

Introduction: beyond the molecule

Prior to Russia's invasion of Ukraine in February 2022, the European Union imported over forty per cent of its natural gas from Russia. That dependence, which for decades had been regarded as a pillar of geopolitical stability on the premise of mutual benefit, was exposed as a strategic vulnerability of the first order when Moscow weaponised energy supply as an instrument of coercion. The ensuing crisis compelled Brussels to reconfigure its energy architecture as a matter of urgency, and the REPowerEU Plan, adopted in May 2022, crystallised that resolve with a figure that encapsulated its entire ambition: twenty million tonnes of renewable hydrogen by 2030, of which ten were to be produced within EU borders and a further ten imported from reliable partners¹. The magnitude of the challenge becomes apparent when one considers that current global hydrogen production stands at approximately ninety-five million tonnes per annum, of which barely one per cent is of renewable origin².

Green hydrogen—produced through the electrolysis of water using renewable electricity—emits no carbon dioxide during production, unlike conventional hydrogen derived from natural gas or coal. But green hydrogen is not merely a molecule. It is a geoeconomic vector whose mastery will redistribute power amongst those nations that produce it, those that transport it, and those that consume it. And in that redistribution, ports occupy a decisive position: they constitute the physical bottleneck that determines who captures the flows of the new energy map and who is relegated to the status of mere customer³. Spain, possessing one of the greatest renewable generation potentials in Western Europe, a network of forty-six ports of general interest, and a geographical position that renders it a natural hinge between North Africa and the heart of the continent, enjoys competitive advantages that are difficult to replicate. Yet advantages left unexploited dissipate.

On 28 January 2026, the Third Vice-President of the Government and Minister for the Ecological Transition, Sara Aagesen, announced that the Council of Ministers would approve within the coming months the Draft Bill on green hydrogen, a legislative instrument that Spain still lacks despite having mobilised over three thousand million

¹ European Commission, *REPowerEU Plan*, COM(2022) 230 final, 18 May 2022.

² International Energy Agency (IEA), *Global Hydrogen Review 2024*, September 2024.

³ Gonzalo Escribano, 'Una diplomacia europea del Hidrógeno 2.0: alineando la ambición climática y la seguridad energética', Real Instituto Elcano, ARI 66/2023, October 2023.

euros in support for renewable hydrogen⁴. On the same day, the Chief Executive Officer of Enagás, Arturo Gonzalo, forecast that 2026 would be 'the breakthrough year for hydrogen'⁵. Both statements, delivered at Enagás's Fourth Hydrogen Day—with the virtual participation of Teresa Ribera, now Executive Vice-President of the European Commission for a Clean, Fair and Competitive Transition—frame the inflection point at which the sector now finds itself: the distance between declared ambition and operational infrastructure remains vast, yet financial and regulatory commitments are beginning to acquire critical mass.

The question is whether Spain transforms its ports into energy hubs in time—or whether the opportunity migrates to competitors with greater speed of execution.

Green hydrogen as a strategic vector

The economics of hydrogen: figures and the scale of the challenge

Global hydrogen production currently stands at approximately ninety-five million tonnes per annum, the majority of which is destined for petroleum refining and ammonia manufacture for fertilisers. Roughly ninety-six per cent of that hydrogen is derived from fossil fuels—natural gas, coal, or petroleum—generating around nine hundred million tonnes of carbon dioxide annually, a figure equivalent to the combined emissions of the United Kingdom and Indonesia⁶. Scaling green hydrogen production—in the regulatory sense of renewable hydrogen (RFNBO⁷)—from less than one per cent at present to the volumes demanded by REPowerEU constitutes an industrial challenge without recent parallel, requiring massive investment in electrolysis capacity, additional renewable generation, transport infrastructure, and storage facilities.

The financial commitments already mobilised offer a measure of the scale: globally, announced hydrogen projects exceed one hundred and ten thousand million dollars; in Europe alone, commitments of several thousand million euros were announced during 2025⁸. Spain, for its part, aspires to install twelve gigawatts of electrolysis capacity by

⁴ MITECO, 'Sara Aagesen anuncia un Anteproyecto de ley para afianzar el hidrógeno...', press release, 28 January 2026.

