic was one of the three projects selected by the Horizon 2020 – Green Deal Call, to demonstrate the viability of green hydrogen production on an unprecedented scale in Portugal.

A consortium of 13 companies and research partners was selected by the European Commission as part of the Green Deal to develop a green hydrogen production at 100 MW scale in Sines, Portugal.

GreenH2Atlantic, the renewable hydrogen production project in Sines will be developed by a consortium composed by 13 entities, including companies such as EDP, Galp, ENGIE, Bondalti, Martifer, Vestas Wind Systems A/S, McPhy and Efacec, and academic and research partners such as ISQ, INESC-TEC, DLR and CEA, in addition to a public-private cluster, Axelera.

The €30 million grant will help finance the construction of the hydrogen plant, located in the decommissioned old EDP coal-fired power plant area in Sines. The construction should start in 2023 and operation is expected to begin in 2025, subject to securing the necessary authorisations by the authorities.

The 100 MW electrolyser will be composed of innovative, scalable and fast-cycling 8 MW modules to cover bottlenecks such as efficiency, size, lifetime and flexibility. Other innovative features include the interface system composed of an advanced management system which is required to enable the project's direct connection to a local hybrid renewable power plant (solar and wind).

Green hydrogen is expected to become one of the pillars of economic growth, for it is a decisive energy vector in the decarbonization process for the main sectors of the economy. This project will enable the transition of a former coal-fired power plant into an innovative renewable hydrogen production hub, in alignment with Europe's decarbonization and energy transition strategies.

With the creation of a 'hydrogen valley' centred in Sines, GreenH2Atlantic will significantly contribute to the sustainability goals of the region and Portugal, providing an important contribution to the European energy roadmap.

The project GreenH2Atlantic has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement nº 101036908.

Madoqua Power2X

MadoquaPower2X is developing a world-leading green hydrogen and renewable ammonia project. The project will be located in Portugal in the Sines industrial zone (Zona Industrial e Logística de Sines, ZILS).

MadoquaPower2X is a consortium of Madoqua Renewables, Power2X and Copenhagen Infrastructure Partners (CIP). The consortium is committed to develop, install and operate the project to the highest environmental and safety standards. The project generates economic growth with an economic activity classified as sustainable according to the latest EU Taxonomy and is an important factor to secure an independent power infrastructure.

The project involves the production of green hydrogen using established alkaline-water electrolyzer technology and the production of green ammonia through the Haber-Bosch process. Hydrogen will be transported through the local hydrogen grid and can be used by other local players, as well as blended into the natural gas grid. The green ammonia will be transported by pipeline to the Port of Sines and loaded for export and/or used as maritime fuel and is an attractive option for European green fertilizer manufacturing.

The project will use renewable energy and 1 GW of electrolysis capacity to produce annually 150,000 tons of green hydrogen and 300,000 tons of green ammonia at large scale.

The electricity will primarily be provided through a renewable energy community with access to dedicated solar and wind assets in Portugal which are being developed in parallel. This approach allows for a secure and dedicated renewable power supply for the full lifetime of the project.

H2tALENT

H2tALENT, led by Campus Sul - Interuniversity Association, including NOVA University of Lisbon, University of Évora, and the University of Algarve, in partnership with GALP and HYLAB Collaborative Laboratory, and coordinated by the University of Évora, aims to create an innovation ecosystem focused on "green" hydrogen and the Alentejo.

It is the first Green Hydrogen Valley in Portugal, with funding and recognition from the European Union and the Global Network of Green Hydrogen Valleys.

H2tALENT, funded by the European Commission's HORIZON programme, is one of four Green Hydrogen Vouchers approved by the European Commission in 2023. It has a total budget of €13.5 million, of which €9 million is guaranteed by the European Commission, to support the implementation of this pioneering project, which will run for five years.

H2tALENT has mobilised a consortium of 28 partners, including companies, higher education institutions, interface bodies, local authorities, and regional development agencies, from Portugal and five other countries. The project aims to develop, implement, and test sustainable and innovative solutions for the production and use of green hydrogen in the Alentejo region.

H2tALENT's mission is to generate knowledge, leverage innovation, and achieve a positive impact focused on "green" hydrogen in the Alentejo, as part of a work agenda focused on green hydrogen adopted by Campus Sul.

Among the objectives of the project for the next 5 years, the following stand out: the installation of 11 MW in electrolysers, the annual production of more than 500 tons of green hydrogen, and the reduction of carbon dioxide emissions by about 6 thousand tons per year. In addition, H2tALENT aims to retain and develop green hydrogen-related talent in the Alentejo, thereby boosting the region's economy and contributing to the national and European energy transition.

The approval of H2tALENT by the European Commission recognises the merit of the consortium led by Campus Sul, GALP, and HYLAB, as well as the endogenous capacity of the Alentejo as one of the best locations in Europe for investments in green hydrogen, but also positions it as an important asset in the national and European energy transition strategies.

Costa Rica Hydrogen Alliance, Costa Rica

- 35 members to date, covering all sectors of hydrogen supply chain, both from public and private sector

- Costa Rica is a country committed to the decarbonization of its economy, with a stable democracy and no army since 1948.
- The country's economy is based on tourism, agriculture, manufacturing, financial services, and technology sectors, and benefits from a privileged geographical location with access to marine routes, two oceans, and proximity to the Panama Canal.
- According to the World Innovation Index 2021, Costa Rica ranks third among Latin countries and is among the 50 most innovative countries worldwide.
- Since 2015, Costa Rica has generated more than 98% of its electricity annually from renewable energy sources.
- Costa Rica has a population of 5.139 million, a territory of 51,179 km², and a GDP of USD 64.28 billion.
- The Costa Rican Hydrogen Alliance (AH2CR) was established to catalyze and coordinate the hydrogen ecosystem, promoting relationships among its members and supporting different initiatives.
- AH2CR has 35 members covering all sectors of the hydrogen supply chain, from both the public and private sectors.
- Fernando Castro Cruz, Program Coordinator of the Costa Rican Hydrogen Alliance, specializes in infrastructure, renewable energy, clean development mechanisms, and hydrogen and ammonia technologies, with over 20 years of experience.
- Point of Contact:
  - Program Coordinator: Esteban Echeverría eecheverria@crusa.cr
  - Committee Directors: Flora Montealegre; Silvio Heimann; Juan Ignacio del Valle

Hydrogen Egypt, Egypt

EGYPT's booming Hydrogen economy

Egypt has set a target of providing 5-8% of the world's hydrogen by 2040, creatingsome 100k jobs and adding USD 10-18 bn to its GDP in the process.

The government aims to transform Egypt into a regional hub for green hydrogen production by 2026 and a global hub by 2030, with plans to produce 3.2 mn tons of green hydrogen a year by the end of the president's third term and 9.2 mn tons a year by 2040.

The plan sees the government implementing nine already agreed upon green hydrogen projects worth a combined EGP 1.9 tn in the Suez Canal Economic Zone. Another batch of 23 projects worth some EGP 3.5 tn is also set for implementation by 2030 — 13 of the projects are awaiting the inking of framework agreements and the other ten are awaiting the inking of MoUs.

The government wants half of its public investment spending to go towards green projects by 2025 — last year 40% of the government's investments went towards green projects. The government also wants to break ground on nine green hydrogen projects in the SCZone in "the short term," the report said without giving a specific timeline or specifying what the nine projects are.

Egypt inked framework agreements worth a combined USD 83 bn during 2022's COP27 in Sharm El Sheikh with international companies to construct nine green hydrogen and ammonia facilities in the SCZone. The facilities would collectively produce up to 7.6 mn tons of green ammonia and 2.7 mn tons of hydrogen a year when fully operational.

Part of a wider plan: The government wants to push its green investments to 75% of its total investment spending by 2030 and have its green economy contribute no less than 5% to its GDP.

To help drum up even more hydrogen investments, the government will introduce a package of incentives for the industry, granting a series of tax breaks and non-tax incentives to companies implementing green hydrogen projects within five years and deriving a certain percentage of their funding from foreign investors. The incentives received the greenlight from the House earlier this month and are currently awaiting ratification from the President.

We are now in process of implementing a hydrogen village to apply the small scale hydrogen production applications for Global South conditions as path for energy transition and for lowering harmful emissions in personal and urban industrial spaces.

The climate action stage is an inclusive space and these mentioned short-term priorities are the ones that will be accelerating the global hydrogen agenda in Egypt and in any other country.

Egypt plans to become an international hub for green hydrogen projects and its derivatives. Egypt's mechanisms for green projects development are progressing as recently a new incentive law has been issued to promote the production of green hydrogen projects.

In August 2023, Egypt established the National Council for Green Hydrogen to stimulate green investment. In November, the council launched the National Strategy for Green Hydrogen. Under the strategy, Egypt aims to increase the energy generated from renewable sources to 42 percent by 2035. It also targets up to 8 percent of the global trade in the green hydrogen market by 2040. With local partners and other investors we are engaged in consideration of Mediterranean project location for green hydrogen and ammonia export to Europe

WOMEN IN HYDROGEN: IGNITING DIVERSITY IN THE GREEN HYDROGEN SECTOR

It's imperative that women are truly empowered as stakeholders, policy-makers and implementors of a just energy transition. In a traditionally male-dominated space there's work to be done – but the opportunity is vast. COP28 reaffirmed the commitment to a gender-responsive just transition, not only as a human rights issue but because achieving gender equality and women's empowerment "accelerates the implementation of the Paris Agreement." And as our own energy transition outlook (ETO) shows, an acceleration is needed to get onto a 1.5 °C pathway. So, why is the role of women so pivotal?

Women is shaping the future of Green hydrogen. We seek to drive up gender equality and increase visibility of women in the sector. Robust inclusion, diversity and belonging policies are key. And information is power! Having a system to measure and communicate gender metrics (pay gap, promotions rate, number of women in leadership, etc) is fundamental.

We have to promote diversity in the Green Hydrogen sector by creating a safe space for women to network and discuss the developments in the sector, as well as showcasing female experts.

Implement Mentoring Program that matches women at junior and mid-management levels to improve connections and networking to change the hydrogen sector. This kind of programs is a great tool for capacity training and further empowerment of the future hydrogen leaders. Also we should encourage women to be recruited into STEM roles and do health and scientific researches like for rare metals as example.

This industry is still very male-dominated, and the challenge is deep and structural. By the time girls are offered STEM subjects it's already too late. Girls need to be attracted to science and engineering from pre-school age. Later, mentorships play a very important role in allowing young women to learn from senior leaders, emboldening them to identify and take leadership opportunities.

Gender equality is not 'merely' a moral issue but a prerequisite for effective climate action. I find, as corporate leaders or STEM professionals, women tend to prioritise innovation and address long-term challenges. Since energy transition takes time and creativity, their role is crucial.

Sustainability and gender parity are interlinked and must move in sync. Energy transition requires fresh perspectives – a larger role for women will ensure that innovative solutions are effectively implemented.

Women are often the first to experience the effects of climate change and biodiversity loss in their daily lives. Yet, they are frequently excluded from decision-making processes that directly impact them. This dynamic must change.

It's of paramount importance, to me and numerous women leaders worldwide, to provide a blueprint for the young people of women here and beyond. These individuals aspire to realize their dreams and foster a brighter future. We must ensure their voices are heard, and their perspectives are recognized and celebrated.

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Alex. Free Zone

Hydrogen Egypt Association

POTENTIAL Egyptian & Foreign Technical & Commercial partners/ Associates members & Affiliated associations/ organizations (NGOs & IGOs)

Ⅲ. Overview of Hydrogen Policy

Republic of Korea

A. Building the Foundation for a National Hydrogen Economy

The Republic of Korea has established a comprehensive hydrogen policy framework that positions hydrogen as a central driver for both its carbon neutrality goals and energy security strategy. This foundation was laid through a sequence of major initiatives:

- The announcement of the **Hydrogen Economy Road-map ('19)**
- The formation of the **Hydrogen Economy Council ('20)**
- The enactment of the **world's first hydrogen law ('21)**
- The launch of the **Clean Hydrogen Power Bidding Market ('24)**

These milestones reflect Korea's strong institutional commitment to developing a full hydrogen value chain—from production and distribution to end-use across industries.

B. Scaling Deployment through Market Demand

Korea has also achieved measurable progress in deploying hydrogen infrastructure and technologies:

- Over **34,000 hydrogen vehicles** on the road
- **218 refueling stations** operational

- More than 1 GW of installed fuel cell capacity

These outcomes demonstrate Korea's leadership in scaling hydrogen deployment. Creating demand across multiple sectors is key to driving affordability, ensuring investment stability, and accelerating the transition to hydrogen.

Achievements of Korea's Hydrogen Economy

Hydrogen Vehicles

Category	Year (Unit : Vehicle)						
	2018	2019	2020	2021	2022	2023	2024.3
Total (Cumulative)	893	5,083	10,906	19,404	29,623	34,526	34,872

■ (April 2024) Passenger cars: 34,383 vehicles, Buses: 757 vehicles, Trucks: 20 vehicles ■ Ministry of Land, Infrastructure and Transport

Hydrogen Refueling Station

Category	Year (Unit : station)						
	2018	2019	2020	2021	2022	2023	2024.3
Total (Cumulative)	20	39	63	115	162	201	218

■ Ref: h2hub.or.kr/main/index.do

Fuel Cell Power Generation

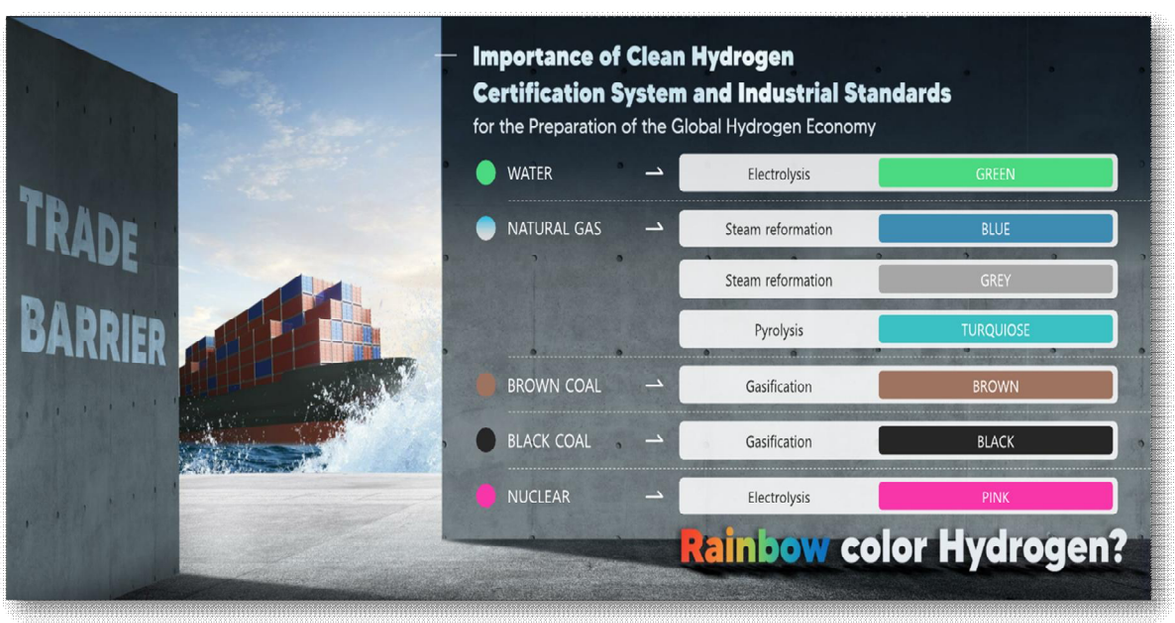
Category	Year (Unit : MW)						
	2018	2019	2020	2021	2022	2023	2024.3
Total (Cumulative)	344	464	605	737	879	1,065.75	1,063.63

■ Power Statistics Information System

C. Clean Hydrogen Certification and Global Trade Standards

While global debate continues around different hydrogen "colors" (e.g., green, blue, grey, pink), Korea emphasizes carbon intensity as the key metric, regardless of production method. Korea's clean hydrogen certification scheme defines clean hydrogen as emitting no more than 4 kg of CO_2 equivalent per kg of hydrogen.

As countries begin to regulate hydrogen trade based on carbon content, transparent certification systems are becoming essential to avoid future trade barriers and ensure international interoperability.

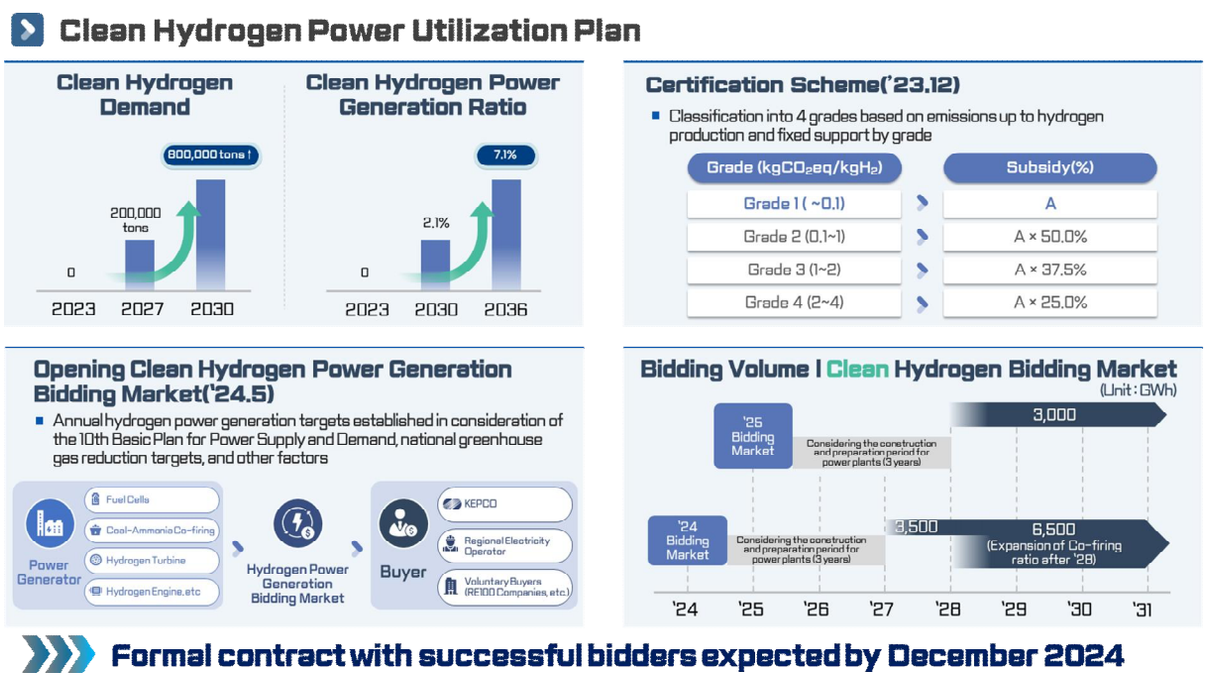


D. Clean Hydrogen Power Bidding Market: A Global First

To support clean hydrogen deployment at scale, the Korean government launched **the Clean Hydrogen Power Bidding Market** in May 2024. This government-led initiative is unprecedented at the global level and includes:

- Annual volume of **6,500 GWh** under **15-year fixed-price contracts**
- Eligibility limited to hydrogen certified under the national standard
- Evaluation based on both cost and carbon intensity

The system is designed to create **long-term demand** and provide **investment certainty** for clean hydrogen in the power sector.



E. Securing Overseas Hydrogen Supply Chains

Recognizing the need for large-scale hydrogen imports, Korea is actively establishing global supply chains through partnerships across Southeast Asia, the Middle East, and Australia. Notable examples include:

- A green hydrogen project in **Sarawak, Malaysia** by Lotte Chemical, Samsung E&A, and KNOC
- A blue ammonia import agreement with **Saudi Arabia**
- Projects in **Oman and Australia** supported by Korean public and private consortia

In parallel, Korea plans to build ammonia receiving terminals with a combined annual capacity of **4 million tons by 2030.**

Oversea Clean Hydrogen Supply Chain

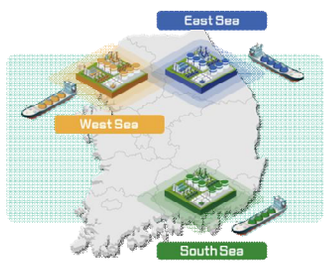
Securing Oversea Clean Hydrogen Supply Chain

Focus on countries in Southeast Asia, the Middle East, and Australia with favorable hydrogen production environments

Country	Region	Participating Companies	Description
Malaysia	Sarawak	Lotte Chemical, Samsung E&A, KNOC	Signed MoU with SEDC Energy, Sarawak Energy Berhad on Oct. 2022 to import Green Hydrogen
Oman	Duqm	POSCO, Samsung E&A, KOSPO, KEWP	Signed a deal to build a large-scale green hydrogen production plant on June 2023
Saudi Arabia	Ras Al Khair	KEPCO, KNOC, POSCO, Samsung E&A, KOSPO	Signed LOI with Aramco on Sept. 2023 to import Blue Ammonia
Australia	NSW	KEPCO	Signed MoU with the Port of Newcastle on July 2023. Currently, candidate project that can apply for headstart programme
US	Texas	SK	SK-backed firm is building blue ammonia plant in Texas(announced Jan. 2024)

Construction of Ammonia Receiving Terminals

Establish large-scale receiving terminals in three regions: West Sea, East Sea, and South Sea with capacity of 1.1 Mt/y by 2027 and 4 Mt/y by 2030



F. National Strategy: The "3-UP" Framework

At the 5th Hydrogen Economy Council in 2022, Korea introduced the **3-UP Strategy** to guide long-term hydrogen development:

1. **Scale & Scope**– Scale demand in transportation, power, and industrial sectors
2. **Infrastructure & Policy** – Build infrastructure and enhance regulatory frameworks
3. **Industry & Technology** – Promote innovation, develop ecosystem, and strengthen export readiness

This strategic approach ensures that growth is coordinated across the hydrogen ecosystem—from technology to trade.

