Basque Hydrogen Industry





Green hydrogen is a key factor in the energy transition, as it provides a versatile, clean and flexible option for the decarbonization of certain sectors

The hydrogen value chain is structured into three main areas:



Hydrogen momentum is strong: more than 1,500 projects and € 620 billion of investments and 48 million tons per year of renewable hydrogen supply announced globally until 2030

Europe continues to have the largest number of projects (617), followed by North America (280). Europe also has the highest total investments announced (€ 179 billion). The global hydrogen project pipeline has grown 7-fold since 2020.



130

Projects

1,572 projects

Considering projects with a COD through 2030:

208

353

Projects announced

Projects in feasibility studies

434

Projects commited (FID taken, under in FEED studies construction or operational)



Global rollout of clean hydrogen continues in Europe despite macroeconomic headwinds

Deployment continues, with more than 1.75 GW electrolysis capacity deployed globally and a total of 26 GW having passed FID. However, continued efforts are needed to foster the faster maturing of projects from announcement to deployment.



The deployment of hydrogen technologies has the clear and unequivocal support of various government administrative bodies

HYDROGEN STRATEGY FOR A CLIMATE-NEUTRAL EUROPE

August 2020



electrolysers for 2030

HYDROGEN October 2020 IOIA DE RUTA HIDRÓGENO NA APUESTA R EL HIDRÓGENO RENOVABLE ARCO ESTRATÉCICO DE ENERCÍA Y CUM 11 GW of installed capacity of electrolysers for 2030

update of NECP 2023-2030

HYDROGEN ROADMAP: A

COMMITMENT TO RENEWABLE



The Basque Hydrogen Strategy drives the creation of a hydrogen production, distribution and consumption ecosystem in the Basque Country, based on the region's industrial, logistical and technological capabilities



Training, R&D and industrial development will position the country as a technology exporter



> Source: The Basque Hydrogen Strategy April 2021

The RIS3 Energy Steering Group agreed to include the field of hydrogen as a new area of the Energibasque strategy for technological and industrial development in 2021.

The Basque Country has all the elements to become a benchmark region for a hydrogen ecosystem

VALUE CHAIN

Industrial hub with capabilities in the engineering and manufacturing of equipment at all levels of the value chain



Strong capital goods industry



Science and Technology R&D Entit

Competitive SMEs network

STRATEGIC LOCATION

On an international transport hub



TEN-T (on the Atlantic Energy and Transport routes)

TEN-E (strategic electricity and gas infrastructure)

INDUSTRIAL PORT AND REFINERY

Industrial port with LNG (regasification) expertise and connected to an extensive pipeline network.

Petronor refinery: a producer and consumer of hydrogen.





INDUSTRIAL FABRIC TO BE DECARBONISED



The Basque Country is home to a technological and industrial network with capabilities and expertise in all segments of the hydrogen value chain

Cluster Energía

spri

ENERGIAREN EUSKAL

ENTE VASCO DE LA ENERGÍA

Large concentration of potential industrial users

Strong capabilities in engineering and manufacturing of H2 components and svstems





The hydrogen sector forum of the Basque Energy Cluster is the meeting point for companies and stakeholders willing to share their knowledge and proposals

An initiative designed to energise the sector, facilitating the exchange of information and knowledge between members and other organisations active in the hydrogen economy in the Basque Country, and identifying opportunities for collaboration.



The Hydrogen Sector Forum is

coordinated by PETRONOR.





+150 associated companies and entities participate in it.



The Forum was set up in collaboration with eight other cluster associations (ACICAE, ACLIMA, FLUIDEX, FMV, MAFEX, MLC ITS, HEGAN and SIDEREX), to provide access for their member companies to information and to participate in forthcoming events.



Rollout of clean hydrogen is also relevant in the Basque Country,

01. PRODUCTION: GREEN H2





Comissioning of a 2,5MW electrolyser.

Ingeteam



Manufacturing of a new rectifier solution for powering electrolysers based on IGBT technology.

02. TRANSPORT & DISTRIBUTION





H2SAREA, the first Spanish demonstration project to verify the optimal behaviour of current gas networks for use with 20% hydrogen.