⁵ Enagás, 'El 4º Día del Hidrógeno de Enagás confirma el despegue del hidrógeno verde', press release, 28 January 2026.

⁶ See note 2.

⁷ RFNBO: Renewable Fuels of Non-Biological Origin. Regulatory category established by European Union legislation to define renewable hydrogen and its derivatives produced through electrolysis using renewable electricity.

⁸ See note 5.

2030—in accordance with the triple targets announced by the Government—and the results of the *call for interest* launched by the H2Med Alliance in 2024 revealed that Spain could export 1.22 million tonnes of green hydrogen annually by 2030⁹. These are not academic projections; they are corporate commitments underpinned by engineering studies and environmental impact assessments currently in progress.

The new energy map: from the East–West axis to the South–North corridor

European energy geopolitics operated for decades under a paradigm defined by an East–West axis: Russian natural gas flowing towards Central Europe through pipelines traversing Ukraine, Belarus, the Baltic, and Turkey. Green hydrogen introduces a radically different paradigm, a South–North corridor in which renewable energy from the Mediterranean and North Africa is transformed into hydrogen and flows towards the industrial heartlands of Germany, the Netherlands, and northern France¹⁰. In this new map, Spain ceases to be an energy island—as it was for decades with respect to gas, notwithstanding the paradox of possessing six regasification plants that barely connected with the continental market—and aspires instead to become an energy export *hub*.

The backbone of that aspiration is the H2Med corridor, recognised as a Project of Common Interest (PCI) by the European Union. It comprises two principal infrastructures: the overland CelZa connection, spanning two hundred and forty-eight kilometres between Celorico da Beira (Portugal) and Zamora (Spain), and the subsea BarMar connection, extending four hundred and fifty-five kilometres between Barcelona and Marseille. The H2Med corridor combines CelZa and BarMar; BarMar is designed to transport approximately 2 Mt/year, and the corridor as a whole could reach some 2.75 Mt/year¹¹. The *European Hydrogen Backbone* (EHB) initiative, which brings together over thirty transmission system operators, envisages a pan-European network of 28,000 kilometres of hydrogen pipelines operational by 2030 and 53,000 kilometres by 2040, with an estimated investment of between eighty thousand million and one hundred and forty-three thousand million euros.

⁹ Enagás, 'H2Med: resultados del Call for Interest', February 2025. Spain could export 1.22 million tonnes of green hydrogen annually by 2030.

¹⁰ International Renewable Energy Agency (IRENA), *Geopolitics of the Energy Transformation: The Hydrogen Factor*, 2022.

¹¹ Enagás, *H2med – Europe's first major hydrogen corridor, project factsheet*.

Institutional milestones have followed in rapid succession. In July 2025, the joint venture for the BarMar project was established, with Enagás holding fifty per cent, NaTran 33.3 per cent, and Teréga 16.7 per cent, and Francisco de la Flor appointed as CEO¹². On 29 August 2025, the Franco-German Council of Ministers, convened under the chairmanship of the French President and the German Chancellor, designated H2Med a 'flagship project' and incorporated support for the corridor into the Franco-German Economic Agenda¹³. On 24 September 2025, the H2Med Alliance reached forty-nine members—including Repsol, BP, Acciona, EDPR, Moeve, EnBW, Uniper, and Ineos—during an event held in Berlin attended by government representatives from Germany, Spain, France, and Portugal, as well as the European Commission¹⁴. European funding has also materialised: on 30 January 2025, the CINEA Executive Agency approved one hundred per cent of the funds requested under the Connecting Europe Facility (CEF), totalling 75.8 million euros earmarked for engineering studies, marine surveys, and environmental impact assessments¹⁵.