5th Hydrogen Economy Council ('22.11)

3UP Strategy for the Hydrogen Economy Development

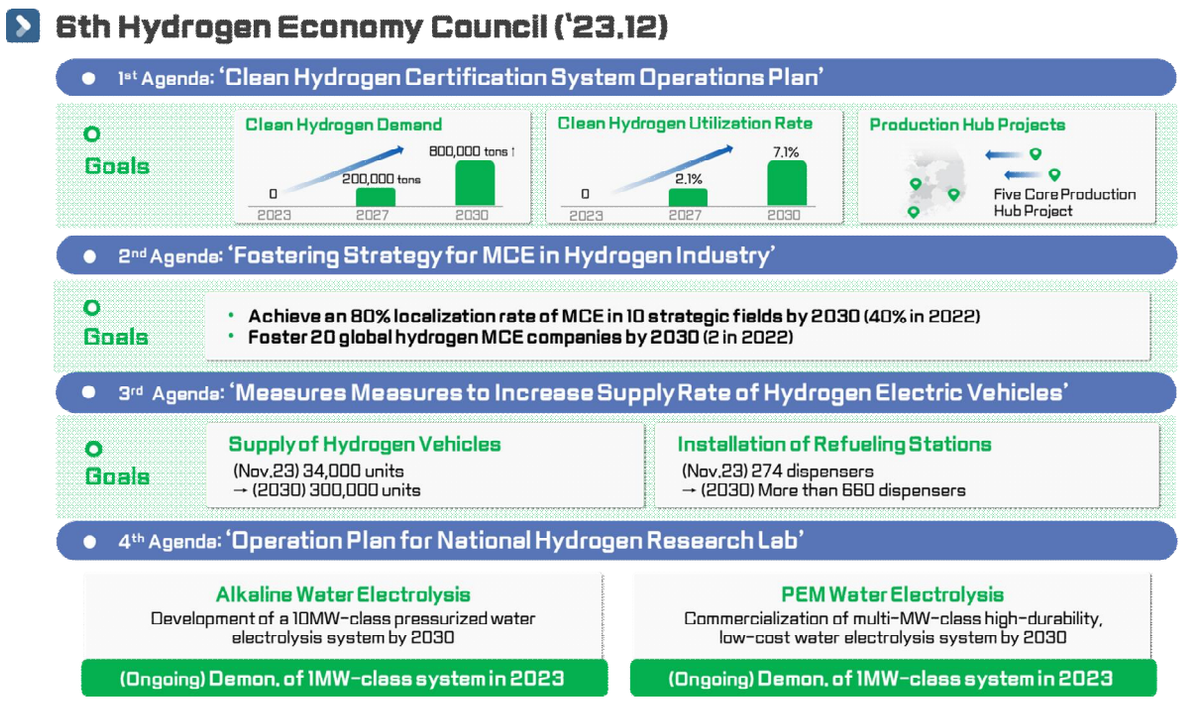
	As-is	To-be
① Scale & Scope	Creating huge demand for growth of the power generation & transport ecosystem	
Transportation	Supplying FCEVs focusing on passenger cars (19,270 units by 2021)	Accelerating deployment of commercial vehicles (hydrogen bus & truck) (30,000 units by 2030)
Power generation	Small-scale fuel cell (767.1MW by 2021)	Large-scale centralized power generation (hydrogen turbine, ammonia co-firing, etc.) (7.1% of Clean Power Generation by 2036)
Production	Domestic gray hydrogen production	Establishment of large-scale domestic and oversees clean hydrogen production bases
② Infrastructure & Policy	Establishment of infrastructure & system for clean hydrogen-based ecosystem transformation	
Distribution	Gaseous hydrogen transportation & refueling (141 units of Gaseous HRSs by 2021)	Liquid hydrogen mass storage & transport (construction of liquefaction plant & refueling station) (70 units of Liquid HRSs by 2030)
Supply	Use of LNG supply chain	Construction of ammonia & liquid hydrogen receiving base and hydrogen pipeline network
Policy	Enactment of Hydrogen Act (February, 2020)	Opening bidding market for hydrogen-based electricity and promoting enactment of Hydrogen Business Act (2023) Implementation of clean hydrogen certification system (2024)
③ Industry & Technology	Nurturing new growth engines to become a leading nation in the hydrogen industry	
Technology	Technology development focusing on hydrogen vehicle & fuel cell (75% level compared to developed countries in 2021)	Securing core technologies for the entire hydrogen value chain (fostering 7 major strategic fields) (100% level compared to developed countries by 2030)
Ecosystem	Designation of hydrogen-specialized enterprises (30 enterprises in 2021)	Intensive development of hydrogen-specialized companies (600 companies by 2030)
Export	Security of domestic track record (No1 world market share for 2 items in 2021)	Full-scale oversees export (No1 world market share for 10 items by 2030)

G. Governance and Policy Refinement

At the 6th Hydrogen Economy Council (2023), the Korean government updated its roadmap with a sharper focus on implementation. Key agendas included:

- Full-scale operation of the **clean hydrogen certification system**
- Strategy to localize **major components and equipment (MCE)** in the hydrogen sector
- Measures to **expand hydrogen vehicle and refueling infrastructure**
- Plans to support **next-generation electrolysis technology and R&D hubs**

These measures are designed to foster market confidence, reduce technical dependency, and secure Korea's leadership in the global hydrogen race.



United States

■ FCHEA has long been the only entity in Washington D.C. promoting the economic and environmental benefits of the hydrogen economy. FCHEA has successfully advocated for billions in collective funding appropriations year after year to support the fuel cell and hydrogen programs at the U.S. Department of Energy (DOE), as well as unique Federal program creation, and legislative, tax, and regulatory mechanisms to advance the industry in the U.S.. In addition to our Federal focus, FCHEA has also been a strong supporting advocate and partner for policy efforts at State, regional, and local levels.

Section 45V Credit for Production of Clean Hydrogen

In 2024, FCHEA and members continued its outreach on the 45V Credit for Production of Clean Hydrogen, enacted in the Inflation Reduction Act (IRA) in 2022. This included meetings with the Administration and White House, submitting detailed written comments and coordinating sign-on letters, writing and publishing opinion editorials, media interviews, building stakeholder coalitions with like-minded Associations, webinars and speaking opportunities, and a suite of advertising efforts.

The final rules and guidance were released in January 2025, and included a range of requests and changes championed by our association that will provide additional flexibilities and support for commercialization of clean hydrogen production in the U.S. This includes:

- Delayed implementation of hourly matched accounting for electrolytic hydrogen until 2030
- Support for a pathway for purchase of interregional EACs
- Allowance for alternatives to meet incrementality requirements
- Recognition of need for project-specific data for upstream methane leak rates to account for investments in responsibly sourced gas / differentiated gas
- Support for more sources of renewable natural gas (RNG), including animal waste, wastewater treatment facilities, and coal mine methane.
- Removal of the onerous First Productive Use requirement for RNG
- Ability to lock in the GREET Model available at the year a clean hydrogen facility begins construction
- Ability to take hour-by-hour accounting versus the annual average accounting

Section 48 Energy Credit – Hydrogen Storage Incentive

In 2024, the final guidance for the Section 48 Energy Credit, which includes a 30% Investment Tax Credit for hydrogen energy storage property, was released. The credit now includes several key changes championed by FCHEA and its members such as removing the energy-only use requirement for hydrogen storage equipment and expanding the list of supported equipment under the credit to include limited hydrogen pipelines, liquefaction equipment, and underground hydrogen storage and compression.

Regional Clean Hydrogen Hubs Program

Five of the seven Hydrogen Hubs were awarded the first tranche of U.S. Department of Energy (DOE) funding from Office of Clean Energy Demonstrations (OCED) in 2024, with three in July and two in November to begin Phase 1 efforts. This included:

- $30 million to California Hydrogen Hub, led by the Alliance for Renewable Clean Hydrogen Energy Systems (ARCHES) to build out a network of clean hydrogen production sites that incorporate multiple facilities at California ports.

- $27.5 million to the Pacific Northwest Hydrogen Hub, led by the Pacific Northwest Hydrogen Association (PNWH2) to build a clean hydrogen ecosystem across Washington, Oregon, and Montana using renewably powered electrolysis.
- $30 million to the Appalachian Hydrogen Hub (ARCH2), led by Battelle, to conduct planning, analysis, and design activities in addition to ongoing stakeholder and community engagement across West Virginia, Ohio, and Pennsylvania.
- $22 million to the Gulf Coast Hydrogen Hub, led by HyVelocity for planning, design, and community and labor engagements.
- $22 million to the Midwest Hydrogen Hub, led by the Midwest Alliance for Clean Hydrogen, LLC or MachH2 for planning, analysis, and design activities in addition to ongoing stakeholder and community engagement.

In January 2025, the final two Hydrogen Hubs were awarded the first tranche of funding for Phase 1 activities.

- $20 million for the Heartland Hydrogen Hub, led by the University of North Dakota Energy & Environmental Research Center (EERC), to leverage new and existing energy resources and infrastructure to produce commercial-scale quantities of clean hydrogen that would be used for American-made, low-carbon nitrogen fertilizer.
- $18.8 million to the Mid-Atlantic Hydrogen Hub, led by Mid-Atlantic Clean Hydrogen Hub, Inc. (MACH2), to develop hydrogen production facilities to be used in industrial applications and heavy-duty transportation, with several refueling stations to support

Hydrogen Grant and Loan Programs

Outside of the Hubs, DOE and other federal agencies have announced, allocated, and awarded billions in funding through several different programs and financing mechanisms to expand and support hydrogen production, electrolyzer, and fuel cell manufacturing in the U.S. Much of the funding is directed towards construction of new and expansion of existing facilities, including the first U.S. enterprises for several international companies. Additional funding awards were granted to projects aimed at improving manufacturing processes with automation and other high-throughput advancements.

The major federal funding award announcements included:

- More than $3 billion in conditional loan commitment from Loan Program Office (LPO) for hydrogen production and storage facilities to ACES I (Utah), Monolith (Nebraska), and Plug (up to six facilities);
- $750 million to 52 projects through the Clean Hydrogen Electrolysis, Manufacturing, and Recycling Program;
- More than $1 billion through the Office of Clean Energy Demonstrations (OCED) for hydrogen projects in Mississippi, Ohio, Texas, and Vermont; and
- Approximately $360 million via the Qualifying Advanced Energy Project Credit (48C) for projects in California, Massachusetts, Michigan, New York, Texas, and Virginia.

Other federal agencies announced funding for hydrogen and fuel cell projects in the U.S. in 2024.

In October, the EPA selected six port authorities that intend to deploy hydrogen and fuel cell-powered cargo handling equipment, drayage trucks, locomotives, and storage and infrastructure technologies to receive more than $475 million collectively through the Clean Ports Program to the Ports of Oakland (California), Detroit (Michigan), Alaska, Charleston (South Carolina), and Honolulu Harbor (Hawaii).

Also in October, the Federal Railroad Administration within the Department of Transportation awarded $96.6 million to support deployment of hydrogen-related transportation technologies and applications in California, Colorado, and Pennsylvania under the Consolidated Rail Infrastructure and Safety Improvements (CRISI) Grant Program.

Hydrogen Provisions in Federal Aviation Administration Reauthorization

Concerted FCHEA efforts throughout the year also led to new hydrogen provisions in the Federal Aviation Administration (FAA) Reauthorization Act of 2024, including expanding the Airport Improvement Program (AIP) and the Center of Excellence for Alternative Jet Fuels and Environment (ASCENT) to include hydrogen, as well as directing the development of a hydrogen aviation strategy.

European Union

European Hydrogen Bank

The results of the European Hydrogen Bank's first auction were announced in April 2024. Seven projects across the EU will receive a total of €720 million, with a plan to produce 1.58 million tonnes (Mt) of renewable hydrogen over ten years, avoiding more than 10Mt of CO2 emissions.

Winning bidders will secure funds per kilogram of hydrogen produced (Kg/H2), sourced from the EU Emissions Trading System (Innovation Fund), bridging the price gap between current production costs and the price that hydrogen offtakers are ready to pay. The premium requested by the awarded project promoters ranged between €0.37 and €0.48 per Kg/H2 – well below the €4.5 ceiling price – for projects located in Spain (3), Portugal (2), Norway (1) and Finland (1).

In December 2024, the European Commission launched the second auction, offering a significant boost to the renewable hydrogen sector with a total budget of approximately €1.2 billion. Renewable hydrogen producers could bid for a fixed-price premium of up to €4 per kilogram of hydrogen produced over 10 years. The auction is structured into two baskets: a general basket (€1 billion) and a newly introduced Maritime basket (€200 million). Additionally, the Auction-as-a-Service model will bring further funding contributions from EU Member States, including Austria (€400 million), Spain (€280-400 million), and Lithuania (€36 million), bringing the total firepower of the Bank to around €2 billion.

The new eligibility criteria for the second auction include limiting electrolyser stack sourcing from China to a maximum of 25% (in MWe), along with other manufacturing steps, as well as requiring

mandatory compliance with European and international safety and cybersecurity standards. Projects will now face stricter requirements to demonstrate their maturity, including a new mandate to reach final investment decision within 2.5 years of the grant signature and an increased completion bond set at 8%.

IPCEIs (Important Projects of Common European Interest)

The European Commission launched the third and fourth "waves" of Important Projects of Common European Interest (IPCEI) in 2024.

The third wave, Hy2Infra, represented the first IPCEI call exclusively focused on hydrogen infrastructure. Through this IPCEI, France, Germany, Italy, the Netherlands, Poland, Portugal, and Slovakia are set to inject up to €6.9 billion of public funding from various national sources. This investment is expected to attract at least €5.4 billion in private capital, resulting in a total deployment fund of €12.3 billion.

The fourth IPCEI wave, known as Hy2Move, focuses on hydrogen mobility and marks the end of the Hydrogen IPCEI programme first launched back in 2019. Hy2Move will see Estonia, France, Germany, Italy, the Netherlands, Slovakia, and Spain collectively inject up to €1.4 billion in public funding from various national sources. This significant public investment is expected to attract at least €3.3 billion in private capital, resulting in a total financial effort of €4.7 billion.

These announcements followed a series of hydrogen IPCEIs that have been published: Hy2Tech, concentrating on hydrogen technologies and notified in 2022, followed by Hy2Use IPCEI in 2023, focusing on hydrogen applications. Together, these initiatives aim to raise over €43 billion from a blend of public and private funds, supporting more than 120 projects involving nearly 100 European companies.

ETS (EU Innovation Fund)

The EU Innovation Fund has awarded grant allocation of €4.8 billion to 85 innovative projects, with hydrogen projects making up one third of total awards. This significant funding initiative marks the largest allocation since the fund's inception in 2020, increasing the overall support to €12 billion and expanding the number of projects by 70%.

Hydrogen Europe welcomes the emphasis on hydrogen-related initiatives within this funding round. Among the awarded projects, 26 focus specifically on hydrogen technologies, representing 30% of the total. This group includes six large projects and four medium projects in the general category, along with twelve manufacturing projects and four pilot projects.

In the manufacturing category, five projects will deploy proton exchange membrane (PEM) electrolysers, fuel cells, and components; three will utilize alkaline technology; two will implement solid oxide electrolysis cells (SOEC); one will employ anion exchange membrane (AEM) technology; and one project will focus on hydrogen storage. Together they are set to generate 9.3 GW of electrolyser capacity representing a substantial increase on all previous Innovation Fund projects, which were projected to deliver 2.9 GW of capacity.

Meanwhile, the production projects selected in this call will deliver 61 kilotonnes of RFNBO annually, bringing the total yearly production supported by the Innovation Fund to 631.5 kilotonnes of RFNBO hydrogen.

The hydrogen projects are distributed across Europe with Belgium, Germany, Spain, Finland, Denmark, Italy, the Netherlands, Norway, Estonia, Greece, and France among the recipients. Hydrogen Europe members are involved in nearly half of the awarded hydrogen projects and in several other successful consortiums.

The ETS Innovation Fund is one of the world's most extensive funding programs dedicated to innovative low-carbon technologies, with a €40 billion budget (under current carbon prices). This fund awards grants through calls for proposals (IF Grant) and competitive bidding procedures (IF auctions).
Beginning of December, the European Commission has launched the following call of the Innovation Fund, along with the second auction of the European Hydrogen Bank, with €2.4 billion for decarbonization projects, cleantech manufacturing including electrolysers and fuel cells, and pilots.

Chile

Public Policies of 2024 in timeline

- February: 3rd Edition of the Green Hydrogen Accelerator – Energy Sustainability Agency (ASE)
  An initiative promoted by the Ministry of Energy and implemented by the Energy Sustainability Agency, aims to support the implementation of green hydrogen production and/or consumption projects in the country through the provision of co-financing for investment.
- April: Official publication of the Green Hydrogen Action Plan 2023-2030 - Ministry of Energy.
  The main objective is to define a roadmap between 2023 and 2030 to enable the deployment of the industry through coordinated actions among various government agencies, aligning with regional and local initiatives.
- June:
  Entry into force of Supreme Decree N°13: Hydrogen Facility Safety Regulations - Ministry of Energy
  A regulation that establishes the minimum safety requirements for hydrogen facilities must comply with.
  Official release of the Green Hydrogen Explorer - Ministry of Energy
  A tool for territorial analysis that facilitates the identification of announced projects in Chile, facilitating their evaluation and enabling the calculation of the Levelized Cost of Hydrogen (LCOH) for any project in a location within the country.
- September: Official launch of the Enabling Regulations Work Plan for the Hydrogen Industry – Ministry of Energy
  A work plan focused on the development of sectorial regulations to regulate the hydrogen value chain, ensuring regulatory coherence among the involved services, including the Ministries of Energy, Economy, Health, Transport and Telecommunications, and Mining, as well as other entities such as the Superintendency of Electricity and Fuels.
- October: 2nd Edition of the Support Guide for the Authorization Request of Special Hydrogen Projects
  The objective is to provide a clear guide for obtaining Superintendency of Electricity and Fuels authorization, an essential requirement to ensure that the facilities meet the highest safety standards and international regulations, such as ANSI, ASME, ASTM, among others.

- December: Magallanes Logistics Development Plan - Ministries of Transport and Telecommunications (MTT), Energy (MEN), and Public Works (MOP).
  The objective is to design a strategic plan for public-use of port infrastructure and logistics in the region, focused on addressing the challenge of the potential development of the green hydrogen industry. This plan aims to guide the state's decision-making towards promoting specific enabling infrastructure projects, essential for consolidating this emerging industry in the Region.

Financing Mechanisms

National incentives have primarily been provided through the Economic Development Agency (CORFO). One of the initial programs in 2021 offered financial support to accelerate the development of green hydrogen production projects, with funding up to a total of USD 50 million.

Among CORFO's main financing actions in 2024 is the promotion of the green hydrogen industry, highlighted by calls for Technological Programs aimed at increasing demand and fostering the development of manufacturing equipment for hydrogen processes. These initiatives will collectively represent public subsidies of USD 13.5 million over five years, while the private sector will contribute an additional USD 10.8 million. It is estimated that projects implemented under these calls could increase hydrogen demand in Chile by up to 1,000 tons per year, potentially rising to 45,000 tons annually as the developed technologies are replicated.

This year, CORFO is also conducting a Request for Proposals (RFP) for the "Manufacturing and/or Assembly of Electrolyzers and Their Components" in Chile.

Presentation of funding for H2V projects awarded in the calls for Technological Programs of the previous year, 2023, along with the opening of calls for 2024.

Additionally, CORFO's Green Credit program aims to support the development of the green hydrogen industry by financing the installation of electrolyzer plants and related equipment for green hydrogen production. The program also supports hydrogen use in key sectors such as mining, transportation, and agriculture, as well as pre-investment studies and compliance with environmental regulations. Companies can access financing of up to USD 30 million, with terms of up to 20 years in special cases.

In terms of tax incentives, the R&D Tax Incentive allows a reduction in the Income Tax equal to 35% of the investment in R&D, by tax credit up to a maximum of USD 1.2 million. It also permits the remaining 65% of R&D investment to be classified as required expenses deductible from Income Tax.

Kingdom of Spain

Spanish NECP update (September 2024)

Under the Regulation on the governance of the energy union and climate action (EU)2018/1999, all Member States must have a 10-year plan addressing decarbonization, energy efficiency, energy security, international energy market, and research, innovation and competitiveness, known as NECP (National Energy and Climate Plan, PNIEC in Spanish). This Plan sets an ambitious goal of 12 GW of electrolysis capacity installed in 2030 and increases national RFNBO consumption targets from those set by RED III (74% of hydrogen consumed in the industry sector should be RFNBO in 2030 and 17,26% of the energy requirements in the transport sectors should come from advanced biofuels and RFNBO).

RED III

An update of the Renewable Energies Directive (known as RED III) was published by the European Commission in November 2023, setting RFNBO consumption targets in the industry sector (42% by 2030) and the transport sector (5,5% combined target for advanced biofuels and RFNBO with a 1% RFNBO subquota). All EU Member countries must transpose this Directive before May 2025, during 2024 the Ministry for Ecologic Transition has been working on this transposition and opened a public consultation on the topic.

Fundings

1. Cadena de Valor

The Ministry for Ecological Transition and Demographic Challenge (MITECO) has allocated 66,6 M€ from the Next Generation EU's Recovery, Transformation, and Resilience Plan (PRTR) for the incentives program aimed at the innovative value chain with the Strategic Project for the Economic

Recovery and Transformation of Renewable Energies, Renewable Hydrogen, and Storage (PERTE ERHA). These initiatives aim to boost the development of basic-fundamental research projects, innovative pilots, and training in key enabling technologies within the renewable hydrogen value chain.

2. IPCEI Hy2Use

The IPCEI Hy2Use program is a joint project between 13 Member States (Austria, Belgium, Denmark, Finland, France, Greece, Italy, the Netherlands, Poland, Portugal, Slovakia, Spain, Sweden and Finland) to promote the decarbonization of industry through the installation of large-scale hydrogen-generating electrolyzers in major European industrial centers, also aiming at research and development of innovative and sustainable technologies for the integration of hydrogen into industrial processes in multiple sectors.

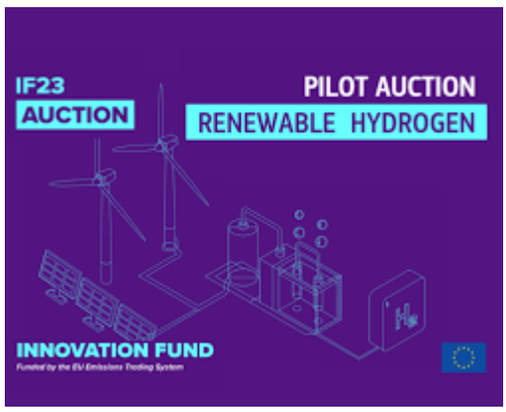
The Ministry for Ecological Transition and Demographic Challenge (MITECO) has allocated 794 M€ to 7 projects.

Development of hydrogen generation and transport infrastructures: Green H2 Los Barrios, Asturias H2 Valley, Renewable Hydrogen to produce ammonia and green fertilisers "Puertollano Phase I" and "Puertollano Phase II", Bilbao Large Scale Electrolyzer and Cartagena Large Scale Electrolyzer,

Development of hydrogen technologies for industrial applications: Ver-ammonia and Green hydrogen project in Magallón.

3. European Hydrogen Bank (EHB) pilot auction

On 30 April 2024, seven European projects were selected for EU financial support in the Innovation Fund's pilot hydrogen auction (IF23 Auction). The awarded funding will help successful bidders to bridge the difference between their production costs and the price that industrial users are willing to pay for this emerging product. Two out of six projects that have signed the Grant Agreement are in Spain (Hysencia and Catalina) with a combined allocated EHB budget of ≈ 238 M€.



H2med and Spanish Hydrogen Backbone

On the 8th of April 2024, the list of Projects of Common Interest (PCI) / Projects of Mutual Interest (PMI) was officially published in the Official Journal of the European Union, which includes the H2med project and the two main axes of the Spanish Hydrogen Backbone.

Australia

The most significant policy developed this year was the AHC's response to the Australian Government's review of Australia's National Hydrogen Strategy.

The AHC believes Australia has an enormous opportunity to create a vibrant hydrogen industry, both for domestic use and for export. Australia has the renewable energy resources, technical skills, and the track record with international partners to become a global hydrogen leader. However, the transition to net zero energy emissions — and hydrogen's role within the transition - will require unprecedented rates of investment in new or repurposed energy sources, infrastructure, and

energy use equipment.

This will need to be synchronised with an equally unprecedented exit, stranding or repurposing of existing capital stock (e.g., coal-fired power stations, gas networks, oil import supply chains, coal export supply chains). Those investments will arise from the interplay of policies and programs of the Australian Government and jurisdictional governments, regulatory bodies, private sector companies, energy users from households to major industrial consumers, the RD&D community and the governments and companies of our major trading partners.

The scale of this task requires planning, funding, and targeted demand stimulation.

During the initial stages of this energy transition, governments and industries have not always done the heavy lifting. As a result, there are perceptions of endless possibilities, ranging from overly optimistic scenarios of a transition without any costs, to the idea of an unchanged environment, or an economy that benefits everyone without any drawbacks.

The AHC would include in this the notion that hydrogen developments can be activated by discrete tasks with surgical precision. Hydrogen is not separate from the energy transition and everything this entails; it fundamentally affects, and is affected by, multiple systems and requires an ecosystem to enable it to be produced, stored, delivered and used efficiently.

