The Texas-Louisiana Gulf Coast & the Netherlands

Building the transatlantic clean hydrogen corridor

Netherlands Enterprise Agency

May, 2026

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This publication is commissioned by:

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Kingdom of the Netherlands

Netherlands Enterprise Agency

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NBSO Texas | Netherlands Business Support Office

ACRETIO PROJECT DEVELOPMENT CONSULTING

This publication

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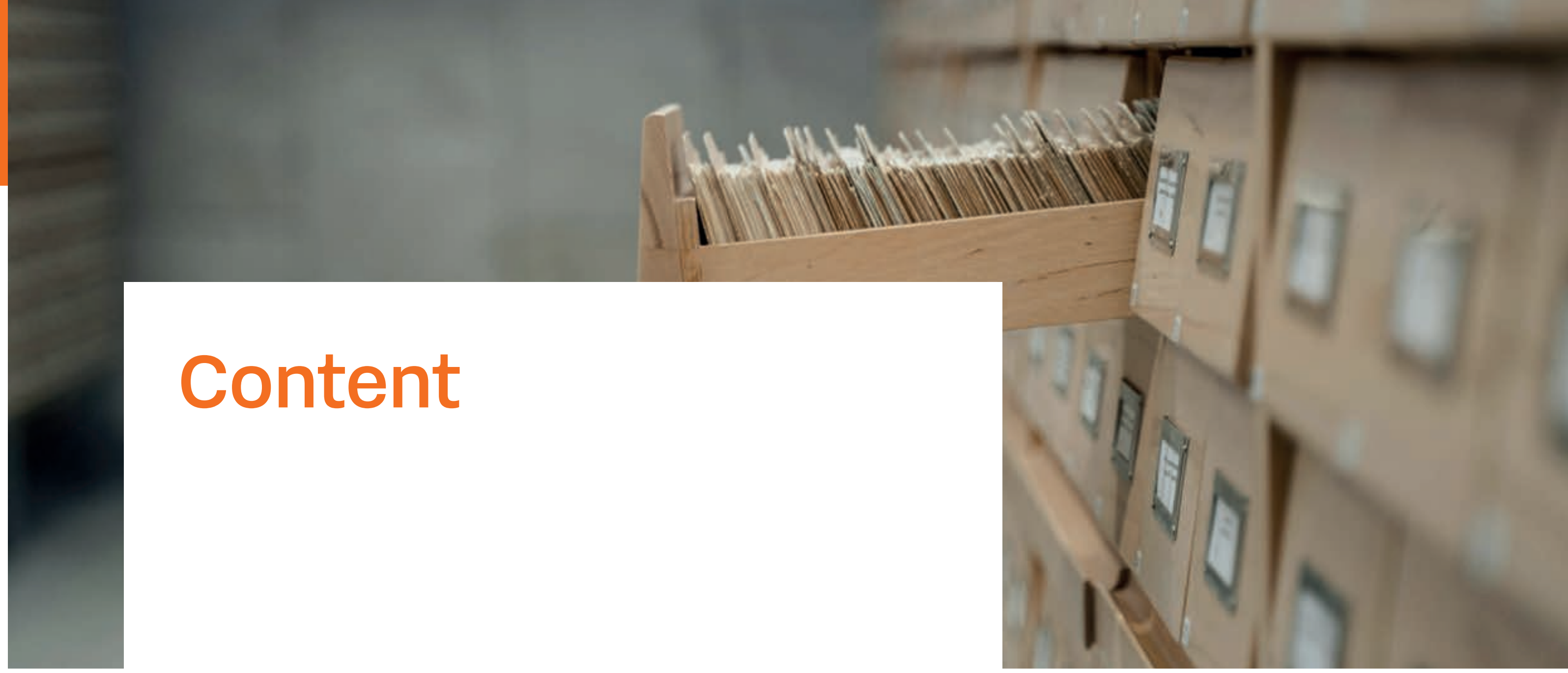
Version May 2026



Content

Introduction

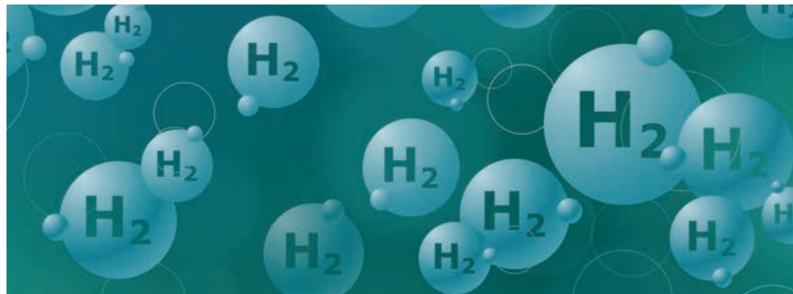
This market scan has been commissioned by the Netherlands Business Support Office (NBSO) Texas, part of the Netherlands Enterprise Agency (RVO). It aims to provide insight into the emerging opportunities within the clean hydrogen economy in the Texas-Louisiana Gulf Coast region, with a focus on strengthening Dutch–American collaboration.

This report builds on a previous market scan that focused primarily on Texas. As the hydrogen landscape continues to evolve, the scope has been expanded to reflect the broader Texas-Louisiana Gulf Coast region. This integrated transatlantic corridor more accurately represents the underlying industrial system, where production, infrastructure, storage, and demand are closely interconnected, linking the unmatched scale of the Gulf Coast powerhouse with the strategic entry points of the Netherlands.

We are mindful that current policy developments in the United States may introduce a degree of short-term uncertainty, with potential implications for the longer-term investment landscape. At the same time, momentum behind the energy transition remains strong. In Texas and Louisiana, this transition is often framed not as a shift away from traditional energy sources, but as one of energy addition, where new, low-carbon solutions are developed alongside a continued role for conventional energy.

The Texas-Louisiana Gulf Coast is uniquely positioned as one of the most competitive regions globally for hydrogen development. The region combines access to low-cost energy, both renewable and conventional, with extensive existing infrastructure, a dense industrial base, and favorable geological conditions for carbon capture and storage as well as large-scale hydrogen storage in salt caverns. Together, these elements support the development of both green and blue hydrogen pathways at scale.

At the same time, the hydrogen sector is entering a more selective phase of development. While interest remains high, the pace of project realization increasingly depends on the alignment of supply, infrastructure, and demand. In particular, the availability of firm, long-term offtake agreements and the evolution of regulatory frameworks will play a defining role in shaping market development.



The joint effort between the Netherlands and Texas was sparked by the visit of Her Majesty Queen Máxima to Texas in late 2022. During this visit, both sides agreed to explore the development of a transatlantic hydrogen corridor linking the Gulf Coast to the Netherlands as a key European entry point. Since then, a range of initiatives has emerged to support this ambition.

While the complementary strengths of both regions are clear, the development of such a corridor will depend on continued progress in areas such as certification, infrastructure development, carrier selection, and market design. Close cooperation between governments, industry, and knowledge institutions will be essential to translate this potential into concrete projects and value chains.

The strong partnerships with stakeholders across Texas and Louisiana, spanning government, industry, and academia, have been instrumental in advancing this effort. We warmly encourage Dutch entrepreneurs, researchers, and policymakers, together with their American counterparts, to explore the opportunities described in this report and to engage with RVO, NBSO Texas, and the broader Dutch diplomatic network in the United States.

We would like to express our sincere appreciation to Serge Ribot, the lead author of this report, for his insightful analysis and dedication in bringing this market scan to completion. We also thank Jörg Gigler for his contributions to the Dutch innovation-focused sections, and Brigitte Wijnbergen for shaping the report into a clear and accessible publication. We are grateful to all partners and contributors in both the Netherlands and the United States who have supported this initiative.

Together, we look forward to continuing the collaboration and advancing the development of a transatlantic hydrogen ecosystem.

Bee Kothuis
Chief Representative and Director of the Netherlands Business Support Office in Houston, Texas

Executive summary

The emergence of a transatlantic clean hydrogen corridor between the Texas-Louisiana Gulf Coast and the Netherlands reflects a broader shift in the global energy system toward large-scale, integrated trade routes linking competitive production regions with industrial demand centers.

The Texas-Louisiana Gulf Coast combines several structural advantages that position it as one of the most competitive hydrogen production regions globally. These include access to low-cost energy (both renewables and natural gas), extensive existing infrastructure, a dense industrial base, and unique geological formations suitable for large-scale carbon storage and hydrogen storage in salt caverns. Together, these elements enable both green and blue hydrogen pathways and support the development of scalable production and export systems.

At the same time, the Netherlands is establishing itself as a key entry point for hydrogen into Europe. Leveraging its ports, logistics capabilities, and emerging hydrogen backbone, it aims to connect international supply with industrial demand across Northwest Europe, including the Delta Rhine Corridor and the German industrial base.

Despite these complementary strengths, the development of a transatlantic hydrogen market remains constrained. While supply-side capabilities are advancing rapidly, demand remains uncertain and highly price-sensitive. Firm, bankable offtake agreements are limited, and this lack of demand visibility has become the primary bottleneck for project realization.

The analysis shows that hydrogen competitiveness will not be determined solely by production cost, but by the ability to operate an integrated system across production, conversion, storage, transport, and end-use. In this context, large-scale storage, particularly in Gulf Coast salt caverns, plays a critical role in enabling reliable, continuous supply by decoupling variable production from steady demand requirements.

A key enabler of future trade lies in the alignment between U.S. and European regulatory frameworks. The carbon intensity tracking required for the U.S. 45V tax credit provides a foundation that can support compliance with European RED III requirements, creating a practical bridge between the two markets.

In parallel, emerging market mechanisms, such as certification systems, pricing indices, and transitional trading models, will be essential to enable early transactions before full physical infrastructure is in place.

The report concludes that the Texas–Louisiana Gulf Coast and the Netherlands form a credible foundation for a large-scale hydrogen corridor. However, its development will depend on the ability to move beyond project announcements and align supply, infrastructure, and demand into coordinated, bankable value chains.

The U.S. Gulf Coast as a leading clean hydrogen hub

The U.S. Gulf Coast is poised to become a leading clean hydrogen hub due to a combination of factors:

Existing infrastructure
Texas and Louisiana have a robust energy infrastructure, including pipelines, ports, and a skilled workforce, which can be leveraged for clean hydrogen production, transportation, and export.

Abundant resources
Both states, especially Texas, have vast wind and solar potential for green hydrogen production, as well as abundant natural gas and depleted oil fields suitable for blue hydrogen production and carbon sequestration.

Favorable geology
The Gulf Coast's unique salt caverns offer significant underground hydrogen storage capacity.

Cost competitiveness
Despite the phasing out of current IRA incentives, the current low production costs make the Gulf Coast a highly competitive location for clean hydrogen production.

Supportive policies
Government initiatives like the H_2Hubs program and the National Clean Hydrogen Strategy and Roadmap are supporting the development of the clean hydrogen industry in the Gulf Coast.