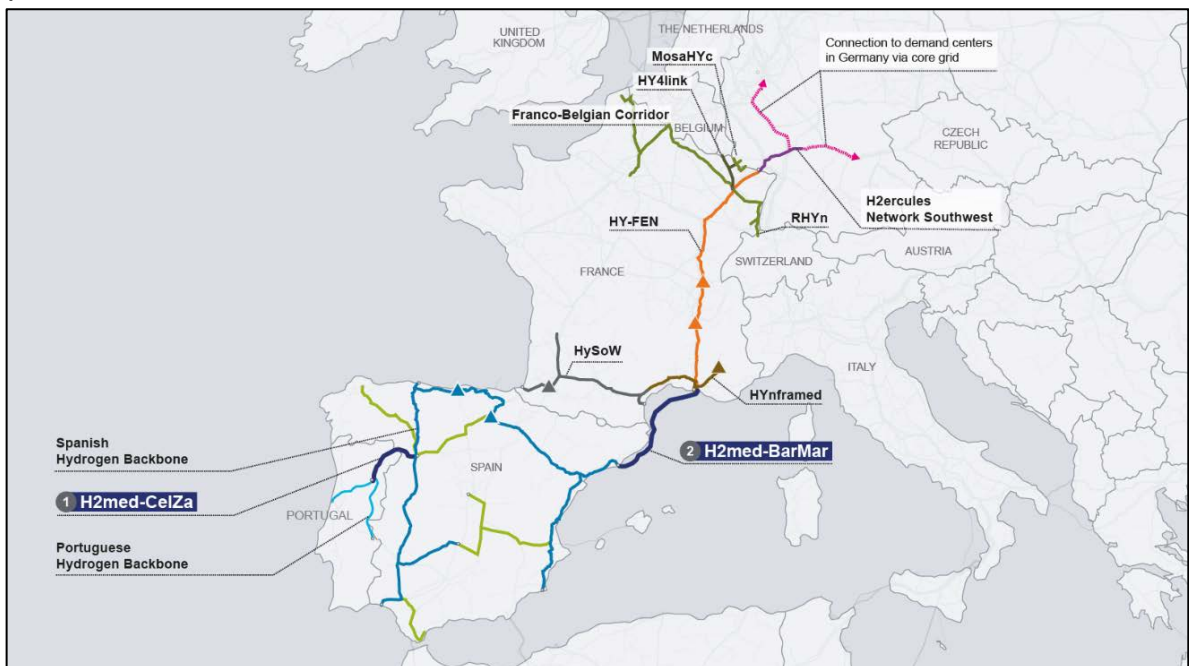


Figure 1: Map of the H2Med corridor and its associated infrastructure: CelZa, BarMar, and connections to the hydrogen backbone networks of France and Germany. Source: H2Med Project (<https://h2medproject.com>)

¹² Enagás, 'Constitución de la sociedad del proyecto BarMar', press release, 3 July 2025. Shareholding: Enagás 50%, NaTran 33.3%, Teréga 16.7%. CEO: Francisco de la Flor.

¹³ Bundesregierung (Federal Government of Germany), 'Franco-German Economic Agenda', 29 August 2025 (25th Franco-German Council of Ministers).

¹⁴ H2Med Alliance, press release from the Berlin event, 24 September 2025. Forty-nine members confirmed.

¹⁵ European Climate, Infrastructure and Environment Executive Agency (CINEA), 'CEF Energy: €1.25 billion allocated to 41 cross-border energy infrastructure projects', 29 January 2025; and Enagás, '€75.8 million announced by CINEA on 30 January for the first axes of the Spanish Hydrogen Backbone and H2Med studies', press release, 7.FEB.2025.

The geophysical surveys completed in November 2025 confirmed the technical feasibility of the BarMar subsea route, and the commercial operation date has been set for 2032.

Global competition: the window of opportunity is not eternal

Spain does not operate in a vacuum. Morocco, with lower labour costs and bilateral agreements with Germany, aspires to become the preferred exporter from the southern Mediterranean. Australia, Saudi Arabia, and Chile are developing megaprojects oriented towards the Asian and European markets. And China, which already leads in installed electrolyser capacity, could dominate their manufacture as well, replicating the pattern it has exhibited in solar panels and batteries¹⁶. Spain's advantage—abundant sunshine, consolidated port infrastructure, proximity to European markets—is real but not eternal, and its realisation depends upon speed of execution.