The AHC's response to the National Hydrogen Strategy refresh proposed 53 comprehensive recommendations to guide policy development, with emphasis on the following recommendations as key components to ensure success of the hydrogen industry in Australia:

- Tasking stewardship of the NHS to a central coordinating body, the Net Zero Economy Agency

  The energy and industry transition will connect complex systems and require fundamental change, planning and creativity across sector, state, departmental and political boundaries. Australia needs cross-departmental steering of net zero work which includes the refreshed NHS.

- Setting priorities and targets, based on robust analysis

  Within the overall net zero programme, the Australian Government must set priorities and meaningful targets, and there needs to be a government commitment to fill current knowledge gaps to a reasonable degree.

- Committing to planning and financial support for shared physical and social infrastructure, including via Hydrogen Economic Zones

  Almost all the physical infrastructure required for a future hydrogen industry at scale is new, and it is long-lived with long planning lead times. There must be planning and co-optimising of different assets to address a range of different markets and to not over-burden consumers' and taxpayers' willingness to pay, or communities' willingness to tolerate construction in their midst. This requires an extension of the current Renewable Energy Zones and hydrogen hubs concept to create zones that can support and be supported by local industries and communities.

- Building scale and capability in the sectors and applications that will be hard to abate

  This is the best 'no regrets' approach that can be taken in an uncertain environment.

- Keeping export options open

  For export, there are two main uses of hydrogen: exporting hydrogen and its derivatives as an energy vector and using hydrogen to process ores that are then exported. Both options need to be pursued to grow our international relationships, support regional energy security, and build Australia's capability for the future, including paying for our own transition.

- De-risking projects through public finance

  The Australian government needs to deploy appropriately scaled public levers that will crowd in and de-risk investment in hydrogen. Ideally, the current and future iterations of the recently announced $2 billion Hydrogen Headstart program will need to incentivise demand or assist project developers to manage demand side risk. The approach must also prioritise timeliness, both to build momentum and to align prospective projects with the timelines for regional offtake (and as a response to the investment challenge posed by the IRA).

To view this and other reports prepared by the AHC this year, visit:
https://h2council.com.au/ahc-publications/

France

Focus on Hy2Move, PIIEC Hydrogen

PIIECs, or major projects of common European interest, are schemes that enable Member States to finance industrial projects, so that the EU can develop an integrated industrial policy that meets the challenges of the future (decarbonisation, strategic autonomy) while preserving intra-Community competition.

Hydrogen benefits from a PIIEC enacted in 2021, structured in 4 waves

- Hy2Tech' on end-user technologies (15/07/22)
- Hy2Use' on applications in the industrial sector (21/09/22)
- Hy2Infra' on investment in infrastructure (15/02/24)
- Hy2Move' on mobility applications (28/05/2024).

French industry is the only European industry present in all 4 waves. Two French equipment gigafactory projects have been selected as part of Hy2Move, the 4th wave of the Hydrogen PIIEC on 28 May 2024: GEN-HY will develop and industrialise modular AEM electrolyser platforms to supply recharging stations. HDF Energy will also develop and industrialise high-capacity fuel cells for rail, marine and stationary applications.

Funding and regulatory framework: a period of uncertainty

The political context, partly due to the reshuffle at the start of the year and the dissolution of the French National Assembly, has been particularly unsettling for the French hydrogen industry in 2024. More than ever, the future of the industry is linked to strategic decisions in national industrial policy at a time when it is facing the realities of industrial cycles in its deployment. Yet the French public authorities are slow to take decisions, while major European players continue to move forward.

A national strategy on hold

After the enthusiasm generated by the publication of the National Hydrogen Strategy in September 2020, we are still waiting for it to be revised, in line with the delay in the new multi-annual energy programme. Admittedly, the outlines announced last December as part of the consultation for the National Hydrogen Strategy, as well as the National Hydrogen Council held on 26 March 2024, have confirmed the course set in 2020. But at this stage, the new roadmap, which takes into account feedback from experience and changes in the European and international context, has still not been finalised, and interministerial arbitration, in the context of a tense budgetary situation, is posing challenges.

The roll-out of electrolysis capacity, the integration of hydrogen into energy systems, the competitiveness of low-carbon hydrogen production, the strengthening of technology control, import policy... The industry's players are mobilising to make their contribution, in harmony with all the players involved in renewable energies. However, the current political uncertainty has delayed decisions at the highest level and, ultimately, the economic trade-off remains the Gordian knot, still unresolved.

Status quo in regulation too

In parallel with the efforts being made in terms of public investment, it is essential to draw up long-term regulations favourable to decarbonisation. Because the success of the National Hydrogen Strategy also depends on electrolysis hydrogen producers being able to secure a supply of decarbonised electricity that is competitive over the long term. This success depends in part on the upstream definition of a regulatory framework for the development of renewable electrical energies, a reform supported by France Hydrogène and under discussion in the 2025 Budget Bill.

In the field of applications, the competitiveness of alternative energies remains critical. For mobility, the TIRUERT (incentive tax on the use of renewable energy in transport) should make it possible to reduce the cost of hydrogen at the pump. How does it work? To set conventional fuel distributors targets for the incorporation of renewable energies, including renewable or low-carbon hydrogen, and to apply a penalty if these targets are not met. A thorough overhaul of this tool to transpose the Renewable Energy Directive (RED3) is eagerly awaited by the industry.

In addition, work is being carried out simultaneously on ICPE headings 1416 and 4715. The draft revision of the ICPE 1416 decree aims to increase hydrogen gas distribution rates in preparation for heavy mobility. A hazard study carried out by Ineris assesses the impact of these changes. The draft decree is currently being written by the DGPR, with the aim of publication in early 2025.

With regard to ICPE heading 4715, a generic hazard study is being carried out to introduce a Registration regime for quantities of hydrogen of between 1 and 5 tonnes, replacing the current Authorisation regime. The draft decree for this new regime should also be published in 2025.

At last and at least: launch of the 1st part of the French Production Support Mechanism

On Friday 20 December, the competitive dialogue for the first tranche of the support mechanism for the production of low-carbon hydrogen by electrolysis (MSP) was opened, until 14 March 2025. This mechanism makes it possible to offset the cost differential between electrolytic hydrogen and carbon-based hydrogen for industrial uses (steel, chemicals, fertilisers, etc.). By supporting the deployment of 1 GW of electrolysis capacity over several tendering rounds, it represents a decisive lever for the development and acceleration of the hydrogen industry.

The first tranche of the support mechanism will enable the deployment of 200MW of electrolysis, for projects with a unit capacity of between 5 and 100MW. The President of France Hydrogène commented: "After a period of uncertainty, this announcement gives France a new dynamic, and we can now count on our major assets to become one of the leaders in carbon-free hydrogen in Europe."

Hungary

The Hungarian Government submitted the draft On the Amendment of Certain Energy-Related Laws ('Egyes energetikai tárgyú törvények módosításáról'), filed under document number T/9720 and adopted on December 23, 2024.

1. Regarding implementation of Renewable Energy Directive (RED III)

- Guarantees of Origin (GoOs): Provisions introduced to ensure transparency and accountability in the energy market.
- Target Objectives: While general objectives are set, the 42.5% renewable energy target and the 1.2% RFNBO objective are not fully integrated.
- Simplified Permitting: Provisions streamline permitting for renewable energy projects but lack detailed mechanisms.
- Monitoring and Reporting: No specific updates or reporting frameworks to the EU are included.

2. Regarding implementation of Hydrogen and Decarbonised Gas Market Package

- Hydrogen Infrastructure Development: Introduces hydrogen supply network guidelines, including integration rules for the gas grid and the appointment of system operators.
- Market Integration: Lacks details on transparent access and cost-sharing mechanisms for hydrogen infrastructure.
- European Network of Network Operators for Hydrogen (ENNOH):

  - The Government's proposal includes the minimum legislation for designating hydrogen system operators, a key precondition for ENNOH integration.

  - However, this requirement is entirely missing from the current draft legislation.

3. Regarding implementation of Alternative Fuels Infrastructure Regulation (AFIR)

- Charging and Refueling Infrastructure: Includes provisions for identification and data access for alternative fuel stations, but a national development plan for EV and hydrogen infrastructure is absent.
- TEN-T Network Compliance: Lacks detailed measures to align Hungary's infrastructure with EU Trans-European Transport Network (TEN-T) requirements.

4. Regarding implementation of ReFuelEU Aviation Regulation

- Sustainable Aviation Fuels (SAF): The legislation briefly mentions SAF, but does not include the 2% EU-mandated SAF target or infrastructure development for storage and distribution at airports.

Denmark

■ Power-to-X Strategy (March. 2022)

The Government has formulated four objectives that collectively contribute to overcoming the barriers for PtX and plot a course for the development and expansion of green hydrogen and green PtX products. The Government is thereby taking the first major holistic step towards a new utilities sector.

Objective 1: Power-to-X must be able to contribute to the realisation of the objectives in the Danish Climate Act

The Government aims to ensure that PtX can contribute to the achievement of Denmark's climate objectives, namely the 70 percent target by 2030, the long-term target of climate neutrality by 2050 at the latest and the reduction of Denmark's global climate footprint.The Government aims to ensure that PtX can contribute to the achievement of Denmark's climate objectives, namely the 70 percent target by 2030, the long-term target of climate neutrality by 2050 at the latest and the reduction of Denmark's global climate footprint.

Accordingly, the Government will:

- Push for ambitious, pan-European requirements for CO2 intensity reduction targets in the negotiations on the EU Commission's "Fit for 55" package, including in the shipping sector.
- Push for higher pan-European sub-requirements for PtX fuels in aviation, as well as the option for individual Member States to set higher national requirements.
- Initiate an analysis of biological resources for the green transition.

Objective 2: The regulatory framework and infrastructure must be in place for Denmark to utilise its strengths and allow Power-to-X to perform on market terms in the long run.

The Government will work to ensure that Danish hydrogen and PtX products can eventually compete with biofuels and foreign PtX products on the market. Accordingly, the Government will create the appropriate economic and regulatory framework for ensuring that the production and use of PtX products can eventually perform on market terms. The Government will also establish

the framework conditions for a hydrogen infrastructure in Denmark that can support flexible operation of the PtX plants and transport hydrogen over long distances.

Accordingly, the Government will:

- Invest DKK 1.25 billion towards operating support for the production of hydrogen and other PtX products. The purpose of the PtX tender is to support the industrialisation and upscaling of PtX production in Denmark and thereby reduce the costs associated with hydrogen production. This is envisaged to encourage growth and job creation as well as Denmark's commercial and export potential in the PtX area. These subsidies will be granted as a fixed price subsidy for a 10-year period.
- Enter into dialogue with the European Commission on allocating DKK 344 million of REACT-EU funds and the Just Transition Fund to establish a national investment funding scheme for innovative green key technologies with a particular focus on PtX and hydrogen, including green production and demonstration projects.
- Initiate a 360-degree review of Denmark's legislation in relation to hydrogen.
- Develop a national regulation for a Danish hydrogen market.
- Give Energinet and Evida the possibility to own and operate hydrogen infrastructure.
- Act on the recommendations from the South Jutland growth team to establish a commercial beacon for green energy and sectoral linking.

Objective 3: The integration between Power-to-X and the Danish energy system must be improved

The Government will work towards creating a framework that ensures that PtX can contribute to an integrated and flexible energy system where PtX is integrated into the system so that it works in harmony with the electricity, gas and heating sector. The Government will accordingly strengthen the basic conditions for ensuring that PtX plants are located in places around Denmark where they can create value for the electricity system by offering flexibility and reducing the need for grid expansion and reinforcement.

Accordingly, the Government will:

- Provide the option for geographically differentiated consumption tariffs, giving Energinet and grid companies the option to differentiate consumption tariffs for large electricity consumers based on their geographical location and thereby ensuring that the tariffs reflect the true cost of electricity to a greater extent. This can provide a financial incentive to choose appropriate locations in the electricity grid for PtX plants and thereby contribute to more efficient use of the electricity grid.
- Create an application-based scheme for establishing direct links between major electricity consumers and electricity producers, e.g. between a PtX plant and a wind farm/solar park, when deemed socio-economically beneficial to do so.
- Act on the recommendations from the South Jutland growth team to establish a commercial beacon for green energy and sectoral linking, including links between PtX and district heating.

Objective 4: Denmark must be able to export Power-toX products and technologies

The Government will work to ensure that Denmark contributes to the realisation of the EU's reduction targets for 2030 and 2050 as well as those of the Paris Agreements, while at the same time exploiting the commercial and export potential for Danish businesses by enabling an upscaling and development of the Danish PtX industry across the entire value chain. Foreign investors can

make a significant contribution in that regard, and promoting investments can further help towards achieving that goal. At the same time, a focus on innovation can contribute to promoting future Danish exports and attracting foreign investment.

In addition to the investment support scheme that will contribute to the upscaling and development of PtX technologies (see objective 2), the Government will therefore strengthen the framework for 1) creating access to financing for major demonstration projects such as PtX plants, 2) ensuring that Danish companies can export certified green hydrogen and green PtX fuels and 3) establish a hydrogen infrastructure in Denmark that can eventually be used to export hydrogen to other European countries.

Accordingly, the Government will:

- Propose that Denmark should aim to build upwards of 4 - 6 GW of electrolysis capacity by 2030.
- Support the export of hydrogen and PtX products by creating the framework for a hydrogen infrastructure that can eventually be linked to a common European hydrogen infrastructure.
- Improve access to venture capital, including Danish businesses' access to export financing, with a view to supporting the commercial development of PtX technologies and products both in Denmark and abroad.
- Support Danish businesses' exports of hydrogen and PtX technology and work to attract foreign investment in Danish PtX projects.
- Work to create clear and uniform rules in connection with European certification for green hydrogen and biogenic sustainable CO2.

Republic of Poland

National hydrogen roadmap, financial support policies (e.g. tax exemptions, subsidies)

The most substantial progress in this regard has been made by Polish Energy Law Act recast, that entered into force in January this year. With this hydrogen became regulated not as "other flammable gas" but as legally defined product. Currently the main Polish energy regulation (Energy Law act) recognizes 4 different forms of hydrogen, depending on the form of production. It is coherent with EU regulations, i.e. renewable hydrogen, low-carbon hydrogen, conventional hydrogen and bio-hydrogen (biomass derived). Apart from that, recast has brought licensing to hydrogen producers, traders and logistics operators. This is mirroring the regulated market of energy carriers such as electric energy, natural gas or liquid fuels. It has also implemented some provisions from so called EU hydrogen-natural package, such as designating hydrogen infrastructure operators, rules of hydrogen distribution, blending and so on.

Pending is the revision of the national hydrogen strategy, adopted in 2021, that was supposed to be revised by the end of last year but it didn't happen.

On the list of subsidies Government by the Ministry of Climate and Environment (Ministry of Energy in Poland) has begun public consultation of so called Investment Strategy, which is a subsidizing mechanism dedicated for ELY systems of at least 20MW installed power. The consultations haven't brought any clear result as of yet.

People's Republic of China

The General Provisions clearly define "energy" as various resources that can be directly or indirectly converted into useful energy through processing, including coal, petroleum, natural gas, nuclear energy, hydropower, wind energy, solar energy, biomass energy, geothermal energy, ocean energy, as well as electricity, heat, and hydrogen energy.

In the section on energy development and utilization, Article 33 of the Energy Law stipulates that the state shall actively and orderly promote the development and utilization of hydrogen energy and foster high-quality development of the hydrogen energy industry.

The Supplementary Provisions further define hydrogen energy as the energy released from the chemical reactions of hydrogen as an energy carrier.

The adoption of the Energy Law marks the official inclusion of hydrogen energy on an equal footing with traditional energy sources such as coal, petroleum, and natural gas, subject to the same management and regulations. This signifies the state's legal recognition of hydrogen as an energy source and further clarifies the energy attribute of hydrogen.

The State Council Information Office of China released a white paper titled "China's Energy Transition".

Promoting the electrification and decarbonization of end-use energy. In the industrial sector, focusing on production heating, drying, and steam supply, the implementation of high-temperature heat pumps, electric heating, and other electricity substitutions will be promoted, and the demonstration application of renewable energy-based hydrogen production in the chemical and metallurgical industries will be pushed forward.

Promoting the transformation and upgrading of the petrochemical industry and strengthening the research and application of renewable hydrogen production and carbon dioxide hydrogenation to produce chemical products.

Exploring hydrogen pipeline transportation and building integrated transportation energy service stations with oil, gas, electricity, and hydrogen at traditional gas stations and refueling stations.

Strengthening energy technology collaborative innovation. Focusing on national major projects such as nuclear power, oil and gas, and key research and development plans such as advanced renewable energy technologies, energy storage and smart grids, hydrogen energy, and clean and efficient utilization of coal, energy technology innovation plans will be formulated and implemented to strengthen top-level design for technological innovation.

Accelerating the development of new energy storage and hydrogen technologies.

Kingdom of Norway

■ POLICY OVERVIEW

The Norwegian government launched a Hydrogen strategy in 2020,[1] in which it emphasizes that Norway has a long history of industrial hydrogen production. Since renewable hydrogen and ammonia was first produced at Rjukan in the 1920s, Norway has further developed its industrial

competence within hydrogen, and Norwegian businesses can draw upon vast experiences from the oil and gas industry, maritime industry, process industry and the renewables sector.

With the launch of the Norwegian Hydrogen Roadmap in spring 2021,[2] the government announced the first targets and measures to build up a coherent hydrogen value chain where production, distribution and use is developed in parallel. Two new hydrogen research centers were also financed: HYDROGENi[3] (coordinated by Sintef) and HyValue (coordinated by Norce).[4]

The government also launched its Green Industrial roadmap in 2022, which puts further emphasis on hydrogen as an important new, green industry for Norway.[5]

In 2023, this strategy was revised. 100 measures were listed to achieve the government's goals. For hydrogen, this included taking part in the European Hydrogen Bank auctions under the EU's Innovation Fund

MARKET DEVELOPMENT

The actors involved in building up the Norwegian hydrogen industry come partly from the country's strong historic research and industrial community on hydrogen and hydrogen technology, which has roots back to 1929 when Norway produced its first ammonia from hydropower and water at Hydro's Rjukan site, but also from the strong renewable industry, the maritime industry, and the offshore oil and gas industry.

In addition to significant competence in the fields of electrolysers, fuel cells, storage tanks and hydrogen refuelling stations, Norway is at the forefront when it comes to developing new solutions in areas such as compressors, subsea hydrogen storage, bunkering solutions and other technologies for maritime application, hydrogen and ammonia ships, safety, carbon capture and innovative concepts for offshore hydrogen production. The country's substantial sub-suppliers in the oil and gas industry can further utilize its competence to develop renewable and low-carbon equipment and appliances for the hydrogen economy.

In Norwegian Hydrogen Forum's last update (12 June 2024) of its annual mapping of *the Norwegian Hydrogen Landscape*, there were 212 projects related to hydrogen in Norway. This includes production, use, research and development and scale-up of technology manufacturing. There were 75 projects related to hydrogen production (incl. derivates), with planned production capacity reaching 7.746 Megawatts (MW) in 2030.

In 2024, five hydrogen production plants have come into operation. Four investment decisions have been made, which will increase production capacity from around 38 MW in 2024 to 95 MW in 2027. Important milestones have been the opening of Yara's 24 MW electrolyser at its Herøya plant in Porsgrunn, as well as the opening of Veidekke's second asphalt plant using renewable hydrogen as heating source.

In the maritime sector, one hydrogen ferry has been in operation since 2023. Two further hydrogen ferries are under construction and will come into operation at the Vestfjorden line in Northern Norway by 2026. In heavy duty transport, MAN has announced plans to deliver up to 100 hydrogen trucks to Norway in 2025.

Use of hydrogen at zero-emission building sites has been demonstrated with good results at Gran (in 2024) and in Oslo (in 2023).

The Norwegian Ministry of Transport aims to develop Norway as a testbed for low- and zero emission aviation. The first hydrogen concept for aviation is expected to be demonstrated in 2026 with Bodø

Airport as the central hub. Hydrogen is also being used for fast-charging of battery-electric road vehicles in Hareid, close to the city of Ålesund.

FUNDING

The funding organisations Enova, Innovation Norway, Gassnova and The Research Council of Norway support hydrogen projects by public funding. They announce separate calls or calls in collaboration in order to accelerate the development and implementation.

In 2024, around 190 million Euro has been approved for funding to hydrogen projects totally. Notably, 103 million Euro was awarded to 9 hydrogen and 6 ammonia vessels in June. In November, 67 million Euro was awarded to 5 hydrogen production hubs (80 MW in total) for maritime application. Final Investment Decisions are expected in 2025.

Over the period from 2015 to 2024 totally about 800mill Euro has been approved for funding from the funding organisations. This amount of funding has been matched with almost the same amount from private players.

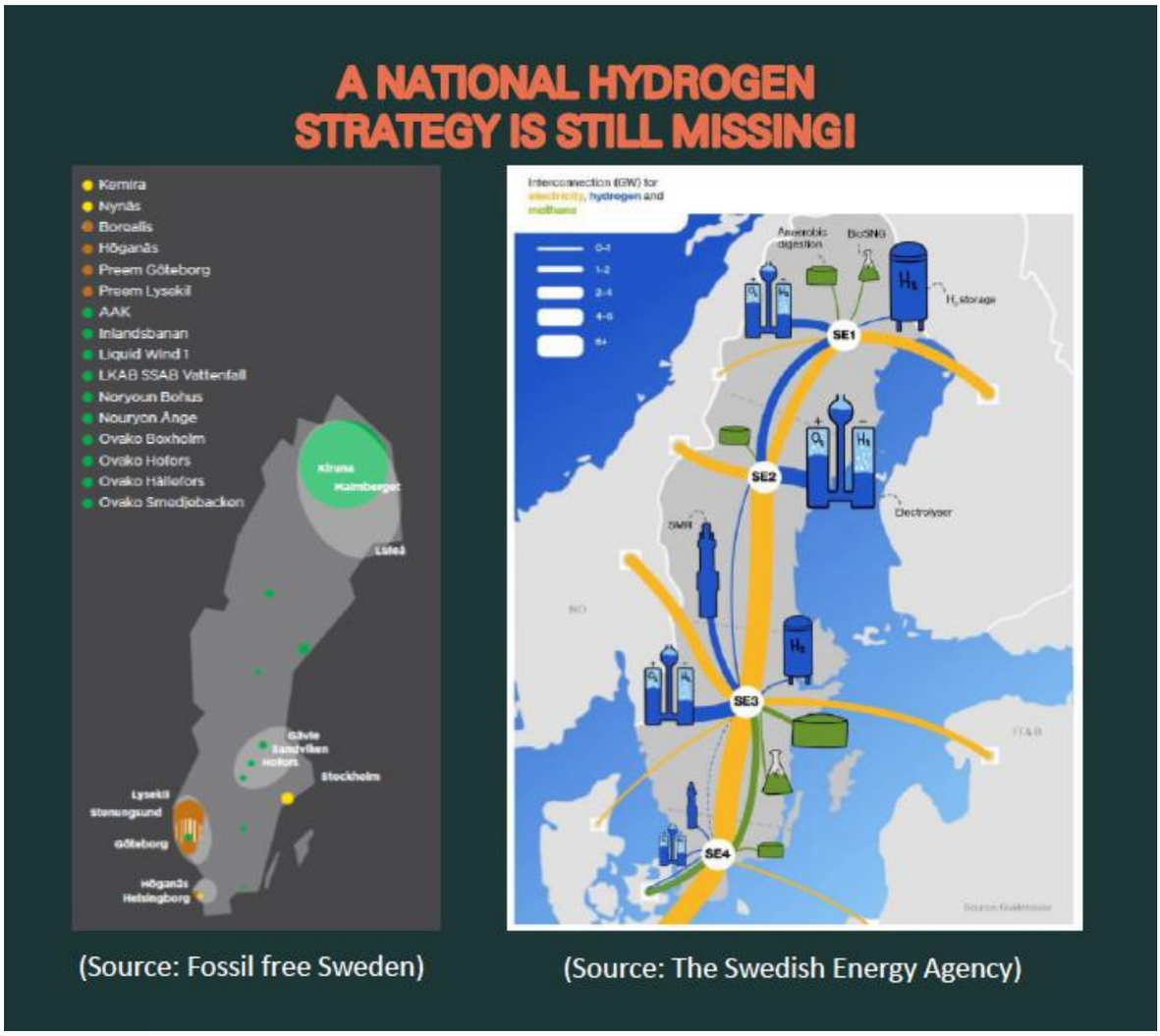
Several Norwegian companies have received funding through the EU's various innovation programs in 2024. In May, Skiga AS was one of seven winners in the European Hydrogen Bank pilot auction. In autumn, the three electrolyser manufacturing companies Nel Hydrogen, Hystar and HydrogenPro were awarded a total of 177,5 million Euro in the Innovation Fund

Sweden

Swedish Energy Agency 2024

- The Swedish Energy Agency is tasked with coordinating the work with hydrogen in Sweden. It is about finding solutions together with actors and other authorities to develop the role of hydrogen in the energy system. The results will be presented to Swedish government in December this year .