Moreover, the success factors that underpinned the century-long success in the traditional oil & gas on the Gulf Coast will ensure its prominence in the Energy transition:

Success Factor	Traditional Oil & Gas	Renewables & Low Carbon Energy	Opportunities/Threats
Land Ownership	Shale growth independent of government	TX/LA produces large amounts of renewable power on private land	Large-scale solar, wind, and hydrogen projects offer potential due to abundant land availability, but face challenges like land-use conflicts and environmental impact assessments.
Innovation	Fracking and Oil Recovery	Carbon Sequestration and Blue Energy	Hydrogen exports, particularly via ammonia, present a significant opportunity. However, H_2 transportation and storage infrastructure needs development.
Regulatory & Incentives	MLPs drove large midstream infrastructure investment	Strong local support & Hydrogen Hubs	Combined US, EU, and Japanese incentives, including tax credits and subsidies, can accelerate clean energy adoption. However, policy changes and regulatory uncertainty pose risks as seen with IRA.
Economies of Scale	LNG exports, Henry Hub, Mont Belvieu	Hydrogen pipelines, CCS and salt dome storage	Expanding renewable energy infrastructure to meet growing demand in key areas presents a major opportunity. This requires strategic planning and overcoming logistical challenges.
Access to Capital Markets	Private equity teams, MLP, E&P structure	Private and governmental capital strength combined	While access to capital is readily available, long project timelines in clean energy may exceed typical investment horizons, potentially hindering project development.
Geographical Advantages	Land availability, Oil fields, Salt formations. Access to seaports	Wind and solar patterns, density, and overlap	Underground hydrogen storage offers a promising solution for managing seasonal variations in clean energy production. However, geological suitability and potential environmental impacts need careful consideration.

Unique window of opportunity

While many aspects of the hydrogen value chain are already well-established, with both the Gulf Coast and the Netherlands enjoying decades of experience in areas such as natural gas production and transportation, the burgeoning field of clean hydrogen presents a unique set of opportunities. In this nascent market, technologies and processes are still emerging, creating a dynamic landscape ripe for innovation and competition. This presents a significant opportunity for new entrants, particularly those with specialized expertise and a drive to shape the future of the hydrogen economy.

Technology	GC experience	NL experience
Windpower	Established	Established
Sun power	Established	Established
Large scale batteries	Established	Established
Electrolysis	Established	Established
Electrolysis at scale	Emerging	Emerging
Desalination	Emerging	Established
H_2 pipeline	Established	Established
Pipeline conversion to H_2	Emerging	Established
CCS	EOR mostly	Emerging
Salt cavern H_2 storage	Emerging	Emerging
H_2 liquefaction (large-scale / export)	Emerging	Emerging
H_2 refueling retail infrastructure (mobility)	Ermerging	Established
NH_3 storage	Established	Established
NH_3 transport	Established	Established
NH_3 shipping	Established	Established
NH_3 cracking	Emerging	Emerging
Other H_2 carriers	Emerging	Emerging
H_2 turbine	Emerging	Emerging
Conversion of gas turbine for H_2 blend	Emerging	Pilots
Green resource certification	Ermerging	Established
Critical materials (rare earths & metals)	Emerging	Emerging

Recommendations for Dutch SMEs

1. **Local Presence and Networking:**
Establish a physical presence or partner with local entities to foster trust and navigate the relationship-centric U.S. Gulf Coast markets. Actively participate in industry events and conferences to connect with potential clients and partners.

2. **Strategic Partnerships:**
Forge alliances with established players in the Gulf Coast hydrogen ecosystem, including companies, research institutions, think thanks, and government agencies, to leverage their expertise and networks.

3. **Tailored Solutions:**
Adapt products and services to meet the specific needs and expectations of the Gulf Coast markets, emphasizing niche expertise and value-added solutions. Highlight the economic benefits and job creation potential of your technologies.

4. **Market Knowledge:**
Stay informed about the latest developments, policy changes, and funding opportunities in the Gulf Coast hydrogen sector. Engage with industry associations and utilize online resources to gather market intelligence.

5. **Flexibility and Adaptability:**
Be prepared to adjust your business strategies and offerings as the Gulf Coast hydrogen market matures and new technologies emerge. Embrace the state's openness to transitional solutions while maintaining a focus on long-term sustainability goals.

By understanding the U.S. Gulf Coast context and embracing a proactive approach, Dutch SMEs can successfully capitalize on the opportunities presented by the nascent clean hydrogen market and contribute to the global transition towards a sustainable energy future.

1. The nascent clean hydrogen economy

The global pursuit of a clean energy future has intensified significantly in recent years, fueled by a growing awareness of the urgent need to combat climate change. The landmark Paris Agreement, adopted at COP21 in 2015, solidified international commitment to limit global warming to well below 2 degrees Celsius above pre-industrial levels, with efforts to limit the increase to 1.5 degrees. This ambitious goal has spurred nations and regions to develop concrete strategies for decarbonizing their economies.

The European Union, with its ambitious Green Deal, has emerged as a leader in this transition. Central to this plan is the target of achieving climate neutrality by 2050, effectively reducing greenhouse gas emissions to net-zero. However, recognizing the urgency of the climate crisis, the EU has also set ambitious interim goals, including the "Fit for 55" package, which aims to reduce emissions by at least 55% by 2030 compared to 1990 levels. These targets have far-reaching implications, requiring a fundamental shift in how we produce and consume energy. The EU's regulatory framework will require private companies to comply with these targets, ensuring a collective effort towards decarbonization.

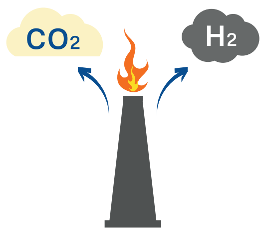
Hydrogen, the most abundant element in the universe.

Clean hydrogen, produced from low carbon energy sources, has emerged as a key enabler of this transition. Its versatility allows it to decarbonize sectors that are difficult to electrify, such as heavy industry, long-haul transportation, and seasonal energy storage. The EU's hydrogen strategy, with its focus on scaling up production and infrastructure, highlights the crucial role this technology will play in achieving the 2030 and 2050 climate targets.

Hydrogen, the most abundant element in the universe, holds immense promise as a clean energy carrier. When used as a fuel, hydrogen produces only water vapor as a byproduct, making it a compelling alternative to fossil fuels in the fight against climate change. However, not all hydrogen is created equal. It is often categorized by "color" based on its production method, which has implications for its environmental impact.

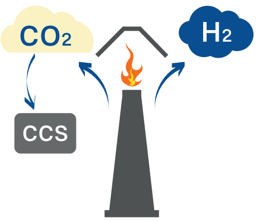
The "colors" of hydrogen

While carbon intensity is gaining traction as a way to classify hydrogen production, the color terminology remains widespread in many business settings. See IEA.org for more information.



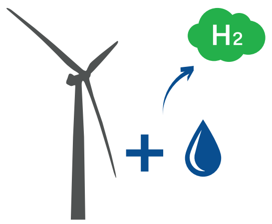
from natural gas

Gray hydrogen
the most common type today, is produced from natural gas mostly through steam methane reforming (SMR), a process that releases significant carbon dioxide.



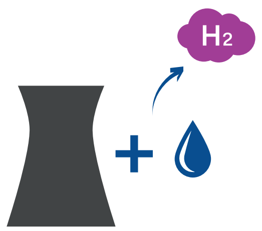
from natural gas with carbon capture and storage

Blue hydrogen
also uses natural gas but incorporates carbon capture and storage (CCS) technology to reduce emissions, with little to no emission of CO_2.



from water using zero-carbon electricity

Green hydrogen
the holy grail of the hydrogen economy, is produced through electrolysis using renewable energy sources like wind and solar power, resulting in virtually no greenhouse gas emissions.

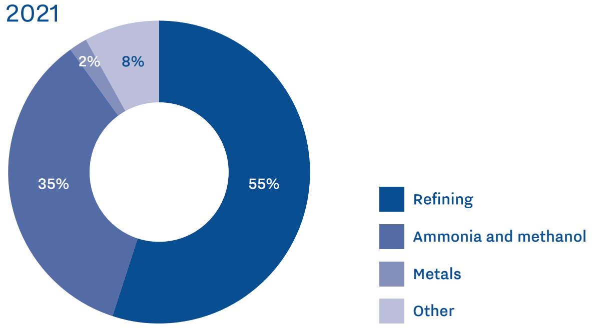


from water using electricity by nuclear power

Pink hydrogen
is produced via electrolysis using electricity generated from nuclear power plants. This process involves using nuclear reactors to generate electricity, which then powers the electrolyzers to split water into hydrogen and oxygen. While nuclear energy is a low-carbon source of electricity, it is not renewable due to the finite nature of uranium resources and the challenges associated with nuclear waste disposal. However, pink hydrogen offers a potential pathway to decarbonize hydrogen production using an established and reliable baseload power source.

Current use and future demand

Hydrogen consumption in the U.S. by end use
2021



Source: U.S. National Clean Hydrogen Strategy and Roadmap

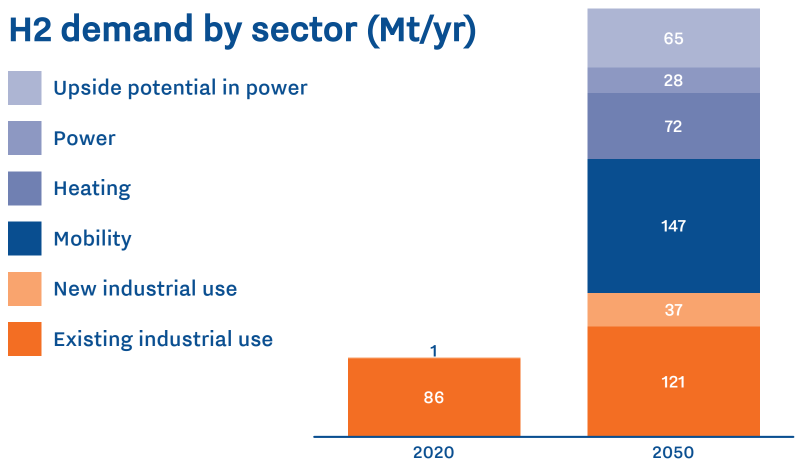
Currently, hydrogen is primarily used in industrial processes, such as refining petroleum and producing ammonia for fertilizers.[1] However, its potential applications are vast and expanding rapidly.

In the future, hydrogen could fuel cars, trucks, and trains, power homes and businesses, and even provide energy storage for the electricity grid. It could decarbonize heavy industries like steel and cement production, and even play a role in aviation and shipping.

Nearly all of the 95-100 million tons of hydrogen consumed per year today is gray hydrogen. As per McKinsey's *2023 Global Energy Perspective: Hydrogen Outlook*, an analysis projects a structural shift toward low-emissions hydrogen over the coming decades. Clean hydrogen demand was expected to reach approximately 270 million tons per annum under a "Current Trajectory" scenario, with a range spanning from around 130 million tons in a "Fading Momentum" case to nearly 600 million tons in a "Net Zero" scenario.

However, more recent market evidence suggests that the timing of this transition is proving slower and more uneven than initially anticipated. While the long-term demand potential remains broadly intact, near-term deployment is constrained by costs, infrastructure availability, and regulatory uncertainty.