Spanish ports: from logistics nodes to energy hubs

Inherited advantage: convertible fossil infrastructure

The Spanish port system handled 558 million tonnes of goods in 2024 through forty-six ports of general interest¹⁷. The Ministry of Transport's Port Investment Plan 2025–2029 envisages allocating over seven thousand million euros to the modernisation of this infrastructure, with 1,617 million euros budgeted for 2026 alone¹⁸. What matters for the hydrogen economy is that these ports are not starting from scratch: decades of handling hydrocarbons, liquefied natural gas, and chemicals have generated logistics capabilities, safety protocols, storage infrastructure, and intermodal connections that constitute assets directly transferable to the hydrogen value chain and its derivatives—green ammonia, green methanol, synthetic fuels. LNG terminals, pipeline galleries linking quays with refineries, experience in handling hazardous substances, and the availability of industrial land with grid access form an ecosystem that dramatically reduces deployment timescales and costs compared with greenfield¹⁹ construction.

Spain's hydrogen port map: five strategic nodes

¹⁶ See note 10.

¹⁷ Puertos del Estado, 'Puertos del Estado lanza el Anuario Estadístico 2024...', 1st October 2025.

¹⁸ Ministry of Transport and Sustainable Mobility, *Plan de inversiones en infraestructuras portuarias 2025–2029*, January 2025. Planned investment exceeding 7,000 million euros.

¹⁹ The term greenfield denotes, in industrial and investment contexts, a project developed from scratch on a site with no prior infrastructure, as opposed to brownfield, which repurposes existing facilities.

Five Spanish ports concentrate the most advanced green hydrogen initiatives, each with a differentiated and complementary strategic profile.

Valencia. The Port of Valencia has been a pioneer in demonstrating the operational viability of hydrogen in high-intensity port environments. The H2PORTS project, funded by the European Commission through the *Clean Hydrogen Partnership* programme, held its final conference on 3 December 2025, presenting the results of years of trials in live operations with a container *ReachStacker* developed by Hyster-Yale and a 4x4 terminal tractor manufactured by Atena, both powered by hydrogen fuel cells. The Valencian port has become one of the first in the world to operate daily with container-handling machinery fuelled exclusively by hydrogen. It also boasts the first hydrogen refuelling station operational in a European port facility, installed at the Xità quay. The pilot results have been described as 'satisfactory' by its coordinators, and the Port Authority has integrated hydrogen into its contingency plans, removing internal regulatory barriers to its handling²⁰. Valencia does not produce hydrogen at scale, but it has answered the prior question: demonstrating that the technology works under the real conditions of a terminal operating twenty-four hours a day, three hundred and sixty-five days a year.

Bilbao. The Port of Bilbao is positioning itself as a renewable hydrogen export *hub* towards northern Europe, articulated around the Basque Hydrogen Corridor (BH2C), a collaboration driven by Petronor to decarbonise the energy, industrial, and mobility sectors of the Basque Country. The signing of a Memorandum of Understanding between the ports of Bilbao, Amsterdam, and Duisburg establishes a direct supply route to the Netherlands and the Rhine-Ruhr industrial region²¹. Under the IPCEI Hy2Use programme, the Bilbao Large Scale project envisages the installation of a 100 MW electrolyser at Petronor's refinery in Muskiz, Vizcaya, with planned production of up to 15,000 tonnes of green hydrogen per year and commissioning expected towards the end of the decade. Studies by the Orkestra-Deusto Institute have identified the Bilbao port's potential as an integrated logistics node for hydrogen, leveraging its experience in liquid bulk and its maritime connectivity with the Atlantic arc²².

²⁰ Fundación Valenciaport, 'The Port of Valencia presents the results of H2PORTS, Europe's largest pilot project for hydrogen-powered port machinery', 3 December 2025.

²¹ Port of Bilbao, 'Port of Bilbao, Duisport and Port of Amsterdam announce development of an intra-European corridor for renewable hydrogen', press release on 16 November 2023.

²² Orkestra-Instituto Vasco de Competitividad / Fundación Deusto, *Una reflexión sobre el posicionamiento de los puertos en el desarrollo del hidrógeno*, Macarena Larrea and Jokin Txapartegi, 2025.

Tarragona. Tarragona aspires to become the natural outlet for hydrogen produced in the north-eastern Peninsula—Aragon and Castile and León—towards the H2Med corridor and Mediterranean markets. Its proximity to the most important petrochemical hub on the Iberian Peninsula, with local industrial hydrogen demand that will make the molecule 'indispensable' according to the Port Authority itself, confers a dual role: producer of renewable hydrogen and facilitator of its import and export logistics. The Vall de l'Hidrogen de Catalunya and Enagás have presented a project to build a dedicated hydrogen network connecting the North and South industrial estates with the port precinct, with the potential to link to the Barcelona–Marseille trunk network²³. Its geographical location also allows it to capture hydrogen flows from North and West Africa and the Middle East.