Target capacity : 5 GW by 2030 and 15 GW by 2045.

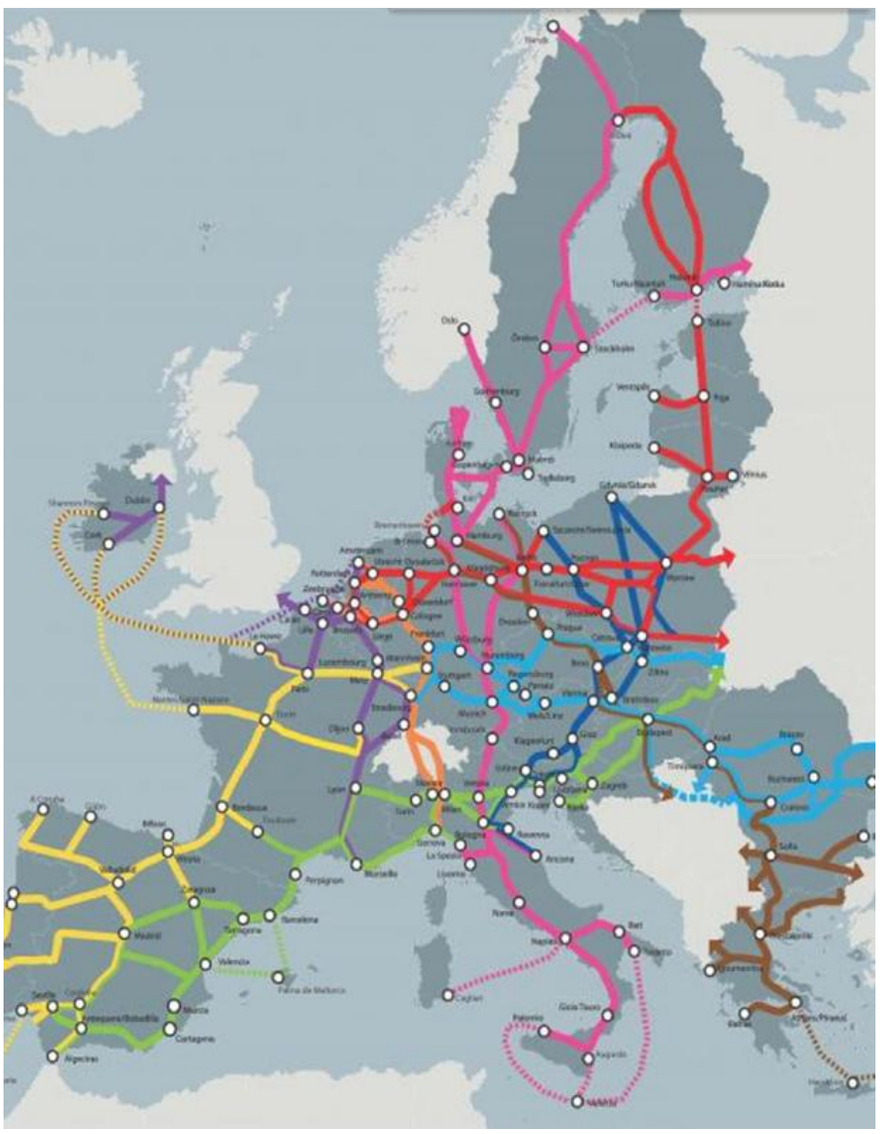


AFIR Enters Into Force (Alternative Fuels Infrastructure Regulation)

- The EU Parliament's AFIR decision is compulsory. For hydrogen refueling stations, the regulation requires:
- A station every 200 km + urban nodes with over 100,000 people
  At least 1 ton/day capacity per station
  Implementation by 2030 (planning starts 2027)
- Implication for Sweden: 34 HRS
  (Map shows EU-wide alternative fuels network)

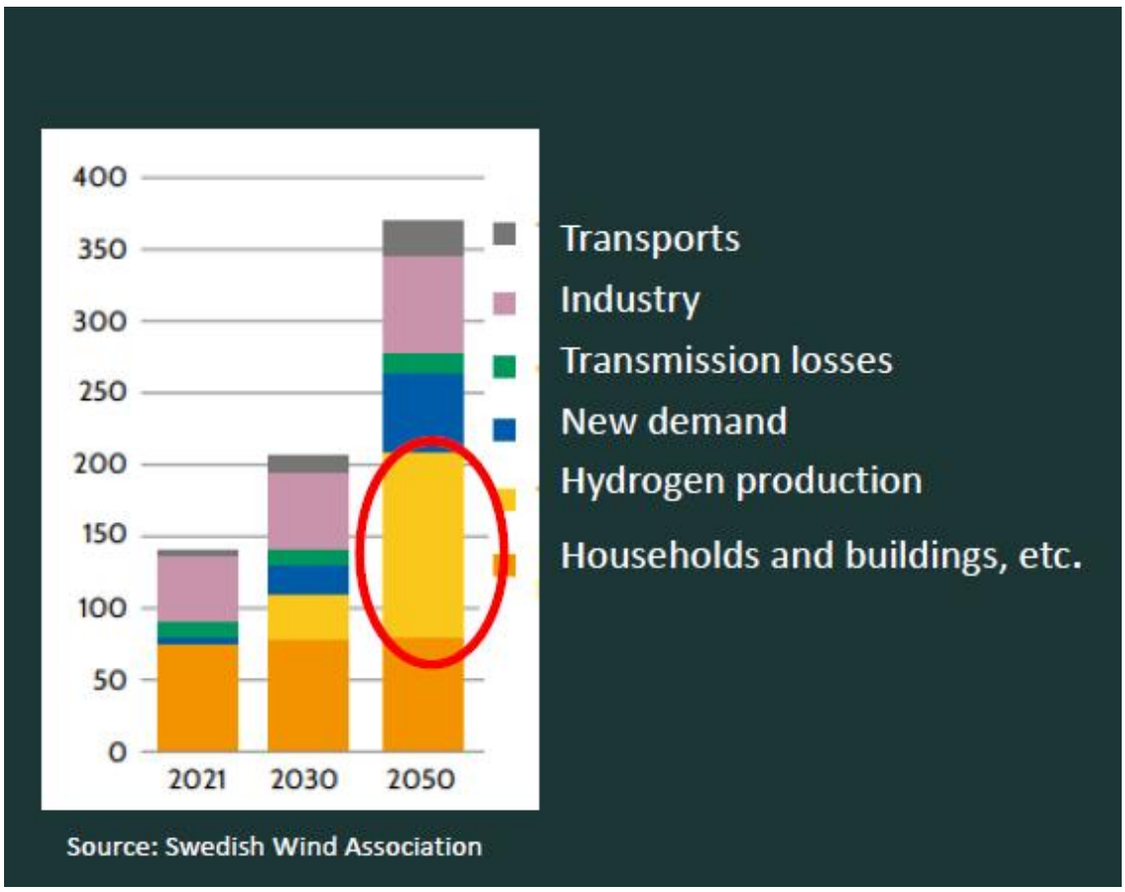
Demand on Electricity Increase 3× by 2050

- The electricity demand in Sweden is expected to total 370 TWh by 2050



- An increase in electricity use can take place as early as 2030, as it is expected to increase to 207 TWh
- Development is primarily driven by current and future climate change in the industry and transport sector.

(Chart source: Swedish Wind Association)



Goverment Incentives and Climate Funding Progams in Sweden

- 2030: minus 63% CO_2 -emissions compared to 1990
- Net zero in 2045
- Climate leap (Klimatklivet): up to 70% CAPEX support for HRS, first H2-production projects approved
- Industry leap (Industriklivet): bigger industrial projects
- Climate premie (Klimatpremien): light and heavy trucks, buses (class 2) – 20% of CAPEX
- Electrification pilots: 13 HRS-support, 100% of CAPEX

EU RENEWABLE ENERGY DIRECTIVE (REDIII)

Implementation day in Sweden 21 May

Industry

- From 32% to 42,5% renewable electricity in the system until 2030
- Min. 42% renewable hydrogen until 2030 to increase to 60% until 2035

- Hydrogen produced with electricity from nuclear power can be used in some countries Transport
- 14,5% reduction of GHG or 29% of renewable energi of the sector's total energy onsumption
- Whereof 5.5% must be so-called "advanced biofuels" and min. 1% from so-called RFNBO (Renewable fuels of non-biological origin)

Costa Rican Hydrogen Alliance
Costa Rica

- Costa Rica has developed a National Decarbonization Plan, a National Energy Plan, a National Electric Transport Strategy, and a National Hydrogen Strategy.
- The National Hydrogen Strategy focuses on:
  - Decarbonization of the transport and industrial sectors.
  - Development of a technological and innovation hub in green hydrogen.
  - Promoting hydrogen exports.
- From 2019 to 2021, Costa Rica conducted key studies for hydrogen strategy development, including:
  - Life cycle analysis of zero-emissions transportation.
  - Total cost of ownership of zero-emissions transportation.
  - Hydrogen refueling infrastructure roadmap.
  - Global market study and impacts for Costa Rica.
- In 2020, a Decree amended the Regulation of Law 7447 (Ley de Regulación del Uso Racional de la Energía) to include tax exemptions for hydrogen generation, storage, dispensing, and utilization equipment.
- Bill 22392 ("Law for the Promotion and Implementation of a Green Hydrogen Economy in Costa Rica") was introduced, declaring activities related to green hydrogen as being of public interest, authorizing public institutions to engage in hydrogen-related activities, and offering fiscal incentives and concessional financing through the national banking system.

Egypt

- Egypt plans to allocate 50% of public investment to green projects by 2025 and 75% by 2030, aiming for the green economy to contribute at least 5% of GDP.
- A hydrogen-specific incentive package (including tax breaks and non-tax incentives) has been approved and ratified, offering benefits to green hydrogen project developers securing foreign investment.
- Egypt's government committed to fast-tracking the implementation of nine green hydrogen projects in the short term in the SCZone.

- H2Med 2025 discussions emphasized the need for Europe to avoid over-regulation, and maintain pragmatic competitiveness in clean energy development.
- The EU's Global Gateway Initiative promotes investments in transport corridors, ports, renewable energy generation, hydrogen production, and raw material value chains with Egypt.
- Policies supporting low-carbon fertilizer production were discussed, leveraging Egypt's hydrogen and ammonia capacities.

Key policy recommendations from H2Med 2025 include:

- Establishing harmonized certification systems to enable trade and interoperability.
- Expanding public-private investment models for hydrogen and sustainable fertilizer sectors.
- Implementing contracts-for-difference and blended finance mechanisms to lower investment risks and attract capital.

Portugal

Portugal actively participated in the European Hydrogen Bank's first auction, securing financing for two major renewable hydrogen projects, Grey2Green-II and MP2X, demonstrating its national commitment to integrate hydrogen into its future energy mix. In addition, the Portugal 2023 program and the European Regional Development Fund (ERDF) 2021–2027 provided funding support for hydrogen initiatives, such as the H2NG project, which focuses on hydrogen blending into natural gas networks. The Recovery and Resilience Plan (PRR) is also co-financing hydrogen-related industrial innovation projects, such as the establishment of a new electrolyser factory by HyChem, further indicating Portugal's policy-level support for domestic hydrogen production and technology development

Hydrogen Colombia
The Republic of Colombia

The hydrogen ecosystem in Colombia is advancing rapidly, with a growing number of projects positioning the country as a key player in the global energy transition.

As of 2025, 36 green hydrogen initiatives have been identified, including both committed projects—those already operational, under construction, or with secured investment—and others in earlier development stages.

These projects represent an electrolyzer capacity of over 18 GW and estimated investments exceeding $40 billion USD through 2040.

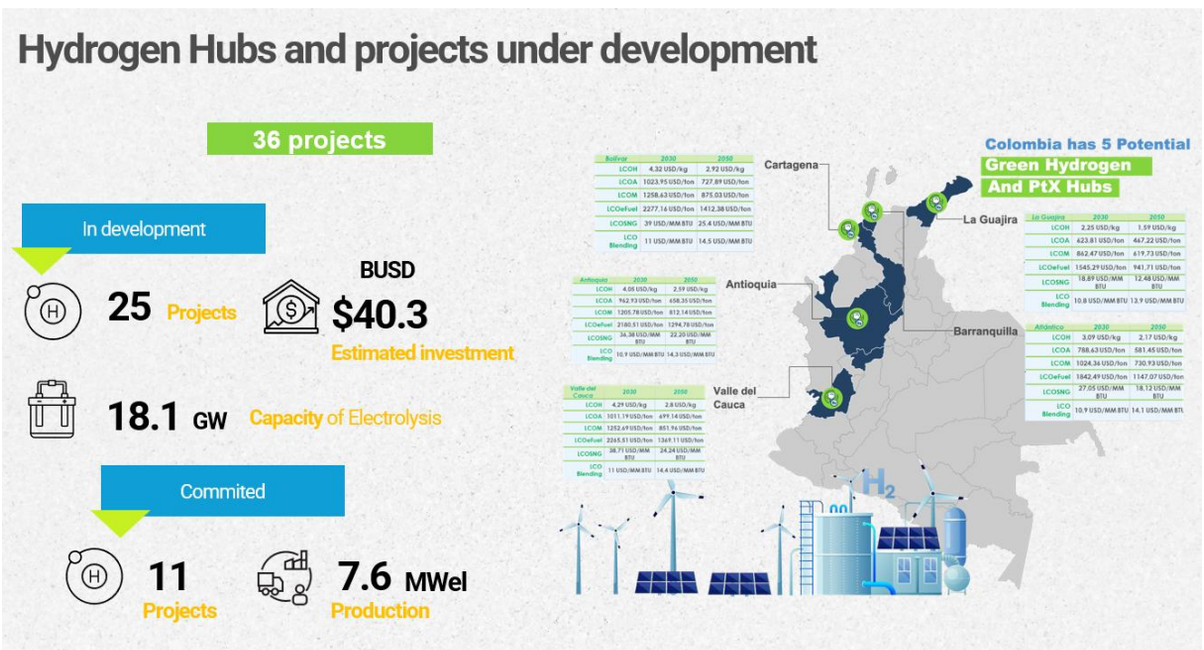
Flagship initiatives such as Coral by Ecopetrol and Protium by Hevolución reflect increasing national momentum and early progress toward large-scale hydrogen production for industrial uses.

This emerging ecosystem is also showing strong export orientation, with 92% of projects in development aiming to serve international markets.

Although many projects are still defining their technologies, there is a clear trend toward using PEM and alkaline electrolysis, particularly for applications like:

- Ammonia production
- Refining
- Sustainable mobility
- Biofuels

The growing involvement of both public and private stakeholders, alongside international cooperation, is contributing to the creation of a robust and diversified hydrogen value chain in Colombia.



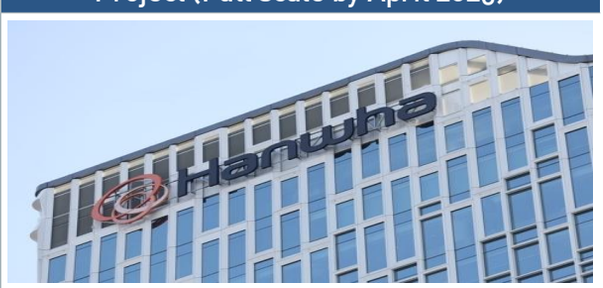
Ⅳ. Recent In-Country Development

Republic of Korea

■ Clean H2/Ammonia Production Demonstration/Commercial Projects

Korea plans to secure advanced high-efficient and mass-production technology through domestic demonstration project, while constructing oversea clean hydrogen production plant for economic supply chain.

▌Major Domestic Clean Hydrogen Project ▐

JeJu 12.5MW Green Hydrogen Pilot Project (Completion by March 2026)	Jeonbuk Buan 2.5MW PEM Hydrogen Project (Full scale by May 2025)
	
Demonstrating all four existing types of electrolyser system; AEC, PEM, SOEC, AEM. Produced H2 will be supplied for 200 cleaning vehicles and 300 intercity buses	Produce 1tonH2/day and supply nearby filling station. FEED completed by Hyundai E&C (Nov 2023)
Pyeongtaek LNG Reforming Blue Hydrogen Project (Constructed in August 2022)	**Pyeongchang 2.5MW Green Hydrogen Project (Full scale by April 2025)**
	
Producing 7tonH2/day and supply 33 filling station nearby. Reformer supplied by Woniltni	Wind power based H2 Production of 1ton/day. Organized by Hanwha Solution
Ulsan Hydrogen Liquefaction Plant (Completion by early 2024)	**Incheon Hydrogen Liquefaction Plant (Demo. since Oct. 2023)**
	
Produce 13kton/yr of liquid hydrogen under cooperation of Hyosung Group and Linde Group. Construct 30 liquid hydrogen filling station simultaneously	SK E&S produces 30kton/yr of liquid hydrogen, and operates charging station that can refuel 60 heavy-duty trucks per day and 24 passenger cars per hour

▌Oversea Clean Hydrogen Project ▐

Queensland SunHQ 1MW PEM Hydrogen Hub (Production start in 1Q 2024)	Sarawak H2biscus Clean Hydrogen Project (FID by end of 2024)
	
Produce green hydrogen based on 124MW solar power plant in Queensland, Australia. Constructed by Ark Energy.	Produce 150kton/yr of green hydrogen in Sarawak, Malaysia. FEED ongoing by Samsung Engineering.

■ Hydrogen Mobility

Korea is actively promoting hydrogen mobility with ambitious goal of deploying 30,000 commercial FCEVs by 2030, and build 70 liquid hydrogen fueling stations across the country. The government has been expanding subsidies for purchasing hydrogen buses and trucks. For October 2023, Korea has deployed 33,245 passenger vehicles, 541 buses, and 10 trucks in the country, while installed 255 commercial HRS units.

Last June, Hyundai motor Group completed construction of 'HTWO Guangzhou' hydrogen fuel cell system manufacturing plant located in Guangdong Province, China. The plant will produce 100kW class fuel cells, with annual production capacity of 6,500 units.

Beside FCEVs, Korea is also developing various mobility technologies including forklifts, drones, UAMs, trams, fuel cell and ammonia powered ships.

		
LH2 Carrier	H2 fueled Ships	H2&NH3 fueled Ship
HYUNDAI GLOVIS HYUNDAI HEAVY INDUSTRIES	SAMSUNG SAMSUNG HEAVY INDUSTRIES	DSME DAEWOO SHIPBUILDING & MARINE ENGINEERING CO.,LTD. KR
AIP approved from KR and LISCR in Oct. 2020 (20,000m3)	Commercialize NH3 Vessel by 2024 AIP approved NH3 fueled ship from KR in Sep. 2022 LH2 fuel cell system from DNV in Nov. 2022	Commercialization by 2025 MOU Signed in Sep. 2022 (Joint R&D for NH3/H2 propulsion system)

			
FC system for vessel	Fuel Cell Leisure Boat	H2 folk lift	
KR HYUNDAI HYUNDAI GLOBAL SERVICE	HYUNDAI VINSSEN	HYUNDAI MOBIS HYUNDAI HEAVY INDUSTRIES HYUNDAI	DOOSAN Bobcat SK E&S
Commercialization by end of 2022 MOU Signed in Jul. 2021 (Commercialization of FC system for vessel)	Commercialization by 2023 Signed MOU in Jun. 2020 (FC system supply and boat development) Demonstration in Progress in Ulsan	Commercialization by 2023 MoU signed in Feb. 2020 Hydrogen Folk-lift Demonstration in Ulsan	MoU signed in Apr. 2022 Pilot Operation in Cheonan in first half of 2023

		
H2 DRON	H2 UAM	H2 Tram
DOOSAN	HYUNDAI	HYUNDAI Rotem
Commercialization by 2025 Implementing National Demonstration Project for Logistics & Cargo Drones	Unveil Hybrid UAS for Freight by 2026 Optimize Urban Operation and Fully-Automatic UAM by 2028 Launch Regional UAM in 2030s	Commercialization by 2023 Hydrogen Tram Demonstration in Ulsan

■ Fuel Cell Power Plant

Korea is a leading country of deploying fuel cell power plant, generating 1,065 MW as of December 2023. One of the major fuel cell power plants is New Incheon Light Dream Complex.

New Incheon Light Dream Fuel Cell Power Plant
(Completed Construction in Oct. 2021)

Generation Capacity of 78.96MW, 134 units of 440kw class fuel cell, providing electricity for 250k households and heat for 44k households.

United States

■ In May 2024, DOE released its updated map of existing and planned electrolyzer installations totaling approximately 4.5 GW, a large increase from the initial map. The largest planned deployment is listed as 1.6 GW in Texas.

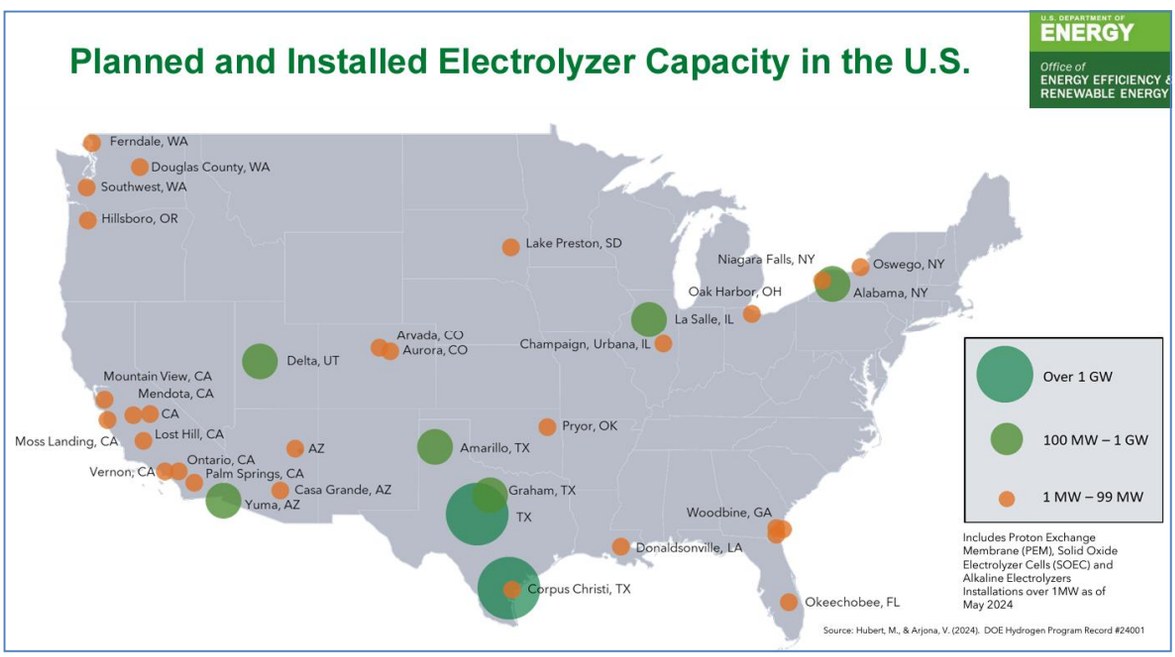
In December, DOE released an update to the Pathways to Commercial Liftoff: Clean Hydrogen report estimating that investment in clean hydrogen doubled from 2023, and that the U.S. is on track to reach 7-9 million metric tons per annum (MMTpa) in operational capacity by 2030.