100% hydrogen distribution network.





World's first palladium alloy membrane manufacturing plant to obtain hydrogen from ammonia or methanol.





The world's largest tube trailer in terms of pressure (517 bar) and capacity (1.3 ton) for hydrogen transport.

with milestones achieved in the complete value chain

03. END USES: MOBILITY





Irizar i6S: Efficient Hydrogen long-distance bus prototype.



HYMPULSO: Comprehensive project in rail mobility through hydrogen.



Urbino 18 hydrogen and Urbino 12 hydrogen commercial busses.





FCH2RAIL: First hydrogen train to perform tests on the Spanish railway network.





Reheating furnace prototype for the evaluation of hydrogen combustion technologies.







First spoon heater capable of running entirely on green H2.





Oxyfuel prototype to evaluate the use of H2 in metallurgical cutting.

Collaboration on key R&D initiatives is essential to overcome



HYNNOVA was created to provide a solution to the technological limitations existing in large hydrogen production plants, seeking to carry out the necessary research to create new advanced technological solutions for the modular design and efficient and safe management of high-capacity renewable hydrogen production plants.



HIMUGI focuses on the conceptualization of safe and sustainable H2 systems based on three lines of research: sustainability in advanced manufacturing processes for Type IV (tubular) tanks, the study of critical metallic components, and the comprehensive safety of the system.





methodologies to design, produce and evaluate metallic materials and structures from the point of view of their behaviour in the presence of hydrogen.

www.h2matproject.com

www.hynnovaproject.com

Basque ELKARTEK programme



Mondragon Goi Eskola Coordinator: Unibertsitatea Politeknikoa technologies presents both advantages and technical challenges to consider.

www.hidruraproject.com



Basque ELKARTEK programme



the main technological challenges of hydrogen development





ONTZHI researches more secure, compact, cost-effective, and sustainable **H2 storage and transport technologies and solutions**. It has 4 workstreams: metal tanks and components, tanks for light vehicles, distribution pipelines, and characterization and modelling.

www.ontzhiproject.com			
	Basque ELKARTEK programme		
EUSKO JAJRUARITZA GOBIERINO VASCO		Coordinator:	

AVOGADRO researches into innovative technological solutions for new generations of H2 refueling stations for heavy goods vehicles and trains, with fiber optic systems for detecting leaks and BoP, to help the Basque Country gain international recognition as a technological benchmark for the HRS of the future.

<u>AVOGADRO</u>

www.avogradoproject.com



Basque HAZITEK programme



Coordinator: Coordinator:



H2SALT seeks to develop a system for the comprehensive management of **hydrogen storage in salt caverns** and validate its technicaleconomic viability, with the development of H2 injection and extraction systems and auxiliary elements.

www.h2saltproject.com



H2INTEGRA researches into **physical and digital solutions** for the creation of a H2 ecosystem that optimally connects and manages the end uses of H2 with the production and distribution infrastructures. The project **integrates different industrial companies** with recognized positions in the Basque industry.

www.h2integraproject.com

Basque HAZITEK programme



The Basque Hydrogen Corridor (BH2C), spearheaded by Petronor-Repsol, is the hydrogen valley of the Basque Country, gathering 55 projects all along the value chain

BH2C has been selected by the Mission Innovation – Clean Hydrogen Mission (CHM) as one of the eight leading examples of 'Hydrogen Valleys' globally, which places it among the world's elite of projects driving the energy transition to green hydrogen.



The Energy Intelligence Center (EIC), founded in 2023, is a key infrastructure that hosts some of the Basques companies leading the clean energy transition

EIC – Energy Intelligence Center aims to build on the opportunities of the energy transition and contribute to the development of the necessary industrial and technological capabilities of the Basque energy sector.

It is a strategic commitment for the future of both the Regional Government of Bizkaia and the Basque Government to contribute to consolidating the competitiveness of the sector.

With a total surface of 19,000 sqm, the center boasts a direct supply of green hydrogen from a 2.5 MW electrolyser located at the Petronor refinery, that feeds 24/7 both its testing facilities and a fuel cell that backs-ups the electrical system.

















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