Cartagena. Cartagena meets the conditions to be one of the first Spanish ports to operate with green hydrogen at industrial scale. Repsol has announced the installation of a one-hundred-megawatt electrolyser at its Cartagena refinery, included in the IPCEI Hy2Use programme, and the port has carried out the first biomethane loading operation by Enagás. The Port Authority has industrial land available with access to electricity, water, and connections to quays via pipeline galleries, and participates in associations and innovative projects on green hydrogen and CO₂ capture through the PortLab. The port's strategic location, combined with the high solar potential of south-eastern Spain, enables it to offer—according to the Port Authority—competitive renewable supply conditions for producing and exporting green hydrogen and derivatives towards northern Europe²⁴.

Huelva. The Port of Huelva has signed a protocol with Iberdrola to promote green hydrogen production near the outer port at Palos de la Frontera, with the aim of supplying both local industry and the transport and port operations sectors. Its Strategic Plan 2023–2030, with a 2050 horizon, identifies conversion into a green hydrogen *hub* for southern Europe as one of its three strategic axes, alongside positioning as an intermodal logistics port and sustainability. Huelva, which together with the Campo de Gibraltar accounts for forty per cent of national grey hydrogen consumption, is competing to capture the green hydrogen production associated with Andalusia's enormous solar generation potential

²³ Port Authority of Tarragona, presentation at Renmad Hidrógeno 2025, Zaragoza, 12 March 2025.

²⁴ Europa Press (Murcia), 8 October 2025. 'El Puerto de Cartagena presenta su estrategia para impulsar el hidrógeno verde en la World Hydrogen Week 2025' (Cartagena/Copenhagen).

and to transform it into exportable green ammonia²⁵. The province hosted the *III Congreso Nacional de Hidrógeno Verde* from 4 to 6 February 2026, bringing together over 1,200 attendees and 450 companies, consolidating its role as a benchmark for the sector.

Industrial clusters as catalysts

The Council of Ministers allocated, under the IPCEI Hy2Use programme, 794 million euros to seven Spanish projects for the production and intensive use of renewable hydrogen. Five of these include electrolyzers of one hundred megawatts or more located in port and industrial settings in Andalusia, Asturias, Castile-La Mancha, the Basque Country, and Murcia, with an aggregate capacity of 652 megawatts of electrolysis and the planned substitution of more than 17,000 tonnes per year of fossil hydrogen with renewable molecules²⁶. To this investment are added the regulatory bases of the PORT-EOLMAR programme, published in the BOE in December 2025, which channel funds from the Recovery, Transformation and Resilience Plan to physically adapt port infrastructure to the deployment of offshore wind and marine renewables²⁷. The concept underlying these initiatives is that of the 'hydrogen valley': an integrated ecosystem where hydrogen production, storage, industrial consumption, and export are concentrated within a single geographical area, with the port serving as the nexus between renewable generation in the *hinterland*²⁸ and demand from international markets.

Risks and bottlenecks: what could go wrong

Regulatory risk

Spain still lacks a specific hydrogen law. The draft bill announced on 28 January 2026 must traverse a legislative pathway that will include public consultation, a report from the Council of State, approval by the Council of Ministers, and parliamentary procedure—a process that is rarely completed in less than twelve to eighteen months. In the meantime,

²⁵ Port Authority of Huelva, *Plan Estratégico 2023–2030 con horizonte 2050*. Protocol with Iberdrola for green hydrogen production in Palos de la Frontera. Host of the III Congreso Nacional de Hidrógeno Verde (4–6 February 2026).

²⁶ Council of Ministers, BOE-A-2024-14084, Royal Decree 663/2024 of 9 July, IPCEI Hy2Use. Allocation of 794 million euros to seven Spanish projects. Aggregate capacity: 652 MW of electrolysis.

²⁷ BOE, Order TED/1488/2025 of 17 December, regulatory bases of the PORT-EOLMAR programme for grants to adapt port infrastructure to the deployment of offshore renewables. Funding: PRTR/NextGenerationEU.