The long wait and now uncertainty for the final Section 45V Credit for Production of Clean Hydrogen requirements as well as announced freezes for committed funds and concerns for future funding for hydrogen under the Trump Administration has led to scaling back of commitments and investments in large-scale hydrogen production and fuel cell and electrolyzer manufacturing facilities in the U.S.

Despite this, many companies announced hydrogen production projects, business development agreements, and hydrogen and fuel cell deployments in the U.S., including more that 1 gigawatt (GW) in orders for fuel cells for data centers and hundreds of fuel cell buses.

FCHEA is working tirelessly to maintain policy certainty for the hydrogen space, communicating the importance of critical tax credits and funding commitments for hydrogen production, technology competitiveness and manufacturing facilities in the U.S. on Capitol Hill and around the country.

In February 2025, FCHEA spearheaded a 45V Defense letter to U.S. Senate and House Leadership and Committee Chairs, coordinating and securing more than 110 signatories representing the full breadth of the hydrogen industry— associations, business groups, Hydrogen Hubs, and corporate entities—emphasizing the importance of and urging support for 45V. In addition, FCHEA has amped up its media efforts with a slew of interviews, op-eds, and speaking engagements.

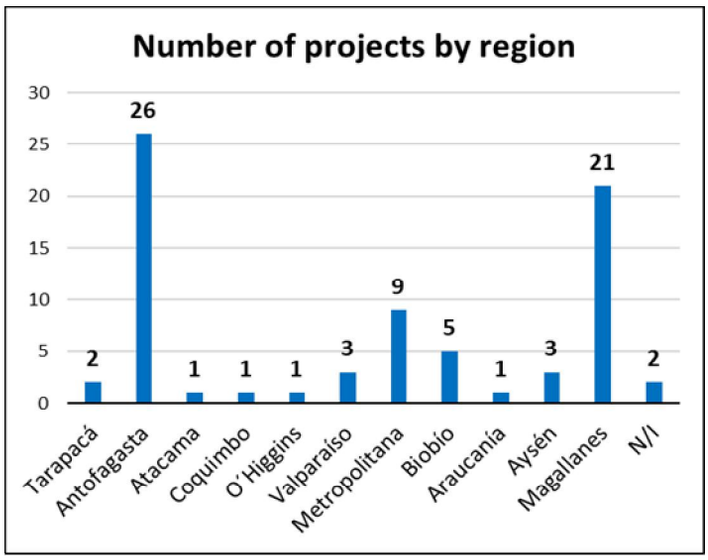


Chile

1. Overview of the Hydrogen and Its Derivatives Industry:

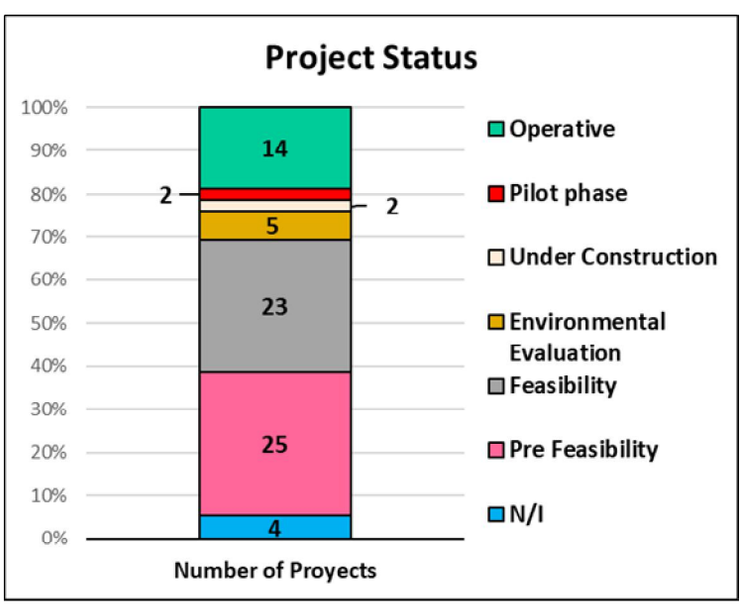
The total number of announced and developing projects amounts to 75. Of these, 48 are categorized as hydrogen and derivatives production and trade projects, while 27 are focused on hydrogen and derivatives applications and use.

The Antofagasta region in the north and the Magallanes region in the south have the largest portfolio of projects, due to their significant solar PV and wind potential, respectively. As a result, these regions are the primary locations for giga-scale projects aimed at producing and exporting hydrogen and its derivatives, primarily ammonia and synthetic fuels.



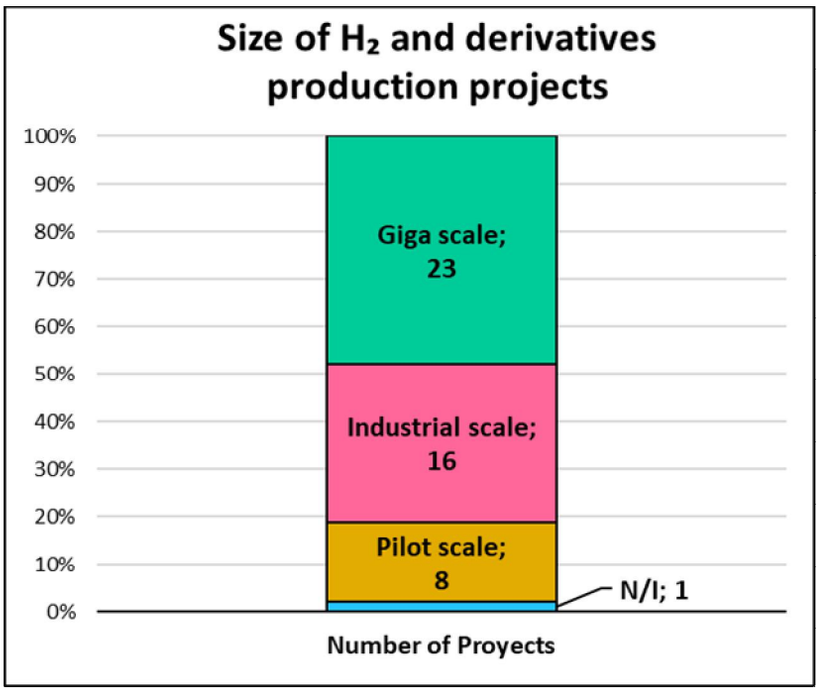
Source: H2 Chile based on public information

Most of the projects are in the pre-feasibility and feasibility phases. However, 2024 has marked significant progress with the commissioning of several projects, bringing the total number of operational projects to 14.



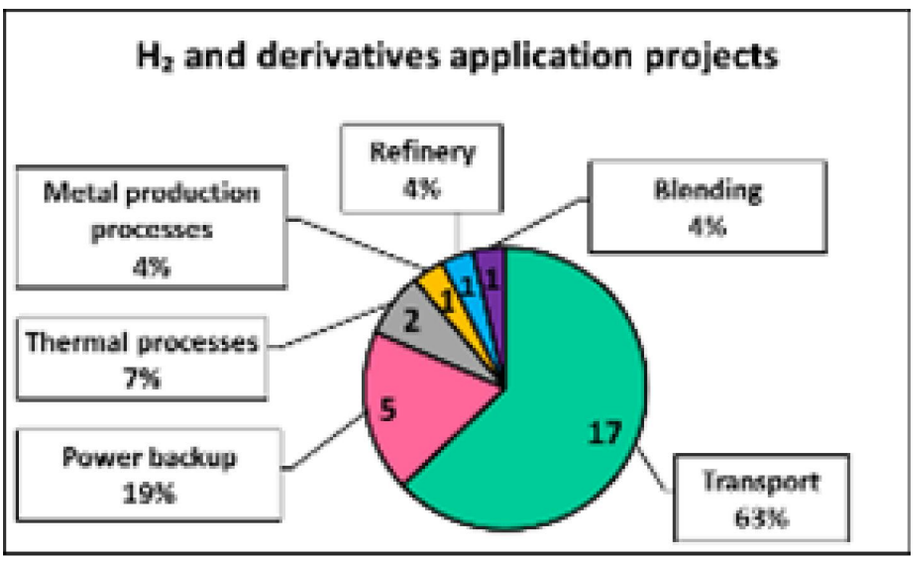
Source: H2 Chile based on public information

Regarding hydrogen and derivatives production projects intended for trade, Chile is focusing on producing large volumes for export, primarily to the European and Asian markets. The country has announced a variety of giga-scale projects, leveraging the favorable conditions in the Antofagasta and Magallanes regions. Notably, the entry of the first giga-scale projects into Chile's environmental assessment system stands out as a key milestone in the permitting process.



Source: H2 Chile based on public information

This year has seen significant progress in the local growth of the hydrogen industry and its derivatives use projects. Notably, there have been announcements of new projects in this category, along with the initiation of several projects focused on mobility applications, power backup, and thermal processes. These projects are smaller in scale, serving as pilot to test technologies and validate their techno-economic feasibility for larger-scale implementation.



Source: H2 Chile based on public information

IV. 2. Highlighted Projects

IV.2.1. Production and trade

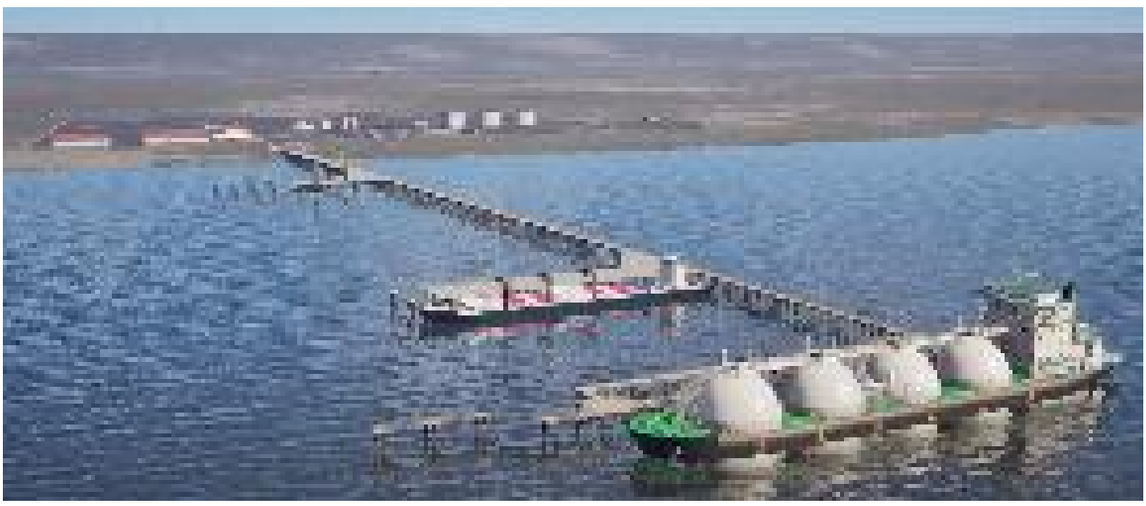
This year marks a significant milestone with the initiation of environmental permitting for large-scale ammonia production projects, beginning with the Volta project by MAE, submitted in February 2024. The project involves the construction and operation of an industrial plant to produce ammonia from green hydrogen (H2V/NH3 Plant), located 8 km from the city of Mejillones in the Antofagasta Region.

Render image of H2V/NH3 Plant in Antofagasta

The plant will have a nominal production capacity of 620,000 tons of ammonia per year, achieved in two successive phases of approximately 310,000 tons each. The produced ammonia will be transported via pipeline to one of the terminals in the Mejillones port sector, from where it will be distributed to consumption points by a third party. Additionally, local trade is also planned through a hydrogen refueling station (HRS) located within the H2V/NH3 plant.

Another noteworthy project is the HNH Energy project, a joint venture by Austria Energy, Ökowind, and CIP, located in San Gregorio in the Magallanes Region. Key components include the construction of a process plant to produce green ammonia based on green hydrogen, with an annual production capacity of 1.3 million tons of NH3. The project also includes a seawater desalination plant, a 1.4 GW wind farm, and a multipurpose maritime terminal capable of exporting up to 10 million tons of NH3 per year.

A key milestone of the HNH Energy project is that it represents the largest investment ever submitted for environmental assessment in the history of Chile's Environmental Assessment Service, with an investment of USD 11 billion. This surpasses even the investments from mining, Chile's primary economic activity, that have been submitted for environmental evaluation.



Render Image, Green Ammonia Export Port in Magallanes.

Another noteworthy project this year, which received environmental approval in November, is the Green Hydrogen Project in Quintero Bay, located in the Valparaíso region. This project is being executed by ACCIONA Energía and GNL Quintero. The initiative includes the construction of a 10 MW electrolysis plant, which will produce 660 tons of hydrogen (H2) per year in its first phase, with plans to scale up production to a maximum of 1,600 tons per year.

With an investment of USD 30 million, the project will focus on supplying green hydrogen to industries such as copper smelters, cement factories, refineries, blending facilities, transportation, and ports located in the Quintero-Puchuncaví, Concón, and La Calera areas—all part of the Valparaíso Region, where the project is based. This initiative will contribute to the decarbonization of the region's industrial sector. Notably, this project is part of the first hydrogen industry financing program by the Economic Development Agency (CORFO), which provided a subsidy of USD 5.7 million.

Quintero Bay, Valparaíso.

In December 2024, AES Chile announced the submission of its Environmental Impact Study (EIA) for the INNA project, its first giga-scale green hydrogen and ammonia initiative in the country. Located in Taltal, Antofagasta Region, the project represents a USD 10 billion investment and is currently in the early stages of development. It will have a production capacity of 100,000 tons of green hydrogen in liquid form and 650,000 tons of green ammonia annually, with both products intended for domestic consumption and export.

The energy for its processes will come from a solar park with a capacity up to 1,700 MW, a wind farm of up to 534 MW, and a battery energy storage system BESS capable of providing five hours of backup operation. Additionally, the project includes the construction of a seawater desalination plant, an export port, and storage facilities with a capacity of 20,000 m^3 for liquid hydrogen and 120,000 m^3 for ammonia.

Taltal, Antofagasta.

IV.2.2. Transportation

In the transportation sector, the arrival of the first two hydrogen-powered heavy-duty trucks in Chile is noteworthy. One of these trucks is operated by Andes Motor for a pilot project involving heavy road transport to mining operations. The second truck, operated by Marval Clean Logistics in collaboration with Walmart Chile, is part of a pilot project for logistics transport by Walmart.

This initiative aligns with Walmart's decarbonization plan, which already launched a hydrogen generation plant in 2023 to supply over 200 forklifts with hydrogen fuel cells. The same plant will also provide green hydrogen to the truck operated by Marval.

H2 Truck by Marval Clean Logistics, inaugurated at Hyvolution Chile, September 2024.

Another notable initiative is the launch of South America's first hydrogen train, introduced by the company Ferrocarril de Antofagasta Bolivia (FCAB). In its first phase, it will cover a route from FCAB's facilities in the city of Antofagasta to the port and will be used for internal maneuvers.

The train was developed by CRRC Qishuyan Company and was specifically designed for FCAB's operational routes, ensuring adaptability and efficiency by adhering the principles of standardization, modularization, serialization, and generalization. Equipped with a high-capacity battery and a 35 MPa onboard hydrogen storage system, the locomotive has a total power of 1.000 kW and features a lightweight design that reduces its weight by approximately 30 tons compared to current hydrogen locomotives.

FCAB inaugurates South America's first hydrogen train.

Finally, another milestone to highlight in transportation applications in 2024 was the inauguration of the first hydrogen bus entirely manufactured in Chile. The bus has a capacity of 30 passengers, a range of 600 kilometers and is designed to operate in industrial, urban, and rural environments at a maximum speed of 90 kilometers per hour. This achievement was made possible through the public-private partnership between Anglo American, Colbun S.A., Reborn Electric Motors, and the support of CORFO, along with the collaboration of the National Pilot Center (CNP) and Fundación Chile.

The project had a total investment of USD 750,000, and it is expected that the bus will begin operations in the first quarter of 2025, after its homologation, which is being carried out in collaboration with the Ministry of Transport and Telecommunications.

President Gabriel Boric inaugurating the first hydrogen bus entirely manufactured in Chile.

IV.2.3. Use of hydrogen in mining

One of the major milestones in the development of the local hydrogen applications industry was the inauguration of the first pilot green hydrogen plant for mining in Til-Til, Metropolitan Region, located at Minera San Pedro. This project is part of the first version of the Green Hydrogen Accelerator program, led by the Energy Sustainability Agency and funded by the Ministry of Energy.

The initiative aims to promote the production and use of green hydrogen nationwide, particularly through pilot projects. The plant has a production capacity of 0.7 kg of H2 per day, supported by a photovoltaic installation. Its operation utilizes technologies such as electrolyzers, air compressors, storage tanks, and fuel cells are used in the operation. The hydrogen produced is initially used to supply the facilities of Minera San Pedro with a focus on validating new technologies for mining energy consumption.

Minister of Energy, Diego Pardow, inaugurating the H2V Minera San Pedro pilot project.

IV. 3. Hydrogen hubs

IV.3.1. Antofagasta

In the hydrogen valley of Antofagasta, Mejillones is an industrial park equipped with infrastructure suitable for the renewable hydrogen industry.

The Mejillones Port Complex includes:

Puerto Angamos, a multipurpose terminal that allows the berthing of post-Panamax vessels.

The Bulk Solids Terminal, which facilitates the transfer of bulk solids and liquids, either through dedicated terminals or multipurpose facilities.

Bahía de Mejillones, Region de Antofagasta

IV.3.2. Magallanes

In the hydrogen valley of Magallanes, the National Oil Company (ENAP) owns multiple ports and storage facilities, which is enhancing and expanding in coordination with the private sector.

The Laredo and Cabo Negro Terminals will be transformed into the initial facilities for introducing specialized equipment during the construction phases of this emerging industry in Magallanes, with an investment of nearly USD 50 million. The agreement involves HIF Global, HNH Energy, and Total Eren.

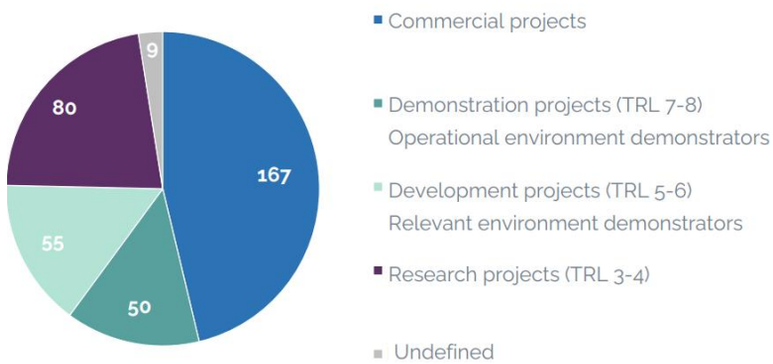
Cabo Negro, Region de Magallanes

The development of Gregorio, in Magallanes will allow the integration and consolidation of the logistical infrastructure needs of multiple green hydrogen projects, accelerating implementation timelines and limiting potential environmental impacts.

Kingdom of Spain

AeH2 2024 Project Census

In the update of the AeH2 2024 Project Census, 361 projects have been registered, and 83 AeH2 members have participated. The total estimated budget or total investment reported by the Project Census would amount to 36 370 M€, of which, so far, some 2650 M€ comes from public funding. The distribution between private investment and public funding varies considerably depending on the range of TRL. The Project Census includes research projects (TRL 3-4), demonstration projects in relevant environments (TRL 5-6), demonstration projects in real environment (TRL 7-8) and commercial projects.



- Research projects (TRL 3-4)

The most frequently investigated topic is the production of hydrogen, with a total of 41 projects (21 of which focus on electrolysis with all four technologies AEL, PEM, AEM and SOEC being currently researched in Spain in several projects). The next most researched topic in the value chain is the uses of hydrogen, with a total of 23 projects reporting activity in this area, with a wide variety of applications being researched: industrial applications (8 projects) standing out, followed by mobility applications (6) and the production of derivatives (5). Other projects are also investigating portable applications or the residential use of hydrogen.Total investment indicated by these research projects amounts to 159 M€, with a high proportion of public funding (127 M€).

- Demonstration projects (TRL 5-8)

105 demonstration projects have been reported. Of these, 55 test the technology in a relevant environment (e.g. pilot plants simulating real operating conditions), while the other 50 test the technology in the operational environment.

There are operating demonstrators of both alkaline and PEM electrolysis and new demonstrators for AEM and SOEC are expected to be commissioned in the next three years.

There are also a number of projects demonstrating hydrogen applications: industry (14 demonstrators), production of hydrogen derivatives (12), uses in mobility (12), residential use (8).

The 'H2Med' and 'Hydrogen Backbone Network' projects are included in this range of TRL due to their first-of-a-kind nature and their estimated total budget. These two projects have a combined estimated budget of more than 6000 M€. Excluding them, the estimated budget for the rest of the demonstrator projects would be over 300 M€ with public funding accounting for a little over 200 M€.

- Commercial Projects

A total of 167 commercial projects have been registered in AeH2 Census of Projects. Most of them involve hydrogen production, and 59 of them consider also hydrogen use (these are either integrated projects with production and use at the same site, or 'valleys' where production and use are close).

If all of them were implemented that could amount to 23GW of installed capacity (of which 13,6GW expect to be operational by 2030). This shows a great appetite in developing commercial projects in Spain. However, implementation may take some time as most of them are still in the early stages of development and a minimization of current barriers experimented by project developers would also be needed.

If we add up all the mentions of possible applications indicated by the projects, the most frequent is the intention to produce one or more derivatives (33 projects), with an equal distribution between intention to produce ammonia and methanol, there are also a few projects that indicate their willingness to produce eSAF. Hydrogen use for mobility is also popular (31 projects), especially in buses and trucks, and industrial uses takes third place (24 projects), including refinery and fertiliser production.

The 167 commercial projects would represent a total budget of around 30 000 M€ of which, until now around EUR 2350 M€ come from public funding. It is important to note that most of these projects are in early stages of development and will be able to further refine their budget estimates and access new sources of public funding in the following years.

Sweden

Hydrogen Refueling Stations in Sweden

2024, Sweden operates six hydrogen refueling stations (HRS), with plans for a rapid rollout of over 20 additional stations by 2025. In total, more than 60 HRS have secured financial support. Under the EU AFIR regulation, Sweden is required to install 33 HRS by 2030. Redundancy in the refueling network will be critical for professional traffic, and the ramp-up period is expected to pose financial challenges for operators.

As of

France

Manufacturing capacity: the transition to scale is taking shape

Gigafactories taking shape

With plants being inaugurated and construction sites starting up, large-capacity electrolyser gigafactories are gradually being built throughout France. The stakes are high: to meet the ambitions of the National Hydrogen Strategy between now and 2030.

In the alkaline electrolyser segment, McPhy has taken possession of its gigafactory in Belfort. Delivered at the beginning of March, the site, inaugurated on 13 June, has begun its engineering and design activities. Eventually, up to 450 people will be employed at the plant, with an annual production capacity of 1 GW.

John Cockerill Hydrogen started production at its Aspach-Michelbach plant (Haut-Rhin) at the end of 2023. This is its first European manufacturing site dedicated to low-carbon hydrogen, with an annual electrolyser production capacity of up to 1 GW.