A more realistic pathway today would resemble the "Further Acceleration" scenario in terms of ultimate



Source: Data from McKinsey's Global Energy Perspective 2023 - Hydrogen Outlook

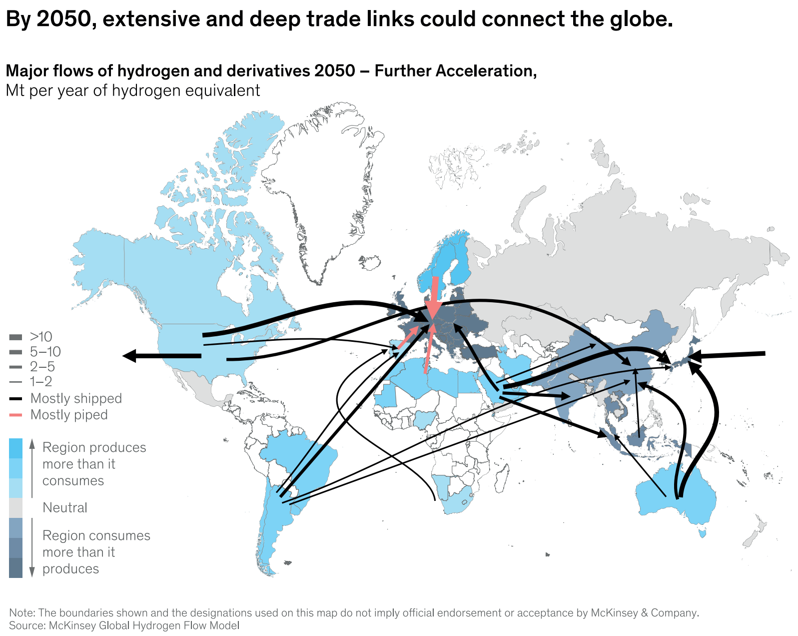
1. U.S. National Clean Hydrogen Strategy and Roadmap, page 16

scale, but with a delayed ramp-up. In this scenario, clean hydrogen demand could reach around 400 million tons per annum, with potential upside toward 450 million tons if hydrogen gains traction in power generation and other new end uses.

In practice, current developments indicate that most growth in the 2020s will remain concentrated in traditional hydrogen applications, with large-scale adoption in new sectors likely shifting toward the 2030s and beyond.

Infrastructure needs

To support this immense growth, massive investment in infrastructure will be needed. And just as the world currently relies on intricate networks of pipelines and tanker routes to transport oil from oil-rich regions to energy-hungry industrial centers, clean hydrogen cannot often be produced where it is needed the most. Regions blessed with abundant sunshine or consistent winds will become the “Saudi Arabias of clean energy”, generating vast quantities of green hydrogen through electrolysis powered by renewable sources. Similarly, regions blessed with abundant natural gas and options for carbon storage will generate vast quantities of blue hydrogen. This clean hydrogen can then be transported via pipelines, tankers, or even converted into ammonia for ease of shipping, to fuel industrial hubs with high energy demands but limited low carbon resources.

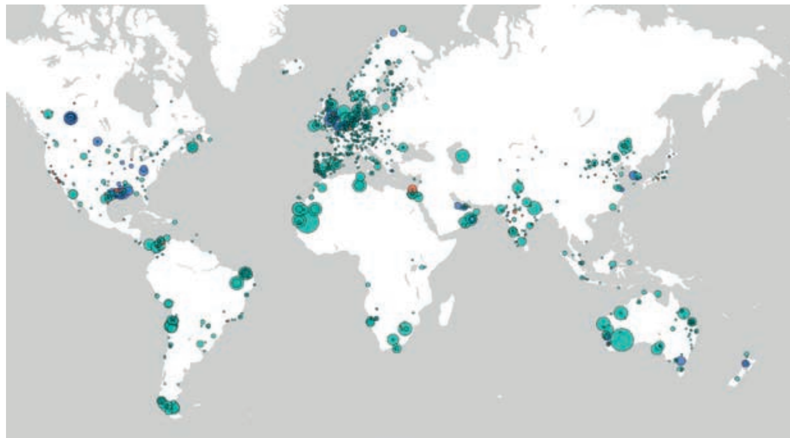


Source: McKinsey Global Energy Perspective 2023: Hydrogen Outlook

Production hubs

Worldwide, there are currently almost 2,600 projects (from concept phase all the way to FID and under construction) aiming at producing 220 million tons of clean hydrogen (183 MTPA by 2030) as per the late 2025 updated of the IEA database. The map of these projects clearly highlights these future production hubs which are not necessarily the same as the current, energy-hungry industrial hubs, e.g. the wind-rich Canadian northeast, the North Sea, Patagonia, the sun-basked Iberic and Arabic peninsulae, Western Australia, South Africa, etc. The Gulf Coast stands out as it possesses both huge solar and wind potential for green hydrogen production, and ample natural gas production coupled with numerous abandoned oil wells for carbon sequestration for blue hydrogen production. As we will see later, it also has salt formations which lend themselves very well for large volumes of underground hydrogen storage.

Almost 2,600 projects are aiming at producing 220 million tons of clean hydrogen by 2030.



Source: IEA database, hydrogen tracker

Transport challenges

Transporting hydrogen presents unique challenges due to its low energy density by volume and its propensity to potentially leak. However, those issues are well understood and have been addressed by the industry in various processes such as that for ammonia, methanol and refinery hydrogenation that require hydrogen supplies under high pressure. Pipelines are suitable for shorter and longer cross-continental distances, i.e. in the range of 500 to 2,000 km. Since hydrogen, even at high pressures, has very low density and viscosity, the pressure drop in hydrogen pipelines is low, and they can be effectively designed as buffer storage to even out intermittent supply from renewable energy resources and continuous demand.

Liquid hydrogen and hydrogen carriers

Although there have been pilot projects using liquid hydrogen for long-distance transport, significant challenges remain. As a result, it is primarily used for immediate consumption, storage, and short-distance distribution. Ongoing research is focusing on converting hydrogen into denser, more transportable forms: hydrogen carriers. While additional options are likely to emerge over time, ammonia (NH_3) currently stands out as a leading hydrogen carrier, offering several advantages. It can be liquefied at much higher temperatures than hydrogen, simplifying storage and transport. There is already an abundant existing infrastructure for ammonia, widely used in the fertilizer industry, but converting hydrogen to and from ammonia is energy-intensive and can generate polluting emissions if not powered by renewable sources.

This has spurred interest in other hydrogen carriers, particularly Liquid Organic Hydrogen Carriers (LOHCs). These organic compounds can absorb and release hydrogen under specific temperature and pressure conditions. LOHCs offer the advantage of being handled using existing infrastructure for liquid fuels, simplifying logistics and storage. However, unlike ammonia, LOHC technology is still in its early stages of development, with ongoing work to improve efficiency and reduce the energy penalty associated with hydrogenation and dehydrogenation. Recent developments illustrate growing momentum: in the Port of Amsterdam, an LOHC-based import corridor is being developed through collaboration between Evos, Hydrogenious, and North Atlantic, linking hydrogenation capacity in Canada with a planned dehydrogenation facility in the Netherlands.

Shipping ammonia has its challenges due to its toxicity and corrosiveness, requiring specialized handling, storage, and transport to ensure safety. Maintaining temperature and pressure during transport is crucial to prevent leaks and spills, which can release harmful ammonia gas. Additionally, the need to “crack” ammonia upon arrival to extract hydrogen adds complexity. While the Dutch energy storage provider VTTI is developing ammonia cracking facilities in the Port of Rotterdam, the Japanese utility company JERA is currently experimenting with using ammonia as a fuel in power plants, specifically by “co-firing” it with coal in existing coal-fired power plants.

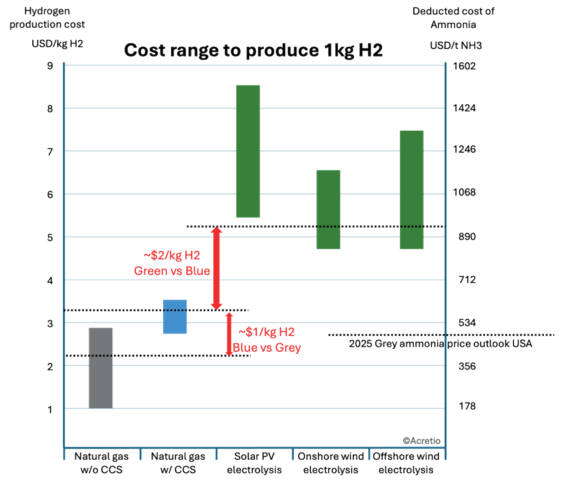
In parallel, liquid hydrogen (LH_2) continues to be explored as a complementary pathway, particularly for high-purity hydrogen delivery. While technically challenging due to cryogenic requirements and high energy consumption for liquefaction, LH_2 enables direct use without chemical conversion. Projects such as the EcoLog Terminal Amsterdam, expected to be operational around 2030 with an initial capacity of approximately 200,000 tons per year, aim to provide flexible distribution via pipeline, barge, rail, and truck across the Netherlands and Germany.

The choice of hydrogen carrier will depend on various factors, including distance, existing infrastructure, cost, and environmental impact. As the hydrogen economy matures, a diversified approach with multiple carriers is likely to emerge to meet the needs of a global energy system. We expect ammonia to remain a key vector for long-distance transport and international trade, while LOHC and LH_2 solutions may develop in parallel for more specialized applications.

Carrier	Key advantage	Key drawback	Conversion energy loss	Best use case
Ammonia (NH_3)	Mature infra-structure, lower cost at scale	Cracking losses, toxicity and corrosion	~25–40% (full cycle)	Bulk trade, power, shipping
LOHC	Uses existing fuel infrastructure, easier handling, stored as a liquid at ambient conditions	Energy losses both ways (hydrogenation for export and dehydrogenation for import), carrier liquid must be recycled	~30–45% (full cycle)	Flexible logistics, distributed supply
LH_2	High purity, no reconversion needed	Liquefaction energy, requires -253°C cryogenic temperature, boil-off losses during transportation/ storage, expensive materials and insulation	~25–35%	Mobility, high-value industrial uses

Costs challenges

One of the biggest hurdles facing the clean hydrogen economy is the challenge of cost competitiveness. Currently, there's a significant mismatch between the price of widely-available gray hydrogen, produced from fossil fuels, and the cost of producing clean hydrogen. Gray hydrogen, benefiting from mature technology and existing infrastructure, typically costs around $1-2+ per kilogram. In contrast, green hydrogen production costs are currently much higher, ranging from $4-8+, even up to $12+, per kilogram, depending on factors like electricity prices and electrolyzer efficiency. Blue hydrogen lies in the middle. This price gap presents a major obstacle to the widespread adoption of clean hydrogen. To compete with established fossil fuels and gray hydrogen, the cost of clean hydrogen production must decrease significantly. This requires advancements in electrolyzer technology, increased economies of scale, and access to low-cost renewable electricity. Bridging this cost gap is crucial for unlocking the full potential of clean hydrogen and accelerating the transition to a sustainable energy future.



Source: Acretio internal analysis

To compete with grey hydrogen, the cost of clean hydrogen must decrease.

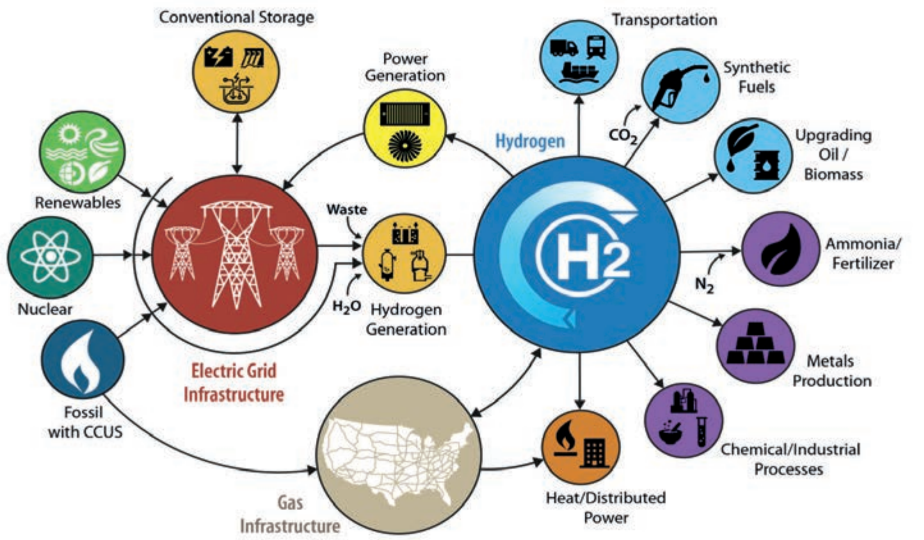
Governments are starting to put in place incentives (see paragraph 2.1 below for more insight on incentives), loan guarantees, funding mechanisms, but without commitments (offtake agreements), projects struggle to get to Final Investment Decision (FID). Also, the significant amount of energy loss along the end-to-end value chain, with estimates ranging from around 30% to as high as 70% of the original energy input, depending on the production, liquefaction, transportation and reconversion processes involved, will remain controversial.