²⁸ The term *hinterland*, of German origin (literally 'back land'), denotes in economic geography and port logistics the land-based catchment area of a port: the inland zone from which it draws goods for export and to which it distributes imports.

electricity planning prioritises twelve gigawatts of electrolysis by 2030, yet the tenders for grid access capacity—essential if electrolysers are to connect to the system—are advancing slowly. The European Delegated Act on RFNBO, which establishes additionality, temporal correlation, and geographical correlation requirements for the electricity used in electrolysis, has increased regulatory complexity, which several project developers cite as a source of investor uncertainty²⁹. At continental level, differing approaches amongst Member States—France prioritises nuclear self-sufficiency, Germany is committed to massive imports, Spain positions itself as an exporter—create potential barriers to the integration of a genuinely fluid European hydrogen market.

Infrastructural risk

The Spanish hydrogen backbone network, the provisional development of which has been entrusted to Enagás³⁰, is currently undergoing public consultation—expected to conclude in 2026—and will not be operational before 2030. Should ports begin producing green hydrogen before the pipelines needed to evacuate it to consumption centres exist, the vector will literally be 'stranded' at the quayside. The problem is compounded in the rail sector: access to Spanish ports requires an estimated investment of 950 million euros, according to the Transport Observatory³¹, and without efficient rail–port connections, overland transport of hydrogen and its derivatives will depend exclusively on road haulage, with the attendant capacity and safety limitations. Finally, congestion in the electricity distribution networks—the same problem that is already constraining photovoltaic installations in the southern Peninsula—could become a limiting factor for large-scale electrolysis unless grid evacuation capacity is expanded.

Competitive risk

Rotterdam has proclaimed itself 'Europe's hydrogen port' and is pressing ahead with the construction of import terminals and the conversion of its gas infrastructure. Marseille-Fos, at the other end of the BarMar corridor, is developing its own hydrogen ecosystem in the industrial zone of the Gulf of Fos. Tanger-Med, in Morocco, combines lower labour costs with bilateral green hydrogen supply agreements signed directly with Germany,

²⁹ See note 3.

³⁰ MITECO, 'El Gobierno autoriza provisionalmente a Enagás a desarrollar las redes de hidrógeno reconocidas como Proyecto de Interés Común europeo', 30 July 2024.

³¹ Observatorio del Transporte y la Logística en España, *Informe anual 2025*. Rail access to ports: estimated investment requirement of 950 million euros.

potentially diverting European investment towards the southern shore of the Mediterranean. On the technological front, China is not only already the world's largest producer of hydrogen by alkaline electrolysis but also dominates the electrolyser manufacturing chain, raising the risk that Europe, in addition to arriving late to production, may end up importing the very technology needed to produce.

Safety risk

Hydrogen, green ammonia, and green methanol present risk profiles distinct from those of conventional fossil fuels. Ammonia is toxic and corrosive; hydrogen is extremely flammable, with a very wide ignition range and an invisible flame; methanol is flammable with acute toxicity. The large-scale handling of these substances in high-density operational port environments will require specific safety protocols, specialised personnel training, and emergency response plans; in short, it demands zoning and operational readiness before scaling up. The AIHRE study, funded by ERDF resources under the POCTEP 2021–2027 programme, has concluded that ports will require infrastructure resistant to the marine environment, clear regulatory frameworks, and intensive collaboration between public and private actors to manage these new energy vectors safely³².

The strategic dimension: ports, defence, and energy sovereignty

The transposition of the NIS2 Directive³³ and the Critical Entities Resilience Directive (CER)³⁴ into Spanish law will reinforce the designation of ports as critical infrastructure, with specific obligations regarding cybersecurity, physical protection, and operational continuity. A port that produces, stores, and distributes green hydrogen becomes a dual-use infrastructure—civil and strategic—whose disruption would have consequences not merely logistical but also energetic and, by extension, pertaining to national security.