Plants for AEM (anion exchange membrane) and PEM (proton exchange membrane) technologies are currently under construction. This is the case for Gen-Hy and its Allenjoie site near Montbéliard

(Doubs), where the startup has already installed a test bench. It's also the case for Elogen (part of the GTT group), which started work at the beginning of the year on its PEM electrolyser gigafactory in Vendôme (Loir-et-Cher). The first is due to come on stream at the end of 2024, and the second at the end of 2025.

For high-temperature electrolysis, we have Genvia, which operates an initial production line in Béziers. Its short-term target is to produce more than 300 stacks a year, using solid oxide electrolysis technology. By 2030, the Hérault-based company is aiming to produce 50,000 electrolysers a year at the Gigafactory, construction of which is due to start in 2026.

Mobility: industrialisation on the move

Tanks and fuel cells, equipment for hydrogen mobility are on the front line, with gigafactories already in service.

Clean Mobility, Forvia's tank production site in Allenjoie (Doubs), opened two months before Symbio's stacks and fuel cells plant, due to open in December 2023, in St Fons, near Lyon.

OpMobility, meanwhile, is building an XXL fuel tank plant near Compiègne (Oise), where it has been operating for nearly 40 years. The target date for commissioning this gigafactory, which has been selected under the Hy2Tech PIIEC, is 2025.

Grenoble-based Inocel, a specialist in high-power fuel cells for heavy mobility and marine applications, will be setting up its first plant in Belfort. The plant is due to come on stream by the end of the year.

The objective of technological sovereignty also means having a presence in key components, in particular bipolar plates for fuel cells. This is the challenge that led to the creation of Innoplate, a joint venture between Symbio and Germany's Schaeffler. The two groups have joined forces to produce on a large scale the new generation of these components in Haguenau, in Alsace. The plant was inaugurated on 6 June.

Hycco was awarded a prize in the France 2030 call for projects, enabling it to accelerate its transition to scale. The Toulouse-based start-up, which was set up in 2019, has developed a manufacturing process for producing new-generation bipolar plates for hydrogen fuel cells. It is now preparing to move to a new site to set up its first industrial production line. The project, with a total budget of €2 million, will be financed in particular by Bpifrance.

With the recent reorganisation of the Hordain site (Nord), Stellantis is one of the first carmakers to have an integrated production line. This line can produce internal combustion, battery electric and hydrogen fuel cell engines for its compact van ranges. Previously, its hydrogen-powered commercial vehicles were converted electric vehicles, an operation carried out at Opel in Germany. This change represents a crucial step in the transition to scale, with an annual production capacity of 5,000 vehicles for the first year, compared with 500 with the previous organisation.

Stations: ramping up production

The French industry is also very active in the manufacture of charging stations. Two leading players are continuing to grow in this critical segment for the development of applications.

Atawey has taken over the stations business of McPhy, which is refocusing on the production of electrolysers. This acquisition has given the Savoie-based company a high-performance industrial facility, with an additional production area of more than 2,400 m² and four test areas. At the same time, it has just opened a second workshop next to its historic site at Bourget-du-Lac. With 145 employees and an annual production capacity of more than 80 stations, Atawey will be able to meet

growing demand at national and European level.

The other champion, HRS (Hydrogen Refuelling Solutions), has just acquired a new 1.4 hectare site near Grenoble. 10,000 m² dedicated to industrial production, including 2,000 m² for a collaborative test area unique in Europe.

Denmark

In 2024, two commercial hydrogen production facilities were inaugurated in Denmark, marking an important milestone in expanding the country's hydrogen industry. In addition, Denmark agreed to establish a national hydrogen backbone, with government-supported plans for pipeline infrastructure development and financial support mechanisms to connect green hydrogen production to major European markets.

People's Republic of China

Accelerating the development of charging infrastructure networks and improving the layout and services of hydrogen refueling stations and natural gas refueling stations. By the end of 2023, nearly 8.6 million charging infrastructures and over 450 hydrogen refueling stations had been built.

Alkaline water electrolysis hydrogen production technology has reached the international leading level, and a single 3000 standard cubic meter per hour alkaline electrolyzer has been successfully developed, and megawatt-level proton exchange membrane water electrolysis equipment is undergoing engineering verification.

Republic of Poland

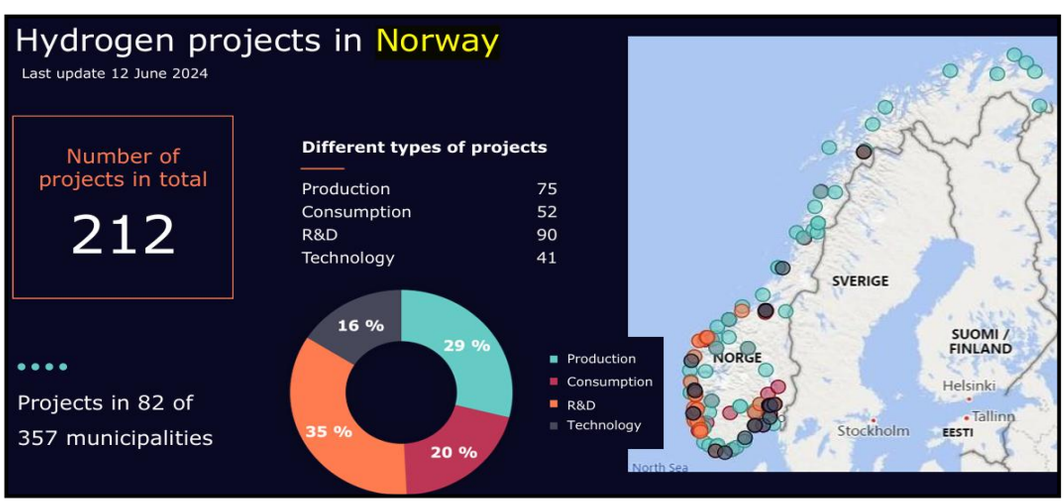
Poland remains the 3rdlargest hydrogen producer in the EU, with predominant role of fertilizer production (2M MTPA of ammonia) in 6 plants. Also oil refining is producing more than 0,4M ton of hydrogen each year mainly for crude oil refining in hydrocracking process. This all conventional hydrogen production through the current SMR standard.

There are 2 operational and one commissioned electrolysis units (all PEM), developed and owned by private companies. Each has a 5MW installed power. One is ZE PAK (Accelera/Cummins) in Konin – power utility, another one Promet Plast (Plug Power) in Gaj Oławski – plastics producer and one in Polenergia (Hystar) in Nowa Sarzyna – also power utility. In case of transport, there are 6 operational publicly available hydrogen refueling stations in Poland. Most of them offer both, individual and heavy duty refueling pressure standards. None of them is supplied with renewable hydrogen. FCEV fleet comprises of c.a. 100 passenger vehicles and about 50 city busses, operated

by public transport companies.

Primary hydrogen utilization happens in heavy industry, incl. chemicals, fertilizer and oil refining. Some glass works also use hydrogen for its high-temperature processes. All of those so-called lead markets are stuck into high energy and natural gas costs related to Russian invasion on Ukraine and destabilization of energy markets that begun even a bit earlier. Therefore their ability to invest in green hydrogen production is limited, while other obstacles like high energy costs in Poland and poor condition of Polish energy transmission and distribution system remain and make it even more difficult to find a positive business case for electrolytic hydrogen in Poland as of 2025. Not to mention high carbon intensity of Polish power production, which prevent grid connected electrolysis from becoming even near low emission.

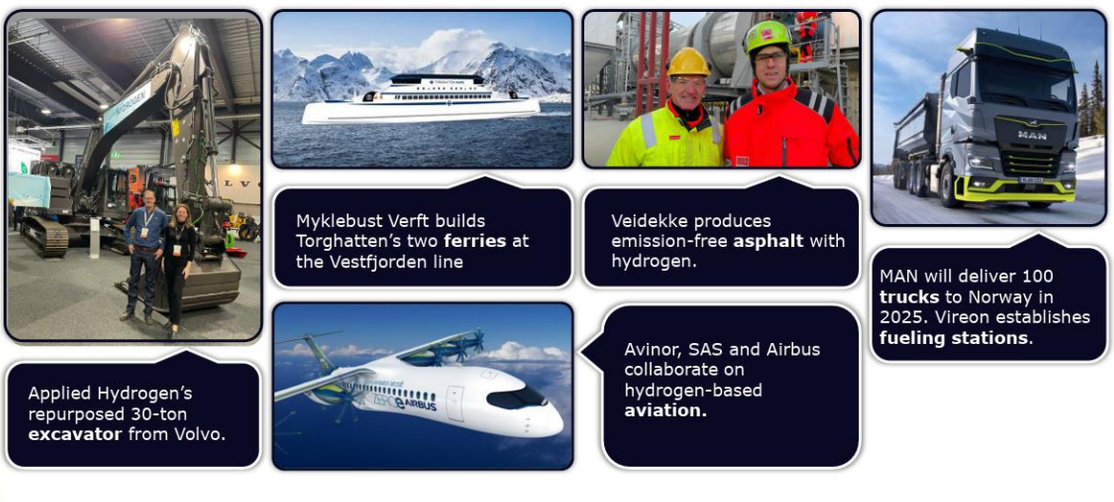
Kingdom of Norway



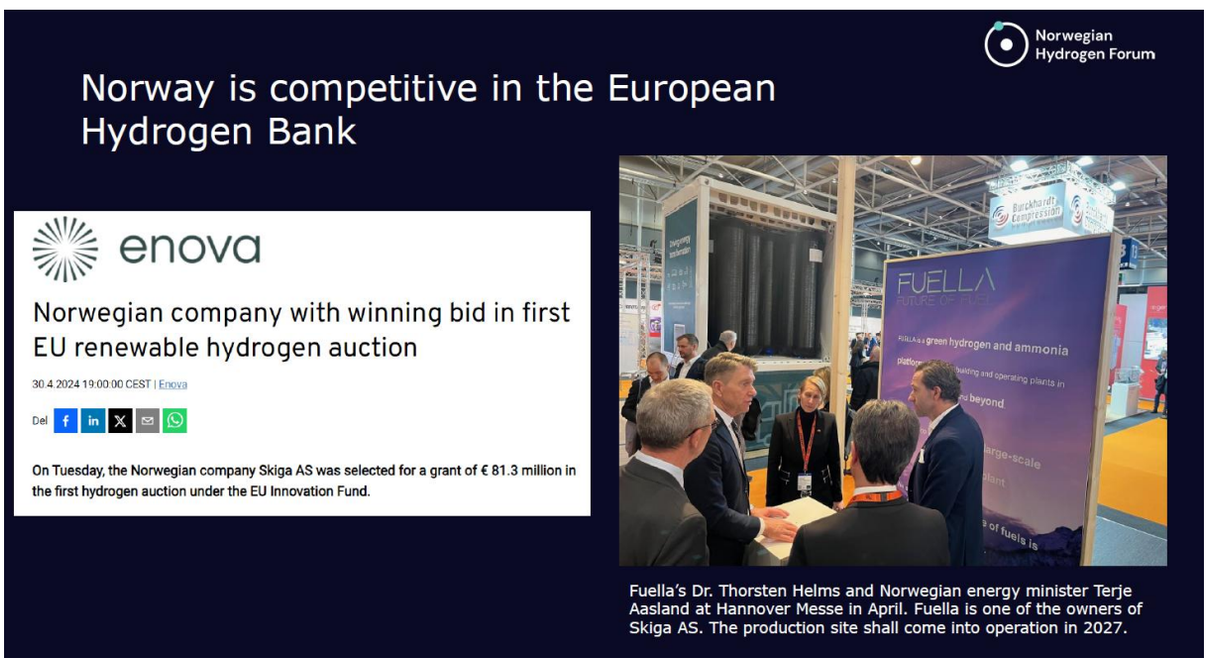
As of June 2024, Norway has identified 212 hydrogen projects across 82 municipalities, covering production, consumption, R&D, and technology sectors.

New hydrogen production plants are scheduled to begin operations in 2024, including sites in Kaupanes, Porsgrunn, Hellesylt, Rørvik, and Kårstø.

New investment decisions for hydrogen production were made in 2024, with projects confirmed in Kristiansand, Glomfjord, Kongsberg, and Høyanger.



Hydrogen applications are expanding in Norway, with developments in construction equipment, ferries, aviation, asphalt production, and heavy-duty trucks.



In April 2024, the Norwegian company Skiga AS won a € 81.3 million grant in the EU's first renewable hydrogen auction under the Innovation Fund. Fuella, one of the owners of Skiga AS, operates a green hydrogen and ammonia platform and plans to launch a new production site by 2027.

Costa Rican Hydrogen Alliance
Costa Rica

- Since 2019, a consortium has been developing hydrogen as a fuel in Costa Rica, with founding members including CRUSA Foundation, IDB Lab, Ad Astra Rocket Company, and others.
- The technical cooperation project "Road to Decarbonization: Promoting the Hydrogen Economy in Costa Rica" was launched through an agreement between the CRUSA Foundation and IDB Lab (Agreement No. ATN/ME-16972-CR) to facilitate hydrogen ecosystem development.
- Costa Rica achieved 99.4% electricity coverage in 2019, but in 2021, electricity accounted for only 22% of total energy consumption, with fossil fuels making up 68%, mostly in transport and industry sectors.
- Costa Rica is working on decarbonizing transportation and industrial sectors as the next major step.
- Costa Rica entered the Detailed Preparation Phase (DPP) for NAMA Facility funding in December 2022 with a project to develop a green hydrogen ecosystem, initially focused on transportation and later scaling to industry.
- The project, if approved, would receive a €25 million grant to establish green hydrogen infrastructure through the SPV "Hidrógeno Verde S.A.".

Egypt

- Egypt is implementing nine green hydrogen projects worth a combined EGP 1.9 trillion in the Suez Canal Economic Zone (SCZone).
- An additional 23 green hydrogen projects worth EGP 3.5 trillion are planned for implementation by 2030 (13 projects awaiting framework agreements; 10 projects awaiting MoUs).
- During COP27 (2022), Egypt signed framework agreements totaling USD 83 billion with international companies for nine green hydrogen and ammonia facilities in the SCZone.
- The Egypt Hydrogen Valley Consortium was launched at H2Med 2025, connecting Egyptian and European ports to establish an inter-regional Hydrogen Valley across MENA and Europe.
- Plans are underway to establish integrated Hydrogen Valleys across MENA and Europe, connecting renewable hydrogen supply to local industrial and transport demand clusters.
- The Hydrogen Mediterranean Summit (HIS 2026) will be held on September 15–16, 2026, with objectives to:
  - Raise industry awareness of EU-Egypt hydrogen business opportunities.
  - Foster EU-Egypt industrial cooperation and regulatory support for hydrogen projects.
  - Present EU import policies and Egypt's hydrogen strategy.
  - Highlight specific cooperation platforms, including the EU-Egypt business platform and major international initiatives (e.g., UNIDO Hydrogen Programme, EC/Egypt/EBRD agreements).
  - Facilitate first matchmaking sessions between Egyptian flagship projects and European industry players.

Portugal

In the European Hydrogen Bank's first auction results announced on April 30, Portugal secured two significant projects—Grey2Green-II and MP2X—among the seven selected across Europe. These two projects, located in Sines, will receive €84.2 million and €245.2 million in funding respectively and represent a combined capacity of 700 MW of electrolysers, aiming to produce at least 727 kilotonnes of hydrogen over the next ten years. Portugal ranked third in terms of tendered electrolyser capacity and hydrogen production volume and achieved the fourth-lowest average levelized cost of hydrogen (€8.77/kg) among participating countries.

Additionally, through the Interreg SUDOE 2021–2027 program, the SharedH2-Sudoe project will be developed in Portugal, using surplus photovoltaic energy to produce green hydrogen for public transportation. The project, coordinated by Instituto Tecnológico de Castilla y León, involves Portuguese partners such as AreanaTejo and Enerdura and is expected to conclude by the end of 2026.

Portugal is also implementing the H2NG project, aiming to develop and build a green hydrogen mixing and injection station for both the natural gas transport and distribution networks, with an investment of approximately €1.2 million supported by the Portugal 2023 program.

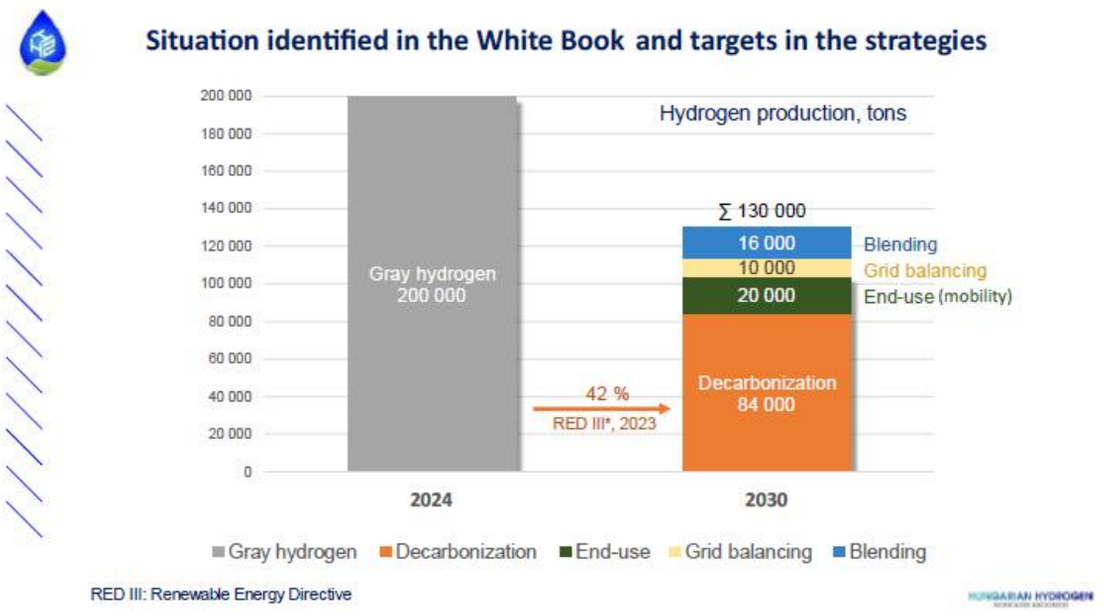
In addition, HyChem, in partnership with TecnoVeritas, is constructing a new electrolyser factory in Torres Vedras, funded with €3.5 million from the PRR, with completion expected by the end of 2026. Finally, Voltalia will invest €26 million to establish two green hydrogen production plants near Lisbon, in Carregado and Covilhã, powered by 100% renewable energy sources and utilizing treated wastewater for electrolysis, with plans to inject the produced hydrogen into the national grid for distribution.

Hungary

In 2024, Hungary launched multiple hydrogen production projects, including MOL's 10 MW green hydrogen plant (1,600 tons/year), MVM's 2.5 MW system (68 tons/year), a 1 MW PEM electrolyser at Bükkábrány Energy Park, and a 1 MW plant at SZTE Science Park.

Hungary has started pilot testing hydrogen-powered buses: Solaris Urbino12 in Győr and Caetano H2.City Gold in the Budapest agglomeration.

Budapest Airport and Airbus launched a hydrogen ground operation project under the GOLIAT initiative. Hungary also deployed hydrogen-powered garbage trucks and opened its first public hydrogen refueling station in 2024.



Hungary's hydrogen strategy aims to replace 200,000 tons of gray hydrogen by 2030 with 130,000 tons of clean hydrogen, targeting 84,000 tons for decarbonization and additional volumes for mobility, grid balancing, and blending.

Ⅴ. Major Milestones of 2024

Republic of Korea

■ International Cooperation

MOU Signed with HYTEP (Czech Republic) on Hydrogen Industry Cooperation

On September 20, 2024, H2KOREA signed a Memorandum of Understanding (MOU) with the Hydrogen Technology Platform of the Czech Republic (HYTEP) during the Korea–Czech Industry Energy Tech Forum in Prague. The agreement aims to strengthen bilateral cooperation across policy, technology, and project development in the hydrogen sector.

Key areas of cooperation include:

Joint development of hydrogen production, storage, and refueling infrastructure

Collaboration on hydrogen fuel cell R&D and pilot projects

Information exchange on certification, safety, and international standards

Facilitating investment and business opportunities between Korean and Czech hydrogen industries

This agreement reflects the two countries' shared commitment to accelerating the hydrogen transition and building a sustainable clean energy ecosystem.

Korea–Japan Hydrogen Cooperation Dialogue (June 2024, Seoul)

In June 2024, Korea and Japan held the first official Korea–Japan Hydrogen Cooperation Dialogue in Seoul, following a bilateral summit earlier that year. The dialogue brought together government representatives and leading hydrogen organizations from both countries, including H2KOREA, KEPCO, and KNOC on the Korean side, and JH2A, CFAA, and JOGMEC from Japan.

Both sides agreed to strengthen collaboration in the clean hydrogen sector to help meet carbon neutrality goals and ensure energy security. The two countries established three joint working groups focused on: carbon intensity certification, safety, and harmonization of standards in areas such as hydrogen mobility. They also discussed developing a bilateral hydrogen supply chain led by private-sector initiatives.

The dialogue marked a significant step forward in Northeast Asia's energy transition and laid the foundation for long-term policy and industrial cooperation between Korea and Japan.

International Forums/Expo

From September 25 to 27, 2024, the H2 MEET 2024 exhibition was held at KINTEX in Goyang, Gyeonggi Province. As Asia-Pacific's largest hydrogen industry event, it featured participation from 317 companies and institutions across 24 countries, showcasing advancements in hydrogen production, storage & distribution, and utilization. The exhibition highlighted Korea's regional hydrogen initiatives, with local governments like Gangwon, Gyeonggi, Ulsan, and Pohang presenting specialized hydrogen industry models and developments.

The H2 MEET Conference 2024 comprised three main sessions: Leaders Summit, Country Day, and Tech Talk. These sessions facilitated discussions on global hydrogen policies, technological innovations, and strategies for sustainable growth. Notably, the event emphasized sustainability by measuring its carbon emissions and initiating plans for future carbon-neutral strategies.

Additionally, the H2 Innovation Award recognized groundbreaking hydrogen technologies, with ten finalists across categories like production, storage & transportation, and utilization. The event also hosted export consultation sessions, connecting Korean hydrogen companies with over 30 international buyers from regions including Europe, Japan, China, and India, fostering global partnerships and business opportunities.

In December, the 33rd ISO/TC197 Plenary Meeting on hydrogen technologies was held in Seoul, co-organized by the Korea Hydrogen Industry Association and Korea Gas Safety Corporation. with experts from 39 countries discussing global hydrogen standards. The event included working group sessions and marked Korea's growing leadership in international hydrogen standardization.

On October, Korea held the 3rd Hydrogen Day ceremony at Sebitseom, Seoul, marking the first celebration since its designation as an official commemorative day. Hosted by MOTIE, KHIA, and H2 Business Summit, the event gathered 300 participants and honored 50 industry contributors. A three-day program featured hydrogen technologies from major companies, while five government designated institutions signed MOUs to enhance cooperation in hydrogen promotion, distribution, and safety.

United States

■ International Cooperation

Advancement of Hydrogen Aviation Provisions in the FAA Reauthorization Act

In 2024, the Fuel Cell and Hydrogen Energy Association (FCHEA) played a pivotal role in advocating for the inclusion of hydrogen-related provisions in the FAA Reauthorization Act. These provisions encompass the expansion of the Airport Improvement Program (AIP) and the Center of Excellence for Alternative Jet Fuels and Environment (ASCENT) to support hydrogen infrastructure and research. The Act mandates the FAA, in collaboration with the Department of Energy (DOE) and NASA, to develop a comprehensive hydrogen aviation strategy, including the establishment of an advisory committee comprising public and private stakeholders. Furthermore, the FAA is tasked with formulating regulations for the certification and installation of hydrogen fuel cells and combustion engines in aircraft, aiming to position the United States as a leader in hydrogen-powered aviation.