2. USA as emerging clean hydrogen power

2.1 Governmental strategy

The U.S. has shown interest in hydrogen as an energy carrier for decades, with initial research and development efforts focused on its potential for transportation and energy storage. Already under the Bush Administration the Hydrogen Fuel Initiative was launched in 2003 aiming at accelerating the development and deployment of hydrogen technologies.

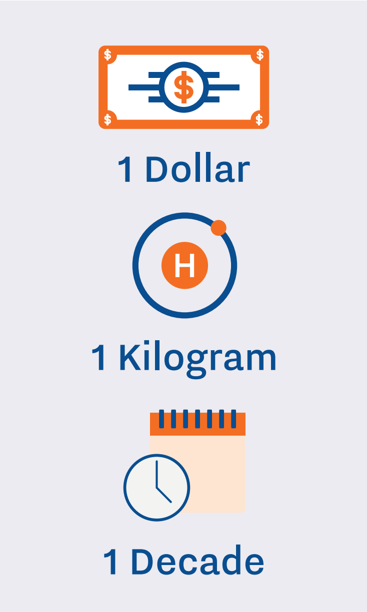
The focus shifted towards clean hydrogen production under the Obama Administration with investments in research and development of renewable hydrogen production methods like electrolysis. During the first Trump administration the Department of Energy (DoE) continued to fund research and development efforts and created in 2017 the H2@Scale initiative "bringing together stakeholders to advance affordable hydrogen production, transport, storage, and utilization to enable decarbonization and revenue opportunities across multiple sectors".[3] A multi-industry, end-to-end supply chain vision started to take shape:



Source: The H2@Scale concept

[3] H2@Scale

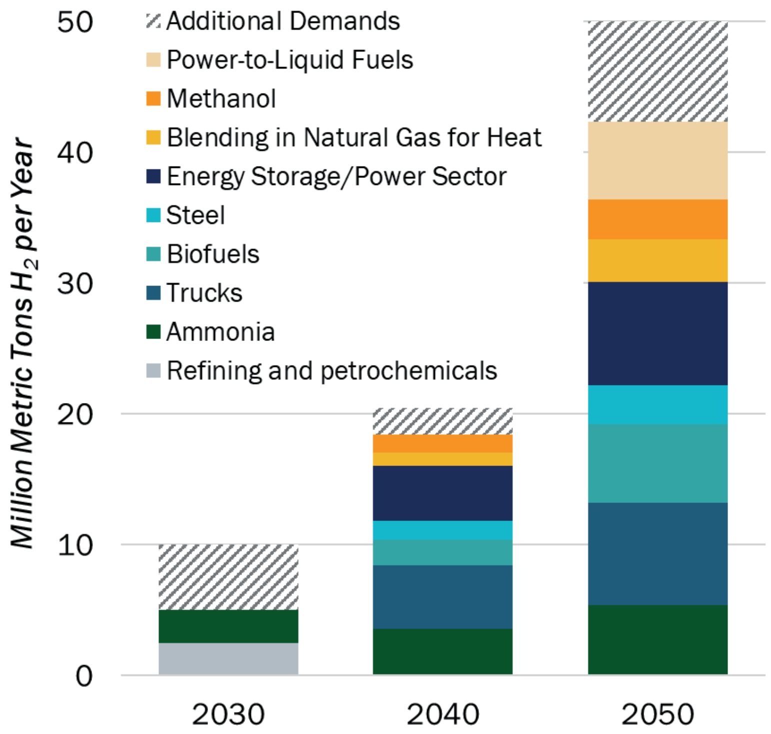
Hydrogen strategies



But it is under the Biden Administration that a strong focus on clean hydrogen emerged, with significant policy support and funding allocated through the 2021 Bipartisan Infrastructure Law (BIL) and the 2022 Inflation Reduction Act (IRA).

In 2021, the DoE launched an initiative dubbed "the Hydrogen Shot" (emulating the ambitions of the 1962 Moon Shot) that set the ambitious goal of reducing the cost of clean hydrogen to $1 per kilogram within one decade (the so-called "1-1-1" goal). This cost target aims to make clean hydrogen competitive with fossil fuels and drive widespread adoption, as the current cost of grey hydrogen is about $1/kg.

Then in 2023, the "National Clean Hydrogen Strategy and Roadmap" was released by the DoE and outlines a comprehensive approach to accelerate the development and deployment of clean hydrogen across various sectors of the economy. It sets a strategic goal of 10 million tons clean hydrogen production by 2030, 20 million tons by 2040 and 50 million tons by 2050. Focusing on reducing production costs, it includes the development of regional hydrogen hubs (see below section 2.2) and tries to address infrastructure needs. The Inflation Reduction Act (IRA) of 2022 established a landmark framework of performance-based tax incentives designed to accelerate the decarbonization of the U.S. industrial and energy sectors by rewarding the domestic production of clean power, fuels, and carbon-reduction



Source: *National Clean Hydrogen Strategy and Roadmap*

technologies. Its main supporting policy involves a targeted suite of credits subsequently refined and reinstated under a condensed timeline by the One Big Beautiful Bill Act (OBBBA) in July 2025, especially 45Q (credit for CO_2 sequestration), 45 and 45Y (clean electricity production credit), 45V (clean hydrogen production credit) and 45Z (Clean fuel production credit). See below for more details on 45Q and 45V.

While the OBBBA accelerated the phaseout of several IRA provisions, it specifically reconfirmed the 45V clean hydrogen production credit on a significantly condensed window; facilities must now commence construction by December 31, 2027, to qualify for the full 10-year credit window, a five-year acceleration from the original IRA deadline. Conversely, the 45Q carbon capture credit was strengthened by providing parity in credit rates, $85 per metric ton, for all capture processes, including carbon utilization and Enhanced Oil Recovery (EOR). Furthermore, 45Z clean fuel production credit was extended through December 31, 2029, though it introduced strict new requirements that feedstocks be derived exclusively from the U.S., Mexico, or Canada. Finally, while initial policy shifts in late 2025 created severe uncertainty for federal infrastructure, the consolidated appropriations bill (H.R. 6938) signed in January 2026 officially safeguarded federal capital for the Regional Clean Hydrogen Hubs program.

45V: Clean hydrogen

45V specifically focuses on clean hydrogen production, offering a tiered tax credit based on the lifecycle greenhouse gas emissions intensity of the process. The cleaner the hydrogen production, the higher the credit, reaching a maximum of $3 per kilogram for hydrogen produced with near-zero emissions. To qualify for the highest credit tier, producers need to meet stringent criteria based on these three key pillars AND begin facility construction by December 31, 2027:

1. Additionality

This pillar ensures that the clean electricity used for hydrogen production is truly new and wouldn't have been generated otherwise. This prevents producers from simply using existing renewable energy sources and claiming the credit, which wouldn't result in any additional decarbonization. Essentially, it incentivizes investment in additional clean energy capacity specifically for clean hydrogen production. This could involve building new solar or wind farms, or expanding existing ones to meet the demand from electrolyzers. It also includes nuclear power under some circumstances or power from gas- or coal-fired plants where the facility has added carbon capture and sequestration (CCS).

2. Hourly matching

This pillar requires producers to match their hydrogen production with the actual hourly generation profile of the renewable energy source. This ensures that the clean electricity used to produce hydrogen is consumed when it is generated, maximizing the use of renewable resources and minimizing reliance on grid electricity with higher emissions. This encourages the use of electrolyzers that can operate flexibly (i.e. load following), responding to the variability of renewable energy generation.

3. Deliverability

This pillar mandates that the clean electricity used to produce hydrogen must come from the same geographic region as the production facility. This ensures that the benefits of clean energy development, such as job creation and grid improvements, are realized in the same region where the hydrogen is produced. It also reduces transmission losses and promotes regional energy independence.

	Carbon Capture (CCS)	H_2 Production
Incentive	45Q	45V
Value	\$85/ton CO_2 captured	\$3/kg H_2
Value translated for H_2	\$0.88/kg H_2	\$3/kg H_2
Value translated for NH_3	\$156/ton	\$534/ton
Most applicable to	Blue Hydrogen	Green Hydrogen
	45Q and 45V cannot be combined but they can be transfered	

45Q: carbon capture

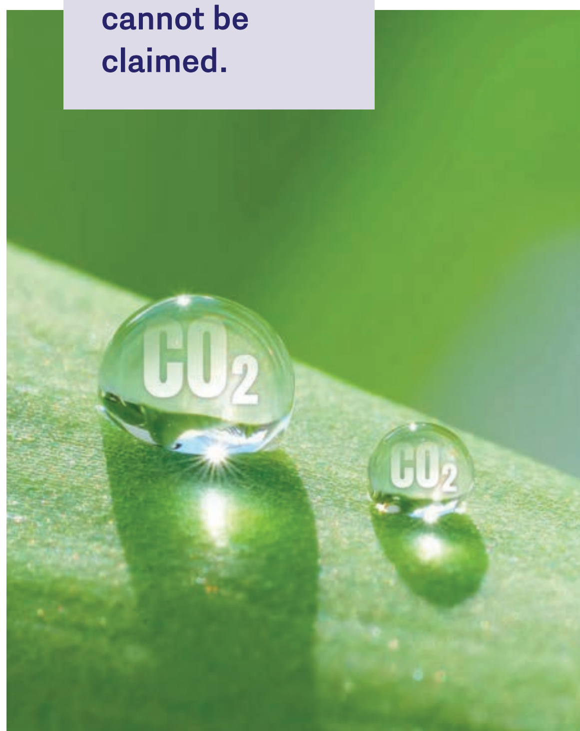
45Q, on the other hand, centers on carbon capture and sequestration (CCS). It provides a tax credit for capturing carbon dioxide from industrial sources and storing it securely, either underground or through utilization in certain products. A fundamental change introduced by the OBBBA in July 2025 is the establishment of credit rate parity for projects placed in service after July 4, 2025. This eliminates the previous differentiated tiers, providing a uniform incentive regardless of whether the carbon is permanently sequestered in saline aquifers or utilized for secondary products and Enhanced Oil Recovery (EOR).

The finalized parity rates are $85/ton for carbon captured from industrial and power facilities and $180/ton for carbon captured via Direct Air Capture (DAC). While the OBBBA introduced new compliance restrictions regarding Foreign Entities of Concern (FEOC), it uniquely preserved the original 2032 construction deadline for 45Q, making it one of the few clean energy credits not subject to an accelerated phaseout.

A choice must be made between 45V and 45Q - both cannot be claimed.

A key distinction is that facilities producing hydrogen with CCS must choose between 45V and 45Q – they cannot claim both. This encourages careful evaluation of the project's emissions profile and the economics of each credit.