The defence dimension is not anecdotal. NATO and the European Union are actively exploring the use of synthetic fuels (*e-fuels*) and ammonia in military operations, with the aim of reducing the logistical footprint and the vulnerability of fuel supply chains in

³² AIHRE (*Análisis e Impulso del H₂ Renovable en la región POCTEP*) / Ariema Energía y Medioambiente, *Estudio sobre hidrógeno renovable en puertos*. Spain–Portugal cross-border cooperation project, INTERREG VI-A Spain–Portugal programme (POCTEP) 2021–2027.

³³ Directive (EU) 2022/2555 of the European Parliament and of the Council (NIS2 Directive), 14 December 2022.

³⁴ Directive (EU) 2022/2557 of the European Parliament and of the Council (Critical Entities Resilience Directive, CER), 14 December 2022.

theatres of operation. The availability of green hydrogen and its derivatives at national ports would not only reduce the energy bill of the Armed Forces but would also endow Spain with the logistical autonomy to sustain operations without depending on external fuel suppliers. In a scenario of prolonged conflict on NATO's eastern flank, such as that which has persisted in Ukraine since 2022, the capacity to produce clean fuels on home territory constitutes a strategic asset of the first order.

The blackout of 28 April 2025, which left much of the Iberian Peninsula without electricity supply for several hours³⁵, exposed the fragility of a system that generates renewable energy in ever greater quantities yet lacks sufficient storage capacity. A port system capable of producing and storing green hydrogen would act as a 'strategic buffer': converting renewable surpluses into a storable and transportable molecule, thereby reducing vulnerability to unforeseen outages.

Finally, Spain's geostrategic position in the Western Mediterranean confers upon it a hinge role between the countries of North Africa—Morocco, Algeria, Tunisia, Mauritania—which possess extraordinary renewable resources for hydrogen production, and the countries of Central and Northern Europe, which concentrate industrial demand. Spanish ports will not only manage domestic production; they will also be able to act as transit nodes for North African hydrogen destined for Europe, a role analogous to that which Spanish regasification plants have performed for decades with respect to liquefied natural gas, but with potentially greater geopolitical reach.

Conclusions

The analysis developed in the preceding sections permits the articulation of three fundamental conclusions.

First: Spanish ports possess competitive advantages that are difficult to replicate for occupying a central position in the new European energy map. The infrastructure inherited from the fossil cycle—LNG terminals, pipeline galleries, safety protocols for hazardous substances—combined with a privileged geographical position, an expanding renewable generation surplus, and the designation of the H2Med corridor as a European

³⁵ Red Eléctrica de España, '*Red Eléctrica presenta su informe del incidente del 28 de abril y propone recomendaciones*', press release, 18 June 2025; and '*Incidente en el Sistema Eléctrico Peninsular Español el 28 de abril de 2025*' (technical report).

Project of Common Interest, constitute a starting point that is difficult for other port systems in southern Europe to match. The five nodes identified—Valencia, Bilbao, Tarragona, Cartagena, and Huelva—span the Mediterranean and Atlantic arcs with complementary strategic profiles which, if developed in a coordinated manner, can articulate an integrated system of production, storage, industrial consumption, and export.

Second: the window of opportunity is finite and is narrowing. The absence of a Spanish hydrogen law, the slow progress in resolving grid access capacity tenders, the need for 950 million euros in rail access to ports, the delay in the operability of the hydrogen backbone network, and the growing competition from ports such as Rotterdam, Marseille-Fos, and Tanger-Med together constitute a cumulative risk: if the gap between declared ambition and effective execution is not closed rapidly, the opportunity will migrate to competitors advancing with greater regulatory and financial determination.

Third: transforming Spanish ports into green hydrogen hubs is not merely energy policy; it is national security policy. The convergence of the energy transition, European directives on critical infrastructure protection, the exploration of clean fuels for military operations, and the need for resilience in the face of events such as the April 2025 blackout places hydrogen ports at the precise intersection of energy, industry, and defence. European energy autonomy—and, by extension, Spain's position in the emerging geopolitical order—will depend in large measure on what happens at Spanish quaysides over the next five years.

Epilogue

When, in 2022, the war in Ukraine severed Russian gas supplies, Spanish regasification ports demonstrated within weeks that geography and inherited infrastructure can become strategic assets if the political will exists to activate them. Green hydrogen poses a challenge of a higher order of magnitude, but the underlying lesson is the same: Spain has sunshine, wind, ports, and engineering. What it needs is speed.

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