Advocacy on Section 45V Clean Hydrogen Production Tax Credit

In late 2024, FCHEA actively engaged in policy discussions surrounding the final guidance on the Section 45V Clean Hydrogen Production Tax Credit, issued by the U.S. Department of the Treasury. FCHEA advocated for a more practical implementation framework, raising concerns over overly restrictive requirements. Its efforts contributed to key adjustments in the final rules, including the removal of the dedicated-use requirement for energy storage equipment and clarification of eligible property definitions. These changes are expected to significantly improve investment conditions and project bankability for hydrogen developers in the United States.

International Forums/Expo

FCHEA participated in the 27th Annual Congressional Renewable Energy and Energy Efficiency EXPO and Policy Forum held on July 30, 2024, in Washington D.C. Connor Dolan, Vice President of External Affairs at FCHEA, spoke during the Renewable Energy panel. He emphasized the role of hydrogen and fuel cell technologies in achieving U.S. clean energy goals and called for stronger federal support and funding mechanisms.

The event, co-hosted by the Environmental and Energy Study Institute (EESI) and bipartisan congressional caucuses, gathered experts from across the energy sector to present market and policy solutions to U.S. lawmakers and the public.

Participation in the EXIM 2024 Annual Meeting (June 6–7, Washington D.C.)

FCHEA members actively participated in the 2024 Annual Meeting of the Export–Import Bank of the United States (EXIM), held from June 6 to 7 in Washington, D.C. Under the theme of "Energy Transition and the New Green Economy," the event featured opening remarks by Marty Durbin (President, U.S. Chamber of Commerce Global Energy Institute) and included FCHEA member representatives Jason Few (President & CEO, FuelCell Energy) and Aman Joshi (Chief Commercial Officer, Bloom Energy) as panel speakers. The session emphasized the role of hydrogen and fuel cell technologies in advancing U.S. competitiveness and export-driven growth. FCHEA reaffirmed its commitment to supporting clean energy deployment through trade and finance.

Chile

V.1. Private Sector; contracts, plans, agreements, funding

In Chile, numerous project developers are making significant investments in hydrogen production and storage facilities, as well as large-scale electrolysis plants powered by renewable energy sources such as solar and wind.

Collaborative public-private partnerships play a crucial role in the development of hydrogen infrastructure. For instance, the National Oil Company (ENAP) has signed agreements with several companies to enhance existing transportation networks, upgrade export terminals, and construct new facilities.

In January of this year, ENAP signed a Memorandum of Understanding (MoU) with the private entity TEG Chile, which represents the intention and commitment of both companies to collaborate on green hydrogen in the Magallanes Region. Furthermore, in September, ENAP signed an agreement

with HIF GLOBAL, enabling the state-owned company to participate as a shareholder in HIF projects, facilitating the commercialization of carbon-neutral fuels, and advancing the modernization of existing infrastructure in Magallanes. Additionally, ENAP entered into an agreement with EDF Chile for the use of the Cabo Negro industrial complex.

The signing of the agreement between ENAP and EDF to initiate studies that will enable the use of the Cabo Negro industrial complex in Magallanes, facilitating the potential export of approximately 400,000 tons annually of green ammonia.

The company MAE signed an agreement with the water utility Aguas Antofagasta (ADASA) for the reuse of wastewater in Mejillones, which will prevent the discharge of sewage into the sea and provide water supply for the operation of its Volta project, which will produce green ammonia. This is a groundbreaking initiative aimed at contributing to the conservation of the bay and environmental protection, as well as improving the quality of life for the residents.

The private sector has also begun operations for the production and distribution of hydrogen and its derivatives across various hydrogen valleys in the country. A notable example this year was the testing phase of the Nehuenco Plant, operated by the energy company Colbún, which produced its first renewable hydrogen molecules.

Haru Oni Plant of HIF Global, Region de Magallanes

Another example is in Magallanes, where the first commercial export of e-fuels produced at the Haru Oni plant by HIF Global took place. They successfully shipped 100,000 liters to Europe and the United States.

The Superintendency of Electricity and Fuels (SEC) has updated its support guide for requesting authorization for special hydrogen projects. In this regard, it certified the safety standards for the UCSC Green Hydrogen Plant, granting it official approval.

As mentioned earlier, this year saw the launch of the work plan enabling regulations for the development of the hydrogen industry in Chile (2024 – 2030), by the Ministry of Energy. This work plan fosters the development of sectoral regulations for the hydrogen value chain and represents a multisectoral effort.

Andrea Albagli Viceminister of Health, Diego Pardow Minister of Energy, Nicolás Grau Minister of Economy, Suina Chauhán Viceminister of Mining.

The Biobío Region presented a roadmap that will guide short, medium, and long-term actions to foster the development of the green hydrogen and derivatives industry and decarbonize the region's production matrix. The work was carried out in collaboration with stakeholders in the public, private, and academic sector.

Stakeholders in the launch of the H2V Bíobío 2024 – 2050 Roadmap of the Biobío Green Hydrogen Regional Strategic Program.

This year, Corfo awarded the new Green Hydrogen Technology Center for Magallanes to Fundación Chile, which will be responsible for providing technological capabilities and human capital to drive the sustainable development of the industry in the Region.

Ribbon-cutting ceremony during the inauguration of the second Educational Hydrogen Fair in Magallanes, where Corfo awarded the new Green Hydrogen Technology Center to Fundación Chile.

V.2. Governmental agreement or MoU signing

Chile has been establishing key agreements with various countries that are highly interested in positioning Chile as a trade partner for renewable hydrogen and its derivatives. Noteworthy new agreements have been signed with France Hydrogéne, Hydrogen Europe, the Netherlands, Portugal, Taiwan, and others, underscoring Chile's international role in critical issues for the industry, such as off-takers, investments, regulations, and certification.

France Hydrogène and H2 Chile sign memorandum of understanding to accelerate the implementation of hydrogen in France and Chile.

The European Union (EU) has set ambitious targets for green hydrogen and is exploring diverse sources for its production. Chile's potential to generate green hydrogen through renewable energy aligns well with the EU's objectives.

Hydrogen Europe and H2 Chile agree to strengthen cooperation to promote the deployment of Renewable Hydrogen.

V.3. International events hosted

V.3.1. Hyvolution

HyVolution Chile was a professional business-to-business (B2B) event, organized by FISA and co-organized by H2 Chile. The event brought together supply and demand in an exhibition area featuring technologies, products, and services, along with conferences, professional meetings, and demonstrations, among other associated activities.

The event attracted a high level of attendance, including public authorities, representatives from across the value chain, academia, and civil society, with over 4,400 visitors. Throughout the three-day event, there was a strong emphasis on the urgency of seizing the opportunity to develop the industry and advance toward a fair energy transition.

Second version of the Hyvolution Chile: "Ribbon cutting by the President Gabriel Boric". Santiago, September 2024.

Kingdom of Spain

International Cooperation

In March 2024, the Spanish Hydrogen Association (AeH2) signed three new Memorandums of Understanding (MOUs) with Hydrogen Denmark, France Hydrogène, and the German Hydrogen Association to strengthen collaboration and development in hydrogen technologies. Additionally, a letter of interest has been signed with the Uruguayan Hydrogen Association to coordinate efforts in advancing the sector in Uruguay.

These agreements were established during the European Hydrogen Energy Conference (EHEC 2024). Through these partnerships, AeH2 continues to enhance its international presence and position Spain as a European leader in hydrogen technologies.

In September 2024, Spanish Prime Minister Pedro Sánchez visited Shanghai during his official trip to the People's Republic of China. During this visit, he inaugurated the Spain-China Business Meeting and held bilateral meetings with leading companies in the automotive and renewable energy sectors. These engagements aimed to strengthen economic relations and explore collaborative opportunities in green hydrogen and other renewable energy sources. This initiative aligns with Spain's commitment to international cooperation in the energy transition and reinforces its position as a global leader in green hydrogen technologies.

Mayor achievements of the private sector.

1. bp and Iberdrola España have given the green light to the construction of a 25 MW green hydrogen project at bp's Castellón refinery, which is expected to be operational in the second half of 2026.
2. Accelera™ by Cummins celebrated the opening of its new electrolyzer manufacturing plant in Guadalajara, Castilla-La Mancha, Spain. This facility is expected to create 150 high-skilled jobs in the region, with the potential to reach 200 jobs as production grows, and will help expand the development, manufacturing and adoption of zero-emission technology in Spain and Europe. The plant has the capacity to produce 500 megawatts (MW) of electrolysers per year, scalable to more than 1 gigawatt (GW) per year in the future. The facility will produce Accelera's leading PEM electrolyser systems.
3. The Green Hysland project has achieved a groundbreaking milestone with the first-ever injection of green hydrogen (H_2) into the Spanish gas network. This achievement represents a significant advancement in the development of innovative energy technologies. The infrastructure developed includes a hydrogen reception station, a 3,2 km pipeline, and a blender to ensure a seamless and safe integration of hydrogen into the grid. The newly operational infrastructure will supply 115 000 households and 2000 industrial and tertiary consumers across Mallorca with a blend of natural gas and green hydrogen, avoiding 4000 tonnes of CO2 emissions.

International Forums/Expo

- Feria Internacional de Energía y Medio Ambiente (GENERA)

GENERA is an energy and environment international trade fair that takes place annually in Madrid (Spain). The AeH2 always participates with a stand and organizing a Technical Session on the evolution of the hydrogen sector in Spain. 2024 edition took place on 6th, 7th and 8th of February and brought together more than 500 companies and 40 000 professionals.

- European Hydrogen Energy Conference (EHEC)

The EHEC 2024 took place in Bilbao on 6th, 7th and 8th March. EHEC is organised by the Spanish Hydrogen Association (AeH2) and brings together experts, researchers and industry leaders in the field of hydrogen, providing a platform to share the latest advances, innovations and developments in hydrogen-based technologies. The EHEC 2024 was a great success, which had more than 1300 attendees from over 35 countries and more than 250 speakers from across the hydrogen value chain.

France

France and Chile strengthen their hydrogen cooperation

Chile and France have made a significant move to advance the green hydrogen industry by signing a joint declaration to enhance technical and professional training. This collaboration, formalized by the Energy Minister of Chile and the French Ambassador, highlights the strategic role of green and low-carbon hydrogen in meeting both countries' energy goals, particularly in industrial decarbonization. The Franco-Chilean working group, established in 2023, identified skills development as crucial for the sector's growth. Through this partnership, Chile and France aim to foster innovation and create valuable employment opportunities, connecting academic and business sectors in both nations. This initiative offers a unique opportunity for Chilean youth to participate in the expanding green hydrogen industry, with France committed to supporting Chile in developing a skilled workforce for sustainable growth.

Canada

In 2024, Canada actively pursued international partnerships to advance its hydrogen strategy and position itself as a global leader in clean hydrogen production and export.

Investment in Clean Hydrogen Infrastructure: In August 2024, Linde announced a $2 billion investment to construct a clean hydrogen facility in Alberta, Canada. This facility will supply hydrogen to Dow's Path2Zero production complex and is expected to be Canada's largest clean hydrogen production facility upon completion in 2028. The project will also capture and sequester over 2 million metric tons of carbon dioxide emissions annually.

Hydrogen Strategy Progress: Canada's hydrogen strategy, unveiled in 2020, saw significant advancements in 2024. By August, over 80 low-carbon hydrogen projects had been announced, representing more than CAD 100 billion in potential investment. Thirteen low-carbon hydrogen production facilities were established, and investment tax credits for hydrogen production and technology were introduced to attract further investment and support Canadian innovation.

International Forums and Expositions

Canada's commitment to the global hydrogen economy was evident through its active participation in international forums and hosting of significant events in 2024.

Canadian Hydrogen Convention: Held from April 23 to 25, 2024, at the Edmonton Convention Centre, the Canadian Hydrogen Convention is North America's premier event for hydrogen production, storage, and infrastructure. The convention brought together government representatives, Indigenous leaders, and sector professionals to showcase, discuss, collaborate, and do business in the North American market, driving the hydrogen industry forward.

hy-fcell Canada 2024: From June 17 to 19, 2024, Vancouver hosted hy-fcell Canada, bringing together renowned international specialists to discuss solutions for clean energy with hydrogen and fuel cells. The two-day interactive conference program and international exhibition were complemented by a full day of technology tours. Participants included experts from policy, R&D, finance, production, delivery, infrastructure, storage, and multiple end-users, fostering cross-sector conversations on hydrogen and fuel cell technologies.

Energy Transition Forum & Expo: On May 29 and 30, 2024, Calgary hosted the Energy Transition Forum & Expo, a pivotal platform for dialogue and collaboration among energy sector innovators and decision-makers. The forum addressed critical challenges and opportunities in achieving net-zero goals, with discussions on hydrogen advancements, carbon capture, utilization and storage (CCUS), and the development of a local hydrogen economy.

These events underscore Canada's proactive role in fostering international collaboration and innovation in the hydrogen sector, aligning with its strategic goals for clean energy transition and economic development.

Poland

In 2024, Poland advanced its hydrogen strategy through significant international collaborations:

Green Hydrogen Project Initiative: The Polish government announced plans for a €2 billion green hydrogen project, aiming to bolster the nation's position in the hydrogen economy and align with EU climate goals.

Hydrogen Map of Poland: GAZ-SYSTEM completed a comprehensive study analyzing 178 hydrogen-related projects, providing a strategic overview of hydrogen production, consumption, and infrastructure development across the country.

Poland hosted and participated in several key hydrogen events:

H2POLAND & NetZero Forum 2024: Held in Poznań, this forum was the first trade fair in Central and Eastern Europe dedicated entirely to hydrogen and decarbonization technologies. It brought together industry leaders, researchers, and policymakers to discuss the future of hydrogen in the European economy.

Hydrogen Day 2024: Organized by Poznan University of Technology, this event facilitated discussions on sustainable energy and showcased innovative hydrogen solutions, engaging both industry professionals and students.

United Kingdom

The UK continued to expand its hydrogen collaborations in 2024:

UK–Norway Green Hydrogen Partnership: In May 2025, the UK and Norway agreed to strengthen ties on green hydrogen and offshore wind expansion in the North Sea, aiming to enhance energy security and decarbonization efforts.

International Hydrogen Certification: At COP28, the UK signed a declaration of intent on the mutual recognition of international hydrogen certification schemes, promoting global trade and investment in hydrogen technologies.

The UK hosted several significant hydrogen events:

Hydrogen UK Annual Conference & Awards 2024: Held in Birmingham, this event brought together industry leaders to discuss the UK's hydrogen strategy and recognize outstanding contributions to the sector.

Engineering Challenges in the Hydrogen Economy 2024: This conference in London provided a platform for engineers and industry experts to address technical challenges and share solutions related to hydrogen deployment.

Ⅵ. History of GHIAA

■ 2021 GHIAA Forum (September 2021)

GHIAA was first agreed to be launched after the signing of the Letter of Intent (LOI) with 13 hydrogen industrial associations on a consensus on creating a global cooperation platform for sharing information in hydrogen industry. The event was held during the H2MEET in Goyang, Korea. Korea (H2KOREA), EU (Hydrogen Europe), United States (FCHEA), Australia (AHC), Canada (CHFCA), France (France -Hydrogene), Norway (Norwegian Hydrogen Forum), UK (HEA), Spain (AeH2), the Netherlands (NWBA), Chile (H2Chile), China (IHFCA), Singapore (HFCAS) have participated.

■ 2022 GHIAA Forum (May 2022)

GHIAA was officially launched with the participation of 18 member associations during the H2MEET in Korea. First 2022 GHIAA Forum was held where each participating members shared the national hydrogen policies and industry status.

The 1st General Meeting (May 2022)

Following agendas were approved.

- Demark (Hydrogen Denmark), Sweden (Vatas Sverige), Germany (DWV), Argentina (H2ar Consorcio), Colombia (Hidrogeno Colombia) were newly joined.
- Approved Articles of Association and Terms of Reference
- Appointed Jaedo Moon, chairman of H2KOREA, as a Chair, and Frank Wolak, CEO of FCHEA, as vice-Chair of GHIAA
- Designated H2KOREA as an official Secretariat of GHIAA
- Official Website of GHIAA was opened

The 2nd General Meeting (October 2022)

The 2nd General Meeting of GHIAA was held during EU Hydrogen Week in Brussel. Following agendas were approved.

- Two members from Japan (JH2A) and Hungary (HH2) joined that total of 20 member associations were participating GHIAA

- Appointed Jorgo Chatzimarkakis, a CEO of Hydrogen Europe, to the Vice chair of GHIAA
- Resolved the Joint Statement to emphasize the importance of hydrogen and the urgency of implementing a hydrogen economy to COP27
- Agreed on publishing the annual report

The 3rd General Meeting (Feb 2023)

The 3rd General Meeting of GHIAA was held Following agendas were approved during 2023 Hydrogen & Fuel Cell Seminar (HFCS) in California. GHIAA agreed on published 2023 annual report. The special guest, Dolf Gielen, the hydrogen lead in the World Bank, participated to introduce the H4D initiative which aims to assist developing countries in accelerative low-carbon hydrogen deployment. The participated GHIAA members discussed a way to cooperate to act in accordance with following vision.

■ 2023 GHIAA Forum and 4th General Meeting (September 2023)

The 4th General Meeting of GHIAA was held during the H2MEET exhibition in Korea, with participation from 21 member associations. During the Forum, nine associations—including those from Argentina, Australia, China, Colombia, France, Hungary, the Netherlands, Singapore, and Poland—shared updates on their national hydrogen strategies, mid- to long-term policy plans, and major hydrogen deployment initiatives.

The Argentina-based H2ar Consortium introduced a newly released national hydrogen strategy. H2Council from Australia presented a national support policy and investment plan, while IHECA from China shared its Hydrogen Industry Mid- to Long-Term Plan. H2Colombia introduced ongoing production projects alongside national policy updates. France's Hydrogen Task Force outlined its upcoming strategy and cutting-edge hydrogen technologies. The Hungarian Hydrogen Technology Association presented its 2030 roadmap and six major support projects. The Netherlands' NWBA showcased its new Hydrogen Roadmap and incentive programs. Singapore's HFCAS discussed four key pillars for hydrogen deployment. The Polish Hydrogen Association emphasized co-combustion project developments amid the ongoing Russia–Ukraine conflict.

During the General Meeting, the Poland Hydrogen Association was officially admitted as a new GHIAA member. Member associations jointly released the Seoul Joint Declaration, urging stronger policy implementation and financial support for hydrogen deployment. The 2023 GHIAA Annual Report was also formally adopted.

■ The 5th General Meeting (Jan. 2024)

The 5th General Meeting of GHIAA was held in Paris during the World Hydrogen Summit. A total of 18 member countries and 4 observer countries, including Taiwan and Ukraine, participated. GHIAA approved the admission of three new member associations from Portugal, gypt, and Costa Rica. Members discussed the development of a global hydrogen project map, the launch of a hydrogen

industry search engine, and the expansion of national partner databases. The UK Hydrogen and Fuel Cell Association (HEA) presented its interactive hydrogen map. In addition, 14 GHIAA member countries and Taiwan shared national hydrogen policy and industry updates. The meeting marked the launch of the "Three Seas Hydrogen Council," a new regional cooperation platform involving Central and Eastern European hydrogen associations.

■ The 6th General Meeting (Jun. 2024)

The 6th General Meeting of the Global Hydrogen Industrial Association Alliance (GHIAA) was held in Shanghai, China, from June 4 to 6, 2024, with participation from 19 member countries through both in-person and online formats. Member associations shared national policy developments and exchanged views on emerging trends in clean hydrogen deployment across sectors.

The meeting served as a key platform to reaffirm GHIAA's shared mission of strengthening private-sector collaboration across borders. Discussions focused on advancing collective engagement in global hydrogen policy forums, expanding industrial cooperation, and supporting emerging hydrogen markets.

As Vice Chair of GHIAA, H2KOREA highlighted ongoing initiatives to elevate GHIAA's global visibility through multilateral R&D cooperation, participation in major international forums—including COP, IHTF, and the World Hydrogen Summit—and support for hydrogen-related Official Development Assistance (ODA) projects.

Alongside the General Meeting, GHIAA took part in the 2024 International Hydrogen and Fuel Cell Vehicle Congress (FCVC), where leading companies such as Hyundai Motor (Korea), Refire Group (China), Toyota (Japan), Anglo American (UK), Sinoma Science & Technology (China), and Heraeus (Germany) presented key innovations and business models. The event underscored the growing importance of hydrogen mobility and cross-border value chain collaboration.

Appendix Ⅰ. GHIAA Articles of Association

CHAPTER 1 GENERALS

Article 1 The Name of the Association

The name of the association shall be Global Hydrogen Industrial Association Alliance ("**GHIAA**").

Article 2 Background and Objectives

1. GHIAA is an international initiative with the participation of hydrogen industrial associations from individual countries(and/or union).

2. The objective of GHIAA is to strengthen bilateral and multilateral private international cooperation and promote private participation in the decision-making process of the relevant governments and international organizations by fostering cooperation among the participating organizations of GHIAA ("**Members**") ("**Objectives**").

Article 3 Major Activities

GHIAA shall perform the following activities to achieve the Objectives described in Article 2 of this Articles of Association ("**AOA**").

1) Deal with all the relevant matters regarding private international cooperation in all the fields related to hydrogen that are requested by the Members.

2) Participate in the activities of hydrogen-related international consultative bodies and international organizations.

3) Publish materials related to the vitalization of hydrogen industries.

4) Conduct non-profit businesses that serve the Objectives described in Article 2.

CHAPTER 2 MEMBERS

Article 4 Members of the GHIAA

The Member of GHIAA shall be a hydrogen industrial association representing individual countries (and/or union). Only one hydrogen industrial association from each individual country(and/or union) shall be allowed to be a member of GHIAA.

Article 5 Members' Rights and Obligations

1. The Members shall have the right to request assistance from GHIAA for activities to vitalize the hydrogen industry and freely express their opinions in the General Meeting of GHIAA (as defined below).

2. Each Member may appoint one (1) representative ("**Representative**"). A Representative of a Member shall have the right to participate in the Regular General Meeting and the Special General Meeting, appoint and/or be appointed as the Chair, vote on the agendas, and request the Chair and the Secretariat (as defined below) to introduce an agenda at the General Meeting.

3. The Members shall comply with this AOA and the resolution of the General Meeting, and use reasonable commercial efforts to fulfil the Secretariat's requests, including but not limited to, contributing to events held by GHIAA as a speaker, providing related materials.

Article 6 Participation and Withdrawal

1. A hydrogen industrial association that wishes to become a Member of GHIAA ("**Applicant**") shall notify the Secretariat of the intention to participate in GHIAA. The Secretariat shall introduce such intention as an agenda at the General Meeting and notify the Members of this agenda, but not required any quorum for the acceptance of the Applicant. The Applicant shall become a Member of GHIAA when the Applicant and the Chair jointly sign the official form of GHIAA used for a membership application.

2. A Member may withdraw the membership of GHIAA by giving at least thirty (30) days prior written notice to the Secretariat the intention to withdraw the membership of GHIAA along with the desired withdrawal date and the Secretariat shall introduce such intention as an agenda at the General Meeting and notify the Members of this agenda, but not required any quorum for the acceptance of the notice. The Member will be deemed to have withdrawn the membership of GHIAA on the desired withdrawal date.

3. A Member whose representative serves as the Chair and acts as the Secretariat in accordance with Article 13 shall not withdraw the membership of GHIAA until the term of office of the representative as the Chair is completed. Such a Member may withdraw the membership of GHIAA before the ending of the term of office of the representative as the Chair with reasonable grounds when an interim Chair and an interim Secretariat are appointed in the General Meeting.

CHAPTER 3 GENERAL MEETING

Article 7 The General Meeting

The General Meeting is the highest decision-making body of GHIAA.