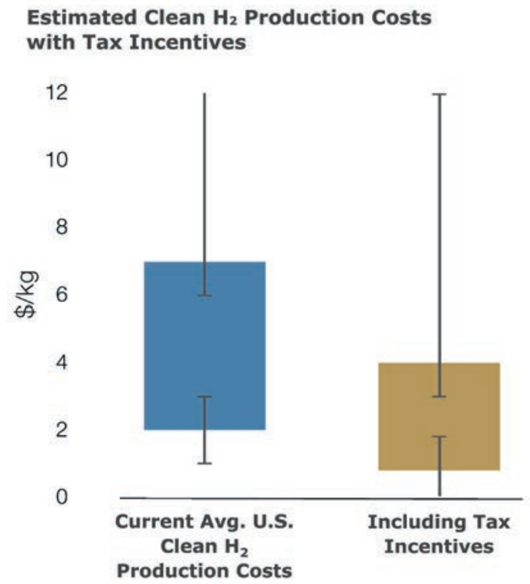
Essentially, 45V rewards the production of green hydrogen, while 45Q rewards the production of blue hydrogen through the incentivization of the capture and storage of carbon emissions. But we expect some producers of blue hydrogen to claim under 45V if they can successfully measure, and prove using the finalized 45V GREET model, a much higher lifecycle Greenhouse Gas (GHG) emission capture (from gas production wells to the methane steam reformer process) than generally modelled until now.



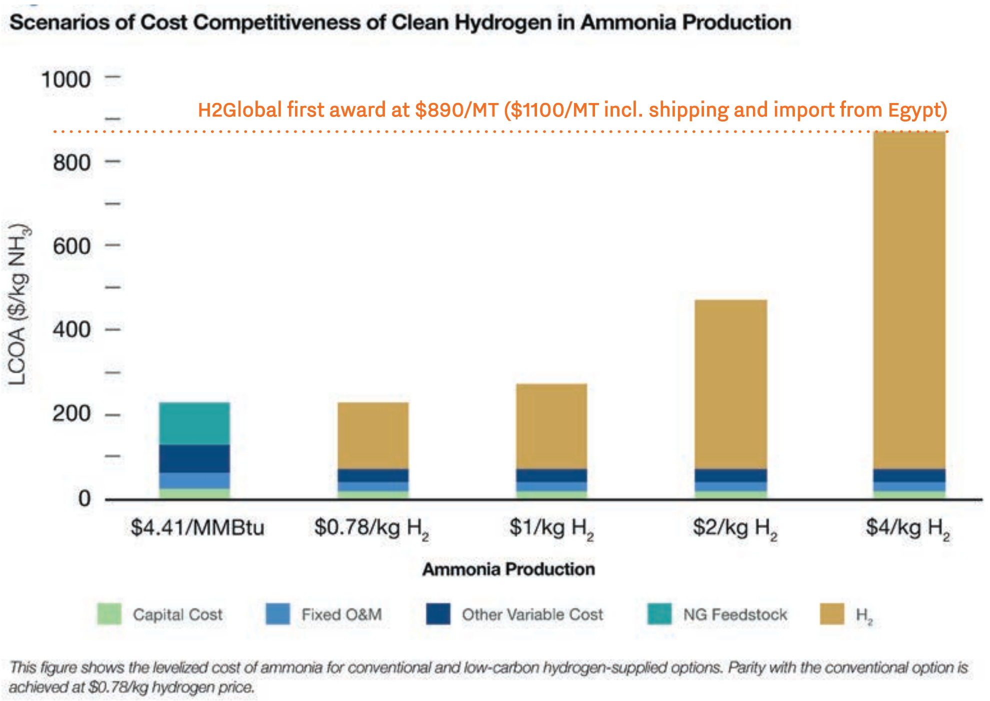
Tax credit impact

These tax credits play a huge role in decreasing the cost of producing clean hydrogen in the short-term. They are designed to act as catalyst to jumpstart the clean hydrogen and carbon capture industries, driving down costs in the long run after the credits expire through economies of scale, technology advancement, market growth and infrastructure.

With these tax incentives, the production cost of clean hydrogen goes from a current estimated range of \$2-\$7/kg H_2 down to \$1-\$4/kg H_2. This translates to a LCOA (levelized cost of Ammonia) of \$500-\$900/ton NH_3, which puts U.S. production cost near the \$350-\$550/ton range within which grey ammonia has fluctuated in the last 2 years if we exclude the spike of the 2021-2022 period. It is to be noted that due to the very early stage of green hydrogen production, there is a wide range of production cost estimates depending on the source.



Source: Energy Futures Initiative. "U.S. Hydrogen Demand Action Plan," February 2023



LCOA: Levelized cost of Ammonia

Source: Energy Futures Initiative. "U.S. Hydrogen Demand Action Plan," February 2023

2.2 The hydrogen hubs

The Regional Clean Hydrogen Hubs (H_2Hubs) program was established as a cornerstone of federal energy policy under the 2021 Bipartisan Infrastructure Law (BIL), which allocated \$8 bln to create a national network of hydrogen producers and consumers. In 2023, the Department of Energy selected seven regional hubs, including the HyVelocity Hub on the Gulf Coast, to receive \$7 bln in catalytic funding.

While these hubs provided an initial framework for structuring hydrogen development around industrial clusters, the market is increasingly transitioning toward a more investment-driven model. In practice, project development and final investment decisions are now primarily shaped by federal tax incentives, notably the Clean Hydrogen Production Tax Credit (45V), rather than by hub-specific grant structures.

As a result, developers and investors are increasingly decoupling project timelines from federal grant programs and focusing instead on compliance with the stringent requirements of the 45V tax credit (additionality, regional deliverability, and hourly matching). These criteria are now central to project design, influencing location, power sourcing, and overall economics. This shift reflects a broader transition from a grant-supported model toward a market-driven approach, where bankability is determined by the ability to secure tax credits and demonstrate competitive carbon intensity.

This evolution also highlights the growing importance of carbon intensity as the primary metric guiding investment decisions. Projects along the U.S. Gulf Coast are increasingly optimized to qualify for the highest tiers of the 45V credit, which can reach up to \$3 per kilogram of hydrogen produced. While designed as a technology-neutral incentive, 45V was initially seen as more applicable to green hydrogen, given the difficulty for blue hydrogen projects to meet its stringent carbon intensity requirements. Increasingly, however, blue hydrogen developers are seeking to optimize project design to meet these thresholds, opting for 45V eligibility over reliance on the 45Q carbon capture credit, given its higher potential value but more stringent requirements.

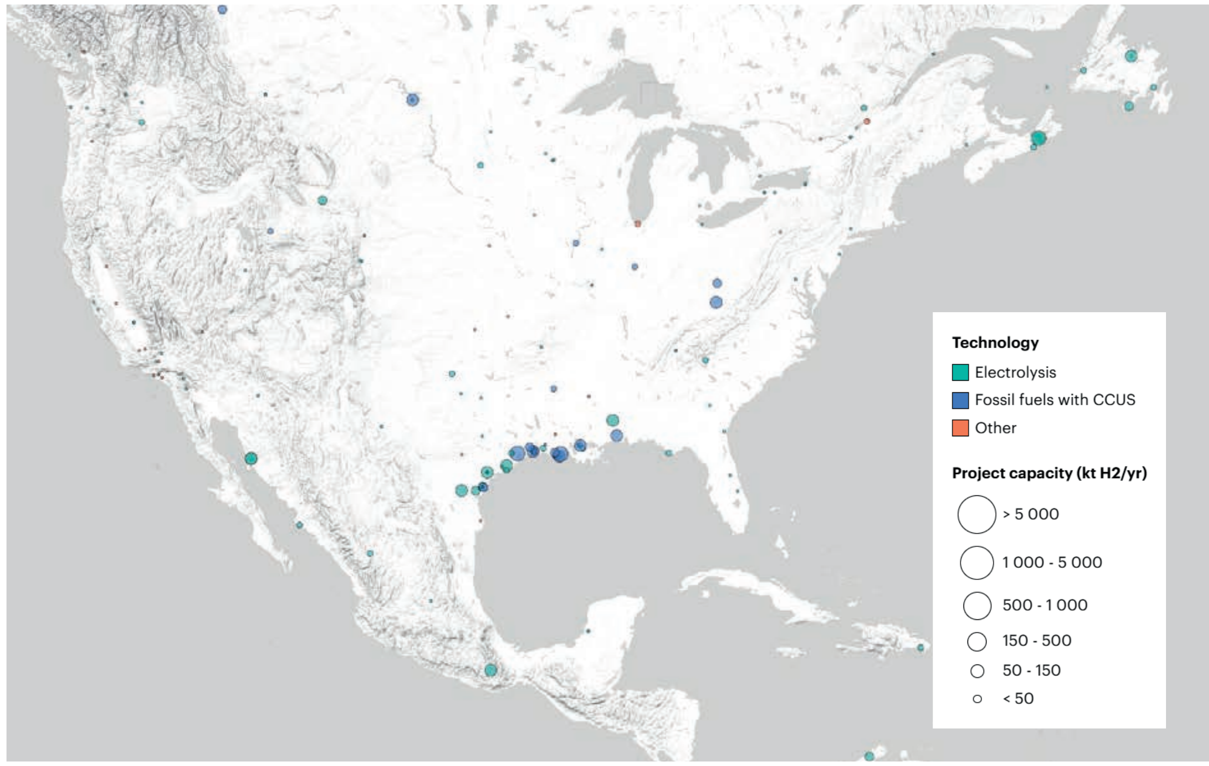
Also, the reality of the hydrogen market in 2025-2026 has diverged from initial expectations as major industry players recalibrate their portfolios in response to shifting demand and regulatory clarity. In late 2025, ExxonMobil officially paused its $7 billion blue hydrogen facility in Baytown, Texas, originally slated to be the world's largest. Air Products cancelled all of its major clean hydrogen projects in the U.S. to focus corporate resources on the NEOM Green Hydrogen Complex in Saudi Arabia.

Conversely, Chevron has doubled down on the Texas Gulf Coast, announcing its $5 bln "Project Labrador" in Port Arthur. This massive blue hydrogen and ammonia facility targets a production capacity of 2,000 tons per day and is positioned as a cornerstone of the HyVelocity Hub. Despite a period of severe policy uncertainty in late 2025, the legal framework for the hubs was safeguarded in January 2026 as mentioned earlier. This legislative stability, combined with mega-investments like Project Labrador, ensures that while the specific players have changed, the Gulf Coast remains the center of gravity for the U.S. hydrogen buildout.

2.3 Projected clean H_2 production

The IEA lists about 195 clean H_2 projects in the United States (as of the September 2025 update), with the vast majority of large projects situated on the Gulf Coast. Should all these projects reach FID and become operational, they would add 18 million tons production of clean H_2 by 2030 (vs. the original 10 million target set by the DoE).

However, when taking into account recent announcements or the lack of published progress, this number realistically drops to a range of 3 to 8 million tons.



Source: IEA Hydrogen Tracker, interactive map

The top projects above 200k tons/year accounting for more than 53% of the potential additional capacity are almost all in early stage, only 1 had reached FID by end 2025.

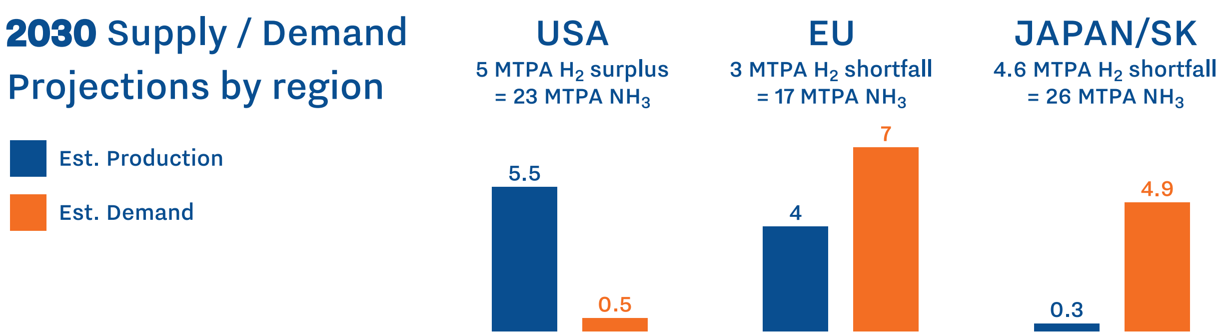
Status	Project name	Location	Date online	Technology	Product	Announced size	Capacity kt H_2/y
FID / Construction	CF Industries, JERA and Mitsui Blue Point Ammonia Complex (LA)	Louisiana	2029	NG w CCUS	Ammonia	1-1.4Mt NH_3/y	252
Feasibility study	Ascension Clean Energy (ACE) complex (LA), phase 2	USA		NG w CCUS	Ammonia	11.3Mt CO_2/y - 7.2Mt NH_3/y	864
	Eastern Louisiana Clean Hydrogen Complex (LA)	USA	2029	NG w CCUS	H_2	5Mt CO_2/y - 750 miln scid	690
	Ascension Clean Energy (ACE) complex (LA), phase 1	USA	2029	NG w CCUS	Ammonia	3.8Mt CO_2/y - 2.4Mt NH_3/y	432
	Data City (was Hydrogen City)	USA	2030	Other Electrolysis	H_2	2GW	347
	HIF Matagorda	USA	2029	PEM	MeOH	1.8GW	270
	Sustainable Fuels Group - CIP Carbon reduced Ammonia plant St Roze (LA)	USA	2027	NG w CCUS	Ammonia	4kt NH_3/d (production)	263
	Project Labrador	USA	2032	NG w CCUS	Ammonia	700t H_2/d (production) - 400	256
	North Dakota Hydrogen Hub (former Great Plains Synfuel Plant)	USA	2028	NG w CCUS	H_2	310000t H_2/y	310
	Enbridge Ingleside Energy Center low carbon ammonia (TX)	USA	2029	NG w CCUS	Ammonia	1.2-1.4Mt NH_3/y	234
	Horizons Clean Hydrogen Hub	USA	2030	Other Electrolysis	Various	1200MW	208
Concept	Angeles Link	USA		Other Electrolysis	H_2	10-20GW	2,599
	Adams Fork Energy (WV)	USA	2028	NG w CCUS	Ammonia	6kt NH_3/d - 3.6Mt CO_2/y	394
	Data City (was Hydrogen City, phase 2)	USA		Other Electrolysis	H_2	3Mt H_2/y	2.654
	Ten08/Ohmium clean ammonia project in Texas	USA		Other Electrolysis	Ammonia	1.4MT NH_3/y production	442

Source: IEA Hydrogen Project Database edited by Acretio based on most recent announcements

2.4 U.S. emerging as clean H_2 supplier to EU and other countries

With its abundant natural gas resources, vast solar and wind energy potential, and mature carbon sequestration infrastructure, the U.S. is poised to become a critical clean hydrogen supplier to Europe and Asia. This role is underscored by a growing mismatch between production and mandated demand in these regions. In 2022, the EU established an ambitious REPowerEU supply vision of 20 mln tons per year of clean Hydrogen by 2030, comprising 10 MTPA of domestic production and 10 MTPA of imports. However, current data suggests Europe will be unable to meet even its narrowed demand targets with domestic supply. While total European demand targets reach approximately 7 MTPA, the EU's domestic production pipeline for projects with a high likelihood of 2030 operation is currently only ~4 MTPA. This leaves a significant domestic supply gap of nearly 3 MTPA just to meet internal goals, reinforcing the strategic necessity of the Gulf Coast - Netherlands corridor to bridge the gap between Europe's binding RED III quotas and its lagging internal production capacity.

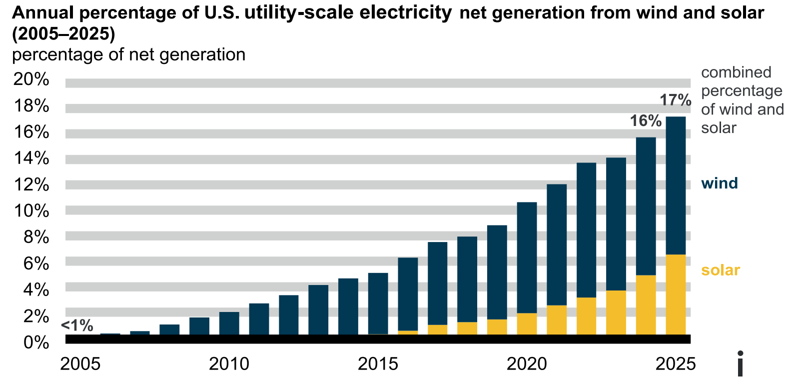
Similarly, Japan and South Korea, facing even greater lack of domestic production potential, are banking on massive imports to match planned demand. Under its 11th Basic Electricity Supply and Demand Plan (February 2025), South Korea targets 15.5 TWh of electricity generation from low-emissions hydrogen and ammonia by 2030, nearly tripling to 43.9 TWh by 2038. Japan has solidified its commitment through the Hydrogen Society Promotion Act (October 2024), launching a USD 20 billion Contract-for-Difference (CfD) scheme to support 15-year supply contracts starting by 2030. Together, Japan and Korea now account for over a third of the world's announced hydrogen-fired power capacity for 2030, creating a long-term, lucrative export market for U.S.-produced molecules.



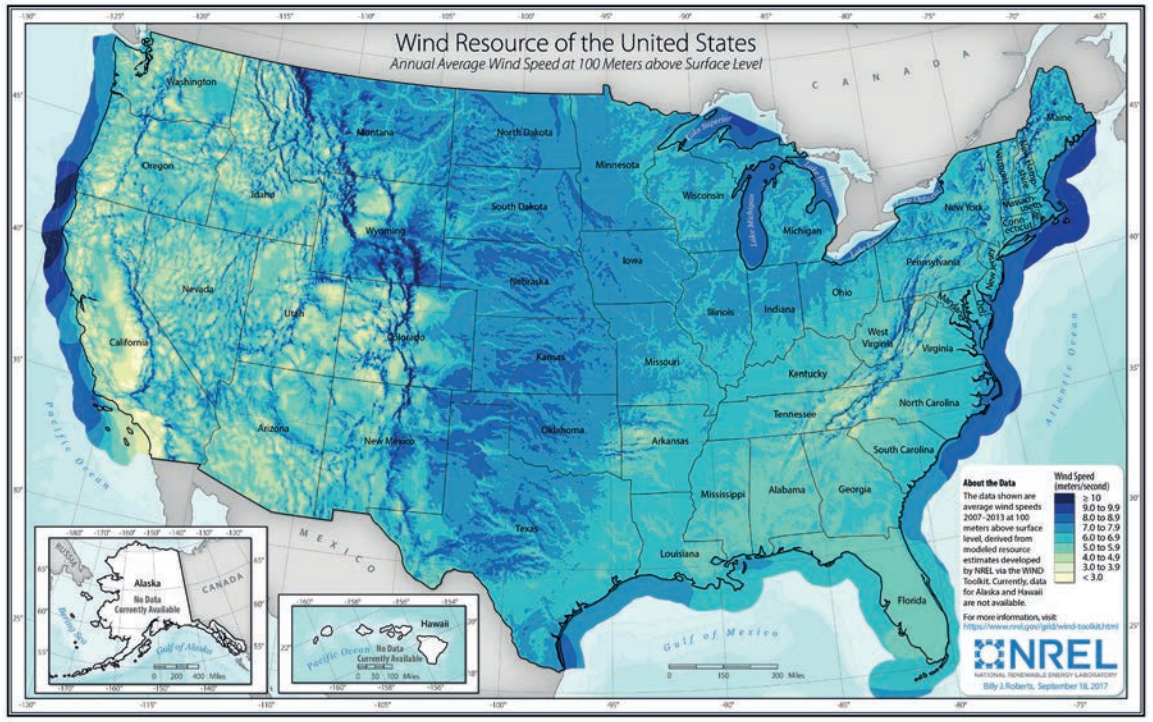
Source: Acretio internal analysis

2.5 U.S. as current producer of renewable power

The United States has emerged as a major producer of renewable energy, largely driven by significant growth in solar and wind power generation. Vast open spaces, particularly in the Southwest, offer ideal conditions for large-scale solar installations, while consistently strong winds across the Great Plains and coastal regions make the U.S. a prime location for wind farms. Technological advancements and falling costs have further accelerated the adoption of these renewable sources, contributing to a substantial increase in their share of the U.S. energy mix, reaching 17% in 2025 for just utility-scale Wind and Solar. U.S. wind production was multiplied by 5 between 2010 and 2025, from 94 TWh to 464 TWh.



Source: IEA, Today in Energy



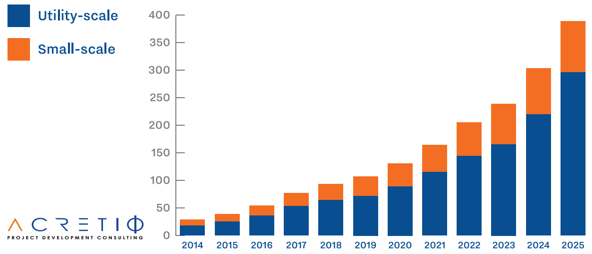
Source: National Renewable Energy Laboratory

As for solar, U.S. generation reached almost 400 TWh in 2025, roughly ten times the level of 2015. Growth remains particularly strong at the state level: from 2024 to 2025, solar generation increased by 42% in Texas (to 64 TWh) and by 30% in Florida (to 30 TWh), on a combined utility- and small-scale basis. California remains the leading state overall, with 90 TWh of generation. However, on a utility-scale basis alone (excluding small-scale photovoltaics), Texas surpassed California for the first time in 2025, producing 58 TWh versus 55 TWh.

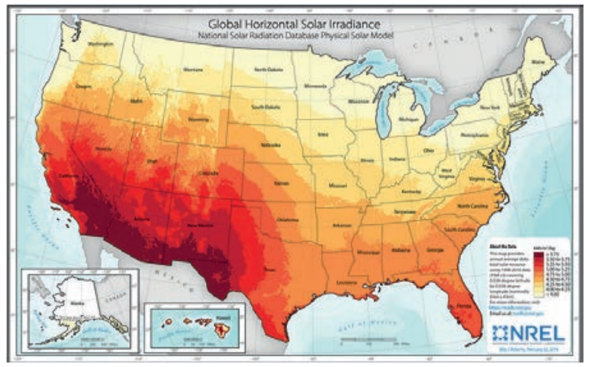
Government incentives have played a pivotal role in the widespread adoption of small-scale solar systems in the U.S. over the past decade. Key programs like the federal solar tax credit, which allowed homeowners to deduct a percentage of the installation cost from their taxes (up to 30%), have significantly reduced the financial burden of going solar. Furthermore, many states have implemented their own incentive programs, such as rebates, performance-based incentives, and net metering policies, further encouraging solar adoption.

US Solar generation

Annual generation by system size (in TWh)

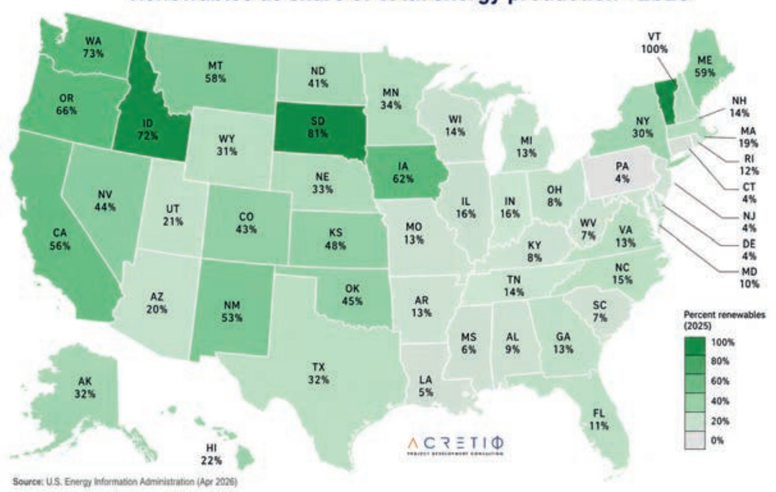


Source: U.S. Energy Information Administration (Apr 2026)



Source: National Renewable Energy Laboratory, maps

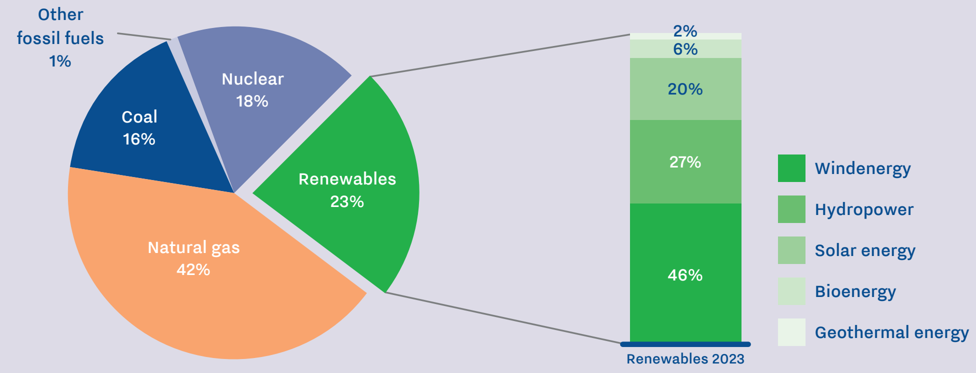
Renewables as share of total energy production - 2025



Source: Energy Information Administration

Within the US, wind energy is the leading renewable source of power, followed by hydro and solar. While Texas is the biggest producer of renewable energy, followed by California in absolute numbers, Vermont, South Dakota, Idaho and Washington state lead the nation with the highest percentage of electricity coming from renewable power.

2023 US Electricity generation

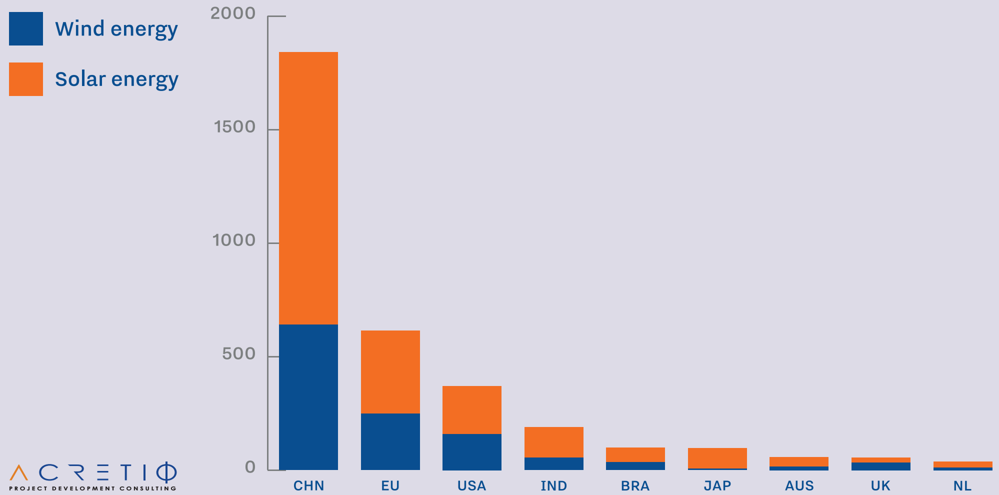


Source: International Renewable Energy Agency and Energy Information Administration

Worldwide, the U.S. is third in renewables energy capacity from solar and wind, after China and the entire EU. At about a quarter of the Chinese capacity it is still far ahead of any other country.

Solar and Wind Capacity - 2025

(installed capacity in GW)



Source: International Renewable Energy Agency (IRENA), Country Rankings, April 2026

Note: EU incl NL, NL shown separately only for comparison purposes

3. The Texas-Louisiana Gulf Coast emerging as the hydrogen powerhouse within the U.S.

3.1 Overview

The Texas-Louisiana Gulf Coast has solidified its position as the nation's hydrogen center of gravity, with the two states collectively possessing approximately 45% of total U.S. hydrogen production. Together, they form a synergistic industrial cluster that functions as a single ecosystem for project developers, despite maintaining separate state regulatory environments.

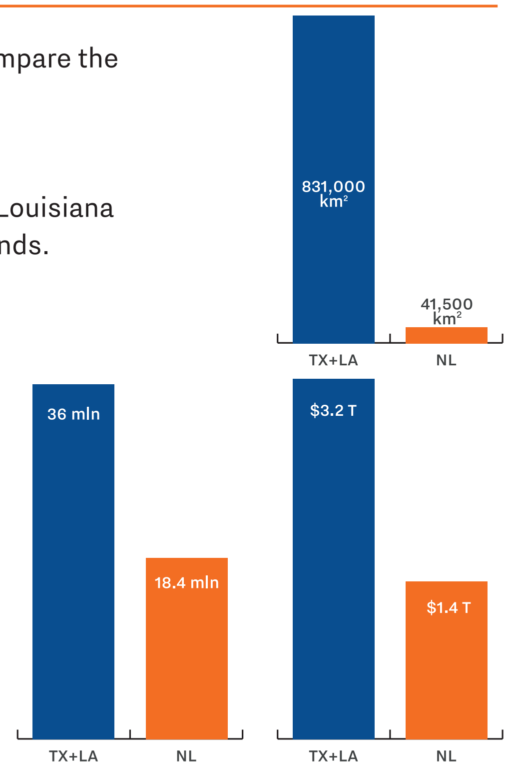
A global scale comparison

To understand the regional dimensions, it is helpful to compare the combined "Powerhouse" to the Netherlands:

Land Mass
With a combined area of roughly 831,000 km^2, the Texas-Louisiana region is approximately 20 times larger than the Netherlands.

Population
The region is home to approximately 36 million people (31.7 mln in Texas and 4.6 mln in Louisiana), roughly double the population of the Netherlands (18.4 mln).

Economic Output (GDP)
The combined 2025 GDP of the two states is approximately $3.2 trillion ($2.94T for Texas and ~$264B for Louisiana). This is more than double the Netherlands' GDP of approximately $1.4 trillion, making the region the equivalent of the world's 7th largest economy.



Industrial centers of gravity

The region's leadership is anchored by two primary industrial "engines":

The Texas Triangle
Delimited by Houston, Dallas/Fort Worth, Austin, and San Antonio, this region contains nearly 75% of the Texas population and serves as a major hub for tech, finance, and energy.

The Mississippi River Industrial Corridor
Extending approximately 150 miles along the Mississippi River between Baton Rouge and New Orleans, this corridor represents the highest density of petrochemical facilities and refineries in the United States. It provides the sophisticated industrial backbone necessary for the massive-scale production of blue hydrogen and ammonia.

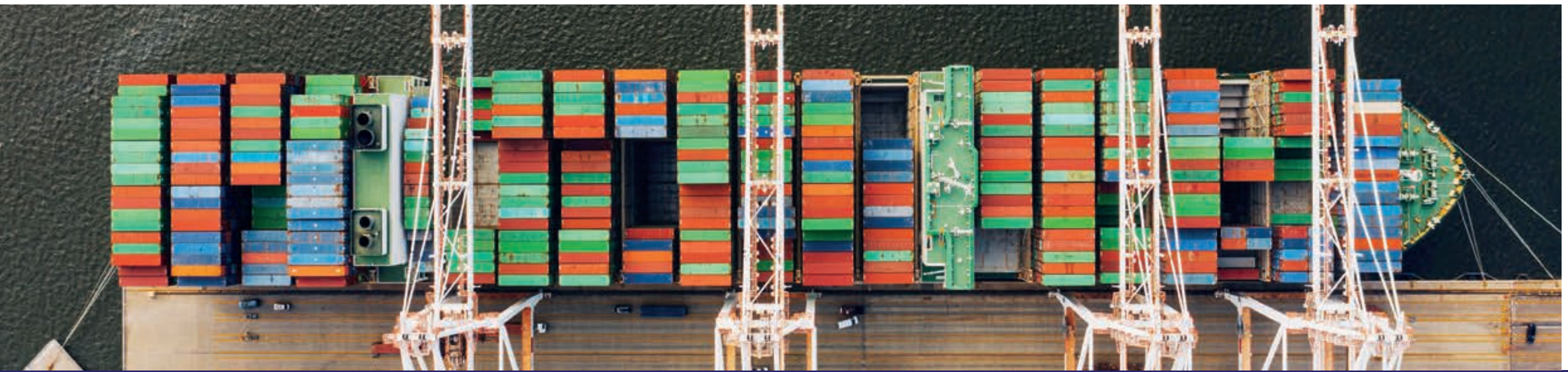
A collaborative regional framework: HyVelocity

The integration of these two centers is anchored by the HyVelocity Hydrogen Hub, an industry-led initiative backed by up to $1.2 billion in federal funding. HyVelocity physically and economically links assets from Houston through the Port Arthur-Lake Charles corridor to the Louisiana Industrial Corridor, leveraging:

Shared Infrastructure
Access to 1,400 miles of existing hydrogen pipelines (90% of the total U.S. hydrogen pipeline network) that physically link industrial assets across both states.

Refining Dominance
A combined capacity processing over 9 million barrels of crude per day, creating a massive built-in demand for hydrogen feedstock.

Maritime Gateways
Access to over 50 major sea ports, some of which are being retrofitted for large-scale ammonia and e-methanol exports to European and Asian markets.



Primacy in carbon management

As of early 2026, Louisiana leads the nation with 65+ proposed CCS projects, followed by Texas with 48+ projects. With both states holding Class VI primacy, they can accelerate local permitting for carbon sequestration in the region's vast deep saline aquifers and depleted reservoirs. This regulatory advantage ensures that major blue hydrogen projects can reach Final Investment Decisions (FID) significantly faster than in other U.S. regions.

NL and the Texas-Louisiana Gulf Coast

The shared history of the Gulf Coast and the Netherlands is deeply rooted in international finance and pioneering settlement. Well before Royal Dutch Shell decided to move its U.S. headquarters from New York to Houston in 1971, a foundational link was established in 1803, when the Amsterdam banking house Hope & Co. (alongside Barings of London) provided the critical financing for the Louisiana Purchase, allowing the young United States to double its territory with Dutch capital.

Dutch settlers in Nederland photographed after the harvest , source: Texan Cultures

This financial partnership continued into the industrial era with the development of the Kansas City Southern Railroad. In the late 1890s, railroad pioneer Arthur Stilwell secured the millions needed for his Midwest-to-Gulf line through the Amsterdam capital market, primarily via his partnership with Dutch financier Jan de Goeijen. As a direct result of this financial backing, Stilwell established the town of Nederland in 1897 as a dedicated colony for Dutch immigrants, many of whom were brought to the region through de Goeijen's promotion of the Port Arthur Land Company.

These major milestones join the individual legacies of influential Dutchmen like Phillip Hendrick Nering Bögel (the Baron de Bastrop), who helped settle the first Anglo colonies in 1795, and David Levi Kokernot, who fought in the Texas Revolution.

A foundation of shared expertise

The Netherlands and the Texas-Louisiana Gulf Coast share a deeply integrated industrial DNA. Key overlapping sectors include energy and energy transition (hydrogen and carbon capture), chemicals, maritime logistics, life sciences, and water management. This alignment has transformed the region into a premier global partner for Dutch innovation, particularly as both regions navigate large-scale industrial decarbonization.

Unrivaled export momentum

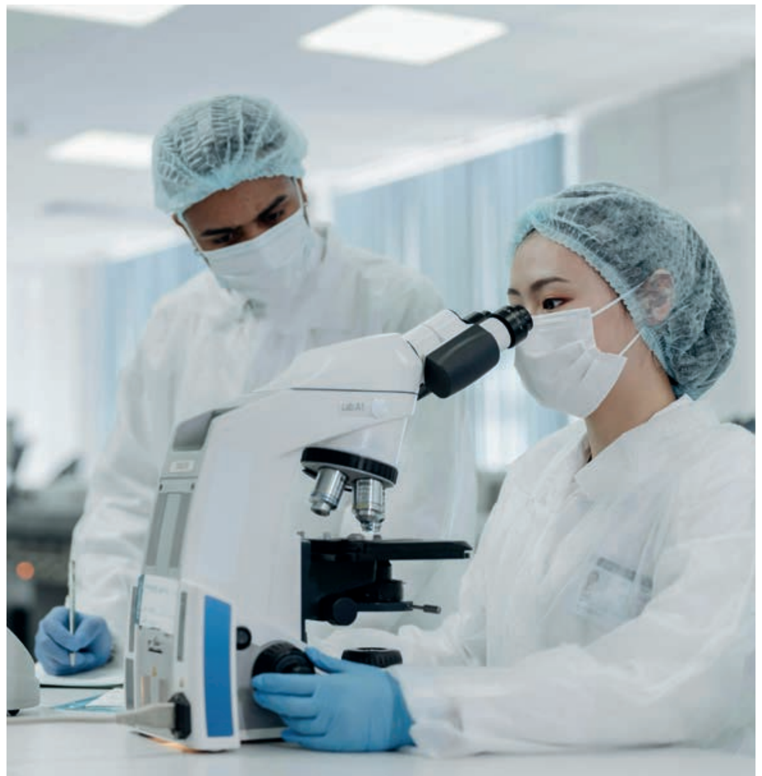
The Gulf Coast serves as a critical energy and commodity gateway for Northern Europe. By 2024, the Netherlands became the third-largest export destination for both Texas ($32.5 billion) and Louisiana ($5.6 billion). Combined, these states exported over $38 billion in goods to the Netherlands, with crude petroleum, refined products, and liquefied natural gas (LNG) leading the volume. Notably, the Houston port district alone saw a 23% surge in Dutch-bound exports in 2024, driven by European energy diversification efforts.

Investment density and job quality

While Texas leads in total trade volume, Louisiana captures an exceptional concentration of Dutch investment relative to its size. For over a decade, Louisiana has ranked No. 1 in the U.S. for per-capita Foreign Direct Investment (FDI). Dutch-owned enterprises are the state's second-largest foreign employer, supporting approximately 9,400 high-wage direct jobs. In 2025, new industrial wins in the region were characterized by high value, with new jobs paying an average salary of $91,000—significantly above the state average.

A strategic clean energy future

Mapping the top sectors reveals a "Hydrogen Powerhouse" in the making. Texas and Louisiana collectively account for approximately 45% of total U.S. hydrogen production. This synergy is being formalized through the Transatlantic Clean Hydrogen Corridor, linking the Gulf Coast's production scale with the Port of Rotterdam's import infrastructure. Beyond energy, the partnership is expanding into Life Sciences and MedTech, with major Dutch trade missions to Houston and Austin in late 2025 targeting digital health innovation.

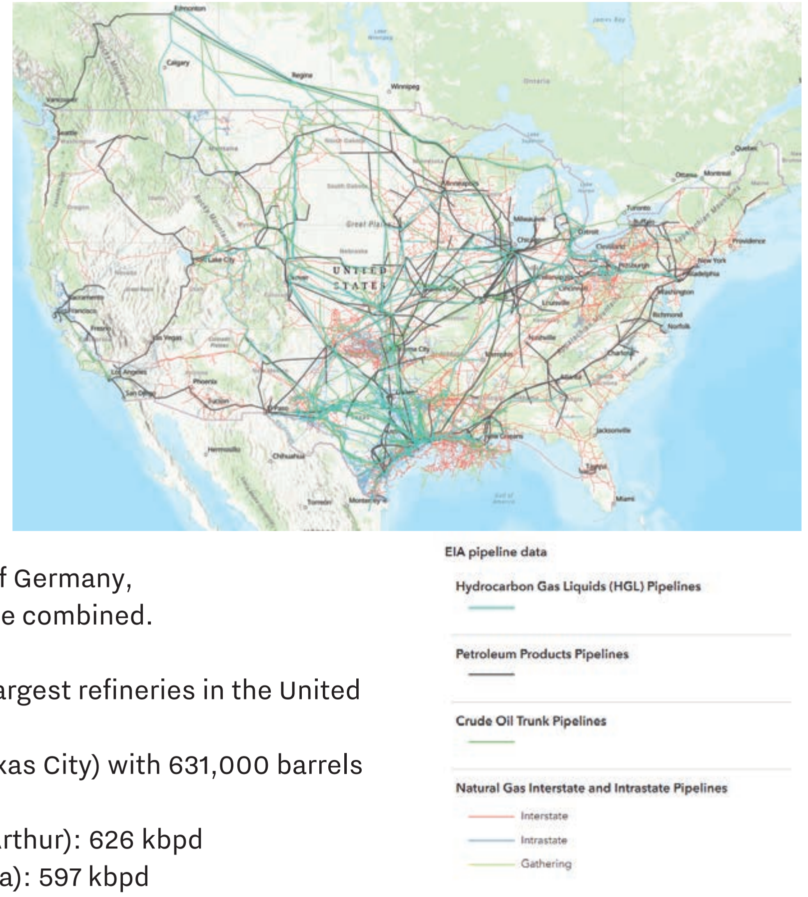


3.2 Current Texas-Louisiana Gulf Coast Energy infrastructure

A quick look at the petroleum map of the U.S. shows that the Gulf Coast plays a central role. One of a producer of crude oil and natural gas, refiner of crude oil and originator of multiple petroleum product pipelines.

Petrochemicals

The Texas-Louisiana Gulf Coast region has solidified its position as the global center of gravity for energy processing and transport. With 50 refineries now operating across the two states, 35 in Texas and 15 in Louisiana, the region possesses a combined crude oil refining capacity of approximately 9.3 million barrels per day. This represents roughly 51% of total U.S. capacity, dwarfing the combined refining capacity of Germany, the Netherlands, Italy, and France combined.



Source: *EIA Pipeline data*

The region is home to the three largest refineries in the United States:

- Marathon Galveston Bay (Texas City) with 631,000 barrels per calendar day (kpbd)
- Saudi Aramco/Motiva (Port Arthur): 626 kbpd
- Marathon Garyville (Louisiana): 597 kbpd

This massive industrial hub is interconnected by an unparalleled infrastructure network of over 430,000 miles of regulated pipelines (including 345,000 miles in Texas and over 90,000 miles in Louisiana based on data from the Pipeline and Hazardous Materials Safety Administration (PHMSA)). When including additional gathering systems not fully captured in federal datasets, total pipeline mileage across the region is often estimated to approach 500,000 miles. This network spans more than twice the distance from the Earth to the Moon, facilitating the high-volume movement of crude from wells to coastal refineries and exporting ports, as well as the interstate flow of refined products to major demand centers in the North, Northeast, and East Coast.

Sea ports

The Texas-Louisiana Gulf Coast is the world's most concentrated maritime gateway, anchored by a combined network of **51 commercial seaports**, including **19 deepwater ports**, spanning over 1,000 miles (1,600 km) of industrial coastline. This regional powerhouse holds the top rankings in virtually every maritime category:

Tonnage dominance
The region is home to the Port of South Louisiana, the largest tonnage port in the entire Western Hemisphere and the #1 port in the U.S. for total domestic trade.

Foreign trade lead
The Port of Houston remains the #1 port in the United States for waterborne foreign tonnage and the 6th busiest port in the nation overall.

Energy export gateway
The Port of Corpus Christi is the nation's largest crude oil export gateway and consistently ranks as the 3rd largest in the world, following only Ras Tanura in Saudi Arabia and Basrah in Iraq.

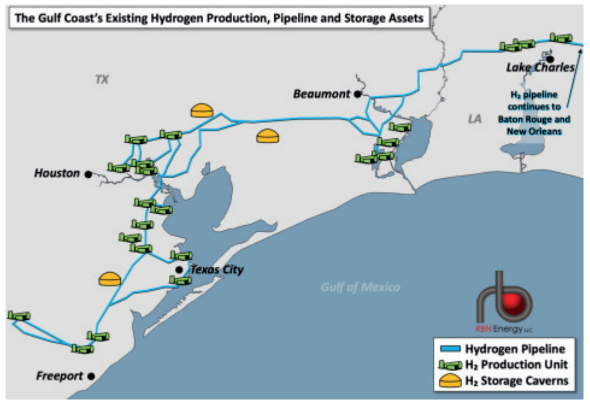
Other infrastructure
The region features two major cruise hubs. The Port of Galveston has solidified its status as the 4th busiest cruise port in North America, while the Port of New Orleans serves as a critical regional cruise anchor and a major container gateway for the American heartland.

A handful of ports are hosting major independent projects for clean fuel exports. These specific developments are positioning the region as a primary global terminal for hydrogen derivatives.

Building on this maritime density, these independent port initiatives collectively provide the infrastructure needed to support the Transatlantic Clean Hydrogen Corridor, linking the Gulf Coast's individual production centers with the Port of Rotterdam and broader global markets.

Hydrogen

The Texas-Louisiana Gulf Coast produces yearly about 5 to 5.5 million tons of hydrogen, nearly entirely used in industrial processes, particularly in petroleum refining to remove sulfur, treating metals, producing chemicals, and in the production of ammonia for fertilizer. It is produced almost entirely via steam methane reformers (SMR) in oil refineries or dedicated large facilities. The major industrial gas players in this space are Air Liquide, Air Products and Linde/Matheson. If not used on site, hydrogen is piped to end-users via an extensive network of dedicated pipelines. Texas has more than 900 miles of hydrogen pipelines, connected to almost 500 miles in Louisiana, all in private ownership, with close to 90% owned by the 3 companies mentioned.