Article 8 Composition of the General Meeting

1. The General Meeting consists of a meeting of the Representative of each Member. Each Member, acting through their Representative, has the right to appoint the Chair and vote on the agendas. The Members shall give at least three (3) days prior written notice to the Secretariat before the General Meeting is held if they wish to change their Representative.

2. The Secretariat shall give seven (7) days prior written notice to the Members and their

Representatives on the agenda before the General Meeting is held.

3. The Members may appoint their officer or employee to be a Representative in the General Meeting.

4. At least one-half of the Members of the GHIAA present at a General Meeting shall form the quorum. In the event there is no quorum, the Members present at the General Meeting shall be considered a quorum and the General Meeting shall proceed with the agenda of the meeting that was adjourned. Each Member, acting through their Representative, shall have one (1) vote.

5. Members shall be entitled to participate in the General Meeting by following manners without the need for a Member to be in the physical presence of another Member(s).

1) voting through the designated written form showing they agree or disagree with each agenda and notifying the Secretariat within the designated date and time.

2) electronic means, such as video conference or other similar telecommunications means by which all persons participating in the meeting are able to hear and be heard by all other participants.

Participation in a General Meeting in such manner shall be counted in the quorum for the General Meeting; and the General Meeting will be deemed to be held at the place where the Chair is present for the duration of the meeting.

Article 9 Chair and Vice-Chair

1. The appointment of the Chair shall be introduced as an agenda at the General Meeting. The Chair shall be appointed by a two-thirds (2/3) majority vote of the Representatives present.

2. The term of office of the Chair shall be two (2) years and the Chair may serve consecutive terms. The Member, whose Representative serves as the Chair, will also act as the Secretariat during its Representative's term of office.

3. GHIAA shall appoint a maximum of two (2) Vice-Chairmen. The term of office of each Vice- Chair shall be two (2) years and they may serve consecutive terms.

4. The Chair shall have the authority to convene the General Meeting and introduce agendas at the General Meeting. The Members shall give their opinions on the proposed agenda and the Chair shall have adequate time to gather their opinions for more than fourteen (14) days. After the foregoing procedure, the Chair will decide whether such an agenda can be introduced at the General Meeting ("**General Meeting Agenda**"). The Members and their Representatives will be informed of the General Meeting Agenda with seven (7) days prior written notice before the General Meeting is held.

Article 10 Convening of the General Meeting

1. The Regular General Meeting shall be convened once every half a year.

2. The Special General Meeting shall be convened by the Chair when:

1) the Chair considers it is necessary to be held, or

2) there is a request by one-third (1/3) of the Members.

3. A prior written notice shall be sent to all the Members and the Representatives at least seven (7) days prior to the General Meeting described in Articles 10.1 and 10.2 above, specifying the time and place of the meeting (including details of the General Meeting for attendees attending by electronic means) and indicating its purposes and the agendas to be resolved in the meeting.

Article 11 Agendas

The following agendas shall be introduced at the General Meeting:

1) Amendment of this AOA;

2) Appointment and Dismissal of the Chair; and

3) All other matters concerning the operation of GHIAA for which the Members' consent is necessary.

Article 12 Adoption of Resolution

1. Unless otherwise stipulated in this AOA, the resolution of the General Meeting shall be adopted with the attendance of the quorum (per Article 8.4) and by the concurrent votes of a simple majority of the Representatives present.

2. In the event of a tied vote at the General Meeting, no action will be taken on the subject matter of the vote.

CHAPTER 4 SECRETARIAT

Article 13 The Secretariat

The Member whose Representative is appointed as the Chair shall be the Secretariat and shall serve as the Secretariat during the term of office of the Chair fulfilling the Objectives of this AOA.

Article 14 Duties of the Secretariat

1. The Secretariat shall have the duty to operate GHIAA by undertaking and performing certain activities, including but not limited to, preparing and holding the General Meeting and managing GHIAA's webpage and the Members.

2. The Secretariat shall have the right to request any Members' participation and assistance necessary to operate GHIAA, including but not limited to, contributing to events held by GHIAA as a speaker, providing related materials.

3. The Secretariat shall use reasonable commercial efforts to support any Member's request for assistance for their activities concerning the vitalization of the hydrogen industry, including but not limited to, contributing to events held by any Members as a speaker, providing related materials.

4. The Chair and the Secretariat shall represent GHIAA concerning the requests for assistance from other institutions or organizations or matters needed to be decided upon or the activities required to be conducted in the name of GHIAA; provided, however, that if such requests and matters are materially important for both the Members and GHIAA, the Chair and the Secretariat shall call a General Meeting to pass resolutions in relation to such requests and matters to represent the interests of GHIAA.

Article 15 Composition of the Secretariat

1. The Member that serves as the Secretariat shall appoint a secretary general and at least two officers who support the secretary general.

2. The Members shall appoint at least one in-house staff for dealing with matters concerning GHIAA and the Secretariat shall collect and manage the list of such staff.

CHAPTER 5 SUPPLEMENTARY PROVISIONS

Article 16 Enactment of Addendum

The Chair shall have the authority to determine the matters with regard to the operation of GHIAA that are not stipulated in this AOA, including but not limited to, creating official forms of GHIAA, by virtue of its authority. However, the Chair shall enact an addendum to the AOA, which shall be approved by a resolution passed by the General Meeting, to decide on matters important for the operation of GHIAA or if there is a Member request.

Article 17 Confidentiality

The Members shall hold the information obtained during the course of conducting their duties under this AOA in strict confidence and not disclose, copy, reproduce, or distribute any of it or otherwise make it available to any third party.

Article 18 Amendment

This AOA may be amended or modified only by the resolution of the General Meeting with the consent of two-thirds (2/3) of the Representatives.

GHIAA Operation Terms of Reference

1. Chair and Vice-Chair

   There shall be one (1) Chair and two (2) Vice-Chair and the term of office shall be two (2) years.

   The Chair will be appointed by the Vice-Chair for the continuity of the activities of GHIAA.

   The representative of H2KOREA, the chairman Mr Jaedo Moon, will be appointed as the first Chair to fulfil the founding purpose of GHIAA.

2. Convening of the General Meeting

   The Regular General Meeting shall be convened once every half a year. The first Regular General Meeting shall be convened by the Secretariat and the other can be held under discussion to cooperate with other occasions such as international events.

3. Operation of the Secretariat and Memberships

   In the initial stage of establishment, membership fees are borne by the Secretariat, in principle, but if necessary, the Members contribute financially under the Member's consent.

4. Others

   The Secretariat shall publish and circulate a report once a year for information sharing among Members.

Appendix Ⅱ. Joint Statement for the COP27

The Global Hydrogen Industrial Association Alliance (GHIAA) call on COP27 for more dedicated action

The Global Hydrogen Industrial Association Alliance (GHIAA) actively supports COP 27 in Egypt to overcome the global climate crisis and urges participants and other stakeholders to support and invest in the hydrogen industry to achieve Net-Zero targets and secure clean energy supplies.

Hydrogen is an essential element of decarbonization and is an infinite clean energy source that can be produced. It has the potential to reduce carbon emissions in several industrial sectors, including transportation, heating and heavy industry. In addition, it can be shipped and traded worldwide as a clean fuel for both liquefaction forms and derivatives (such as ammonia).

Therefore, the world is currently paying attention to hydrogen as an important means of solving the climate crisis and energy security, and more than 40 countries are surveyed to have hydrogen strategies.

According to the Hydrogen Insights 2022 of the Hydrogen Council, hydrogen investment worth about $700 billion by 2030 is needed to get on a carbon-free economy by 2050, but only 3% of the total cost is currently being spent. Therefore, we should quickly and boldly increase investment to build a hydrogen ecosystem.

For the rapid transition to the global hydrogen economy, the international cooperation is essential. Through this, opportunities for the growth of the global hydrogen industry and the expansion of the hydrogen market will be created with mutual cooperation. GHIAA will actively support this and play the role of a bridge.

The associations include the H2KOREA, the Hydrogen Europe, the Fuel Cell & Hydrogen Energy Association (FCHEA), the Canadian Hydrogen and Fuel Cell Association (CHFCA), the Asociación Chilena de Hidrógeno (H2CHILE), the France Hydrogène (AFHYPAC), the UK Hydrogen and Fuel Cell Association (UK HFCA), the Asociación Española del Hidrógeno (AeH2), the Nederlandse Waterstof en Brandstofcel Associatie (NWBA), the Norsk Hydrogenforum (NHF), the International Hydrogen Fuel Cell Association(IHFCA), the Hydrogen and Fuel Cell Association of Singapore (HFCAS), the Australian Hydrogen Council (AHC), the Asociación Colombiana del Hidrógeno, the H2ar Consortium, the Brintbranchen (Hydrogen Denmark), the Vätgas Sverige (Hydrogen Sweden), the Deutsche wasserstoff- und brennstoffzellen-verband(DWV), the Hungarian Hydrogen Technology Association(HH2), and the Japan Hydrogen Association(JH2A).

3rd November, 2022
Jaedo Moon, the Chair of GHIAA, sends this mail on behalf of 20 associations

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Statement for COP27

GHIAA which is organized by 20 hydrogen industry associations around the world called on COP27 participating nations and parties to support investment and technology development and to expedite international cooperation and collaborations for action on the hydrogen economy to implement a net zero target.

1. We, members of GHIAA, collectively welcome that more governments have been recognizing hydrogen as an essential component for achieving carbon neutrality and tried their best to transform their visions into actions as shown in the appendix.

2. Notwithstanding these positive developments, it goes without saying that there are still a lot of challenges to be done by private and public entities. To solve this problem, it is necessary to maximize hydrogen utilization technology, develop clean hydrogen production technology, expand scale-up and infrastructure, and establish an international system for hydrogen trade. It is also urgent to raise funds for continuous investment to address these issues.

3. In order to realize their strategies into action, we call on governments to establish an inclusive policy framework, e.g. to set clear targets for clean hydrogen to decarbonize every sector of the economy as much as possible, establish public hydrogen financing scheme as practically as possible, invest in infrastructure for hydrogen supply chain, and apply globally recognized standards. These certification schemes aim to promote the international trade of clean hydrogen as fairly and transparently as possible.

4. Accordingly, we commit that GHIAA will work closely together to enhance multilateral private cooperation in the dissemination of best practices, technology transfer, and mutual investment.

Appendix. Examples of Countries actions in 2022

- The world is now facing an energy supply chain crisis caused by the protracted Russia-Ukraine war and lingering climate issues.
- In May, the European Commission announced a "REPower EU" strategy aimed at reducing Europe's dependence on Russian gas. Particularly, the Commission aims to achieve 10 million tons of domestic green hydrogen production capacity and 10 million tons of hydrogen imports by 2030 in the EU.
- In August, U.S. president Biden signed a bill, the Inflation Reduction Act, into law, that includes significant support for hydrogen, including a subsidy plan of up to $3 per kilogram for green hydrogen production. The U.S. DOE has released a Funding Announcement as part of the Infrastructure Investment and Jobs Act (IIJA)'s 8 Billion dollars for regional clean hydrogen hubs (H2Hubs). These initiatives strive to develop a hydrogen sector to as part of broader

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decarbonization efforts.

- Germany announced support measures worth 9 billion euros with the aim of securing 5GW of electrolysis capacity by 2030 and is pushing forward to secure green hydrogen production capacity at home and abroad.
- Korea revised the Hydrogen Act in 2022 to specify the strategy for establishing the hydrogen industry ecosystem. Currently, about 26,000 fuel cell electric vehicles (FCEVs) are operating nationwide, and about 190 hydrogen refueling stations (HRSs) have been built and are operated nationwide. The hydrogen fuel cell power plant is in operation at 800MW, and separately, it is expected to expand the power plant that directly or mixed combusts hydrogen to achieve carbon neutrality. Moreover, Korean government held an international forum in May 2022 and is reaching out to the international community to enact a clean hydrogen certification system for international trade in clean hydrogen.
- The Netherlands has set targets to have 3 to 4 GW electrolysis capacity and further accelerates offshore wind energy generation towards 70 GW in 2050. Financial stimuli are diverse and cover the entire value chain, and with use of the Import Project of Common European Interest (IPCEI) facility, at least 1.385 billion Euro is available for these projects. The NWBA will focus on creating, sharing and consolidating knowledge across the value chains in industry, mobility and the built environment.
- In 2022, the UK has seen a doubling of the Government's low carbon hydrogen production target to 10 GW by 2030, with a commitment that at least 50% is from renewable hydrogen. As part of plans to support both capex and opex of hydrogen production, the first electrolytic hydrogen production funding call for both capital development and operation, with initial funding of £100 (more calls planned) million, was launched. The UK's Low Carbon Hydrogen Standard was set at 20g CO2e/MJLHV. On the demand side, £60 million was made available for industrial emissions savings and decarbonisation, and ~£480 million for demonstration and deployment across trucks, buses, maritime and associated refuelling infrastructure. Government published a Sector Development Plan covering aspects such as supply chain development and skills, and has taken the first steps to develop a business model for hydrogen transportation and storage infrastructure.
- After launching the Colombian Hydrogen Roadmap with ambitious goals by 2030, as well as the Energy Transition Law that gives tax benefits for investment in Hydrogen projects, in March of 2022 the first two industrial pilot projects were inaugurated. One of the pilots is on using green hydrogen in the refinery process in Cartagena, and the other one is on analyzing a blend between natural gas and hydrogen. In terms of regulation, in July of 2022, the Government of Colombia issued a national decree that establishes the institutional framework and assigns responsibilities to different ministries to develop the hydrogen ecosystem. In parallel, via the Renewable Energy Fund FENOGE, financial funds were assigned to 10 hydrogen projects for the development of prefeasibility studies.
- Last year, the Economic Development Agency of Chile (CORFO) auctioned a fund of US$ 50 million for the development of hydrogen projects, where 6 projects were awarded. Furthermore, Chile has signed MoUs with different Ports to position its green hydrogen and its derivatives

including the Port of Hamburg, the Ports of Rotterdam, and Antwerp-Bruges. There are also additional agreements with South Korea and Singapore for the technical and commercial viability of supply routes. In August 2022, the Government of Chile created the Green Hydrogen Committee to support the implementation of the National Green Hydrogen Strategy, manage public activities and programs, propose innovation R&D guidelines, support the creation of promotion tools on financing, productive innovation, and the development of local supply chain.

- Major Achievements: 2021 1st HRS opened in Budapest (at present in test operation). 2022 1st 2,5MW industrial H2 electrolyzer and H2 gas motor methane blending project is ongoing-name: Akvamarin, 2022 Evaluation of EU IPCEI projects for the Ministry of Technology and Industry such as: 1. Creating electric system flexibility with H2, seasonal storage, and pyrolizer from biogas), 2. Petrochemical greening, 660MW PV park, electrolyzer, storage, 14500t H2 as the first step), 3. Underground H2 storage at Öcsöd empty gasfield, 4. airport services H2 transformation, H2 airplane fuel development, 5. H2-algae production plant, heavy truck filling station, 6. waste burning, enriched syngas, H2 , and liquid CO2 selling, 7. PV-elektrolyzer-H2 storage- filling station

- In march , China published the “Medium and Long-term Plan for Hydrogen Energy Industry Development (2021-2035)”. The plan proposes four goals for the development of China’s hydrogen energy industry to 2025: Increase the quantity of hydrogen Fuel Cell Vehicles (VFC) to 50,000, Build-up hydrogen refueling station networks, Hydrogen production from renewable energy to reaching 100,000-200,000 tons/year, Carbon dioxide emission reduction of 1-2,000,000 tons/year.

  In August, “Science and Technology Support the Carbon Neutralization Implementation Plan (2022-2030)” was announced, clearly proposing ten major actions, including technological support for energy green and low-carbon transformation, and technological breakthroughs in low-carbon and zero-carbon industrial process reengineering.

- In August, Canada and Germany signed a Joint Declaration of Intent urging the two countries to collaborate in the export of clean Canadian hydrogen to Germany. The Canada–Germany Hydrogen Alliance will commit the two countries to enabling investment in hydrogen projects through policy harmonization; supporting the development of secure hydrogen supply chains; establishing a transatlantic Canada–Germany supply corridor; and exporting clean Canadian hydrogen by 2025. In addition, the province of Nova Scotia set a target to offer leases for five gigawatts of offshore wind energy by 2030 to support its budding green hydrogen industry.

- Norway invested heavily in the development of a domestic hydrogen infrastructure. In 2022, Enova has increased the support with 1,8 bn NOK, of which 669 million was allocated to the establishment of 5 hydrogen production facilities along the Norwegian coast and 451,3 million was allocated to 7 ground-breaking hydrogen- and ammonia-powered vessels. In addition, two research centers on hydrogen and ammonia were established in October 2022. The Norwegian government also supports the establishment of a full-scale value chain for carbon capture, transport and storage in the North Sea and has allocated 16.8 bn NOK to the Longship project. Further CO2 storage capacity has been installed both in the Barents and North seas in 2022. This shall enable large-scale production of very-low emission hydrogen with CCS.

- With ambitious goals of hydrogen production and economic development, Spain presented its

hydrogen roadmap in 2020. It plans to commission 4 GW of electrolyzers, which is around 10% of Europe's production target. Furthermore, the Spanish government approved a Strategic Project for the Recovery and Economic Transformation (PERTE) of Renewable Energies, Renewable Hydrogen, and Storage (ERHA) that will provide 16.37 billion euros of funding.

- Japan announced "The Clean Energy Strategy Interim Report" which shows a roadmap for economic growth and energy transition. Striving towards building a Hydrogen / Ammonia supply chain, and rapid expansion and commercialization, a detailed study will be conducted to advance support measures based on differential cost of conventional fuels in terms of production, transportation and storage together with development of common infrastructures such as storage tanks and pipelines.
- France has an ambitious national strategy to reduce greenhouse gas emissions by 6 million tons of CO2 annually in 2030. Backed by €9 billion from the French government, one of the strategy's main targets is 6.5 GW of installed electrolyzer capacity by 2030, which will enable France to produce clean hydrogen on a large scale. French companies, with the support of the French government, will invest in the construction of gigafactories to manufacture electrolysers, fuel cells, tanks and vehicles with a twofold objective: both to drive down costs and to make France and the European Union self-sufficient in manufacturing key equipment. As an important milestone in 2022, the first ten industrial projects have been launched in France and approved by the European Commission involving public and private investment of €2.1 billion and €3.2 billion respectively – directly leading to the creation of 5,200 jobs.
- Denmark has set out a government target of 4-6 GW of installed electrolyzer capacity in 2030 – and Industry as even greater ambitions aiming for between 14 and 17 GW installed capacity in 2030. All to be powered by renewable energy, mainly from offshore wind, in the recognition that Green Hydrogen as well as fuels based on green Hydrogen are key components in a successful green transition. Denmark will also establish a domestic Hydrogen infrastructure aiming to inaugurate the first pipelines already in 2026 and to establish export opportunities for green Hydrogen by connecting the domestic Hydrogen infrastructure to the wider European network by 2030. This will enable the utilization of the renewable resources in the North and Baltic Seas and the creation of hubs across the country for the production and refining of green Hydrogen for domestic as well as export needs.

This statement was co-signed by the following GHIAA members.

H2KOREA Chairman Jae-do Moon	FCHEA Fuel Cell & Hydrogen Energy Association President & CEO Frank Wolak	Hydrogen Europe CEO Jorgo Chatzimarkakis	CHFCA Clean. Efficient. Energy. President and CEO Ivette Vera-Perez
H2 Chile CEO María Paz De la Cruz	France Hydrogène General Delegate Christelle Werquin	UK HFCA CEO & Founder Celia Greaves	AeH2 Asociación Española del Hidrógeno Chairman Javier Brey Sánchez
NWBA Chairman William van Niekerk	Norwegian Hydrogen Forum Secretary General Ingebjørg Telnes Wilhelmsen	IHFCA Secretary General of IHFCA Ju Wang	HFCAS President Noel Chin
AUSTRALIAN HYDROGEN COUNCIL CEO Fiona Simon	hidrogeno COLOMBIA President Camilo A. Uribe	CONSORCIO H2ar General Manager. Y-TEC Santiago Sacerdote	Brintbranchen Hydrogen Denmark CEO Tejs Laustsen Jensen
VÄTGAS SVERIGE Chairman Anders Lundell	HUNGARIAN HYDROGEN TECHNOLOGY ALLIANCE President Lepsényi István	JAPAN HYDROGEN ASSOCIATION Executive Director Hiroshi Fukushima	DWV Deutscher Wasserstoff- und Brennstoffzellen-Verband Chairman Werner Diwald

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Appendix Ⅲ. Joint Declaration in Seoul

Joint Declaration at the 4th GHIAA General Meeting in Seoul

We firmly recognize that the world has entered a new era of implementing action plans based on the vision and strategy for the development of a hydrogen economy. This year, many countries have announced revised plans, reflecting technological development and geo-economic changes. Although details of the strategies differ depending on each country's economic circumstances, the central theme revolves around establishing an ecosystem centered on clean hydrogen. Political leaders have been actively involved in executing such plans, showing growing confidence and determination for the future of the hydrogen economy.

However, more time is needed for hydrogen to be recognized as a mainstream energy source, replacing fossil fuels like coal, oil, and gas, paving the way towards carbon neutrality. Despite the increased expectations for hydrogen's role in future energy solutions, soaring energy prices and increasing government's financial deficits resulted from the COVID-19 pandemic and the War in Ukraine have significantly discouraged efforts to promote corporate investment.

Nevertheless, various developments are evident in the global hydrogen market. There is a broad acceptance of the necessity for a standardized 'clean hydrogen certification' scheme, categorizing hydrogen based on carbon dioxide emissions. This will solve the issue of ambiguously classifying hydrogen according to its color. We are also taking note of a growing acceptance of the role of various hydrogen production technologies such as blue hydrogen and nuclear hydrogen and its derivatives such as clean ammonia, considering some of the main concerns in the early stage of hydrogen industry, such as high level of financing and costs required to produce green hydrogen and the maturity of the hydrogen industry itself. In the meantime, there is growing consensus on the urgency to actively engage and invest in the clean energy transition to decarbonize hard-to-abated sectors utilizing clean hydrogen, including long-haul transport, chemicals, steel, and more.

Being fully aware of these issues and concerns, the Global Hydrogen Industry Association Alliance (GHIAA) was established with the recognition that international cooperation in the private sector is essential and urgent to promote policies to respond to climate change and expand the hydrogen economy. Being constantly aware of these goals and visions and striving to create jobs and opportunities around the world today, all members of the GHIAA hereby agree to make the following declarations:

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1. For the hydrogen economy to develop in the future, investment in hydrogen technologies, expansion of appropriate infrastructure, and mobilization of necessary financing through strengthened partnership between the government and the private sector are essential. Global cooperation between countries and various entities is vital for its achievement. In order to facilitate and expedite these actions by governments, the GHIAA will cooperate and collaborate to collect information and share best practices with members through documentation and seminars and strengthen dialogues with governments.
2. As the hydrogen economy aims to overcome the geographical bias of fossil fuels, sharing information and technologies among countries is especially crucial. In this sense, we firmly welcome various programs from the international community to support the hydrogen industry in underdeveloped areas. To ensure the success of these programs and related policies, the GHIAA will strengthen partnership with international communities and relevant international organizations through various means.
3. We urge governments to accelerate efforts to establish a global hydrogen ecosystem by clearing technical barriers and facilitating international trade of hydrogen. Relevant measures include the introduction of a clean hydrogen certification scheme and the harmonization of technical regulations and standards. In order to support the government's initiatives, the GHIAA will continue to collect and provide relevant information to various individuals and organizations participating in the clean hydrogen movement.

This statement was agreed by the following GHIAA members on September 14th, 2023.

Korea	USA	EU	Canada	Chile	France
UK	Spain	Netherlands	Norway	Singapore	China
Australia	Colombia	Argentina	Denmark	Sweden	Germany
Hungary	Japan	Poland			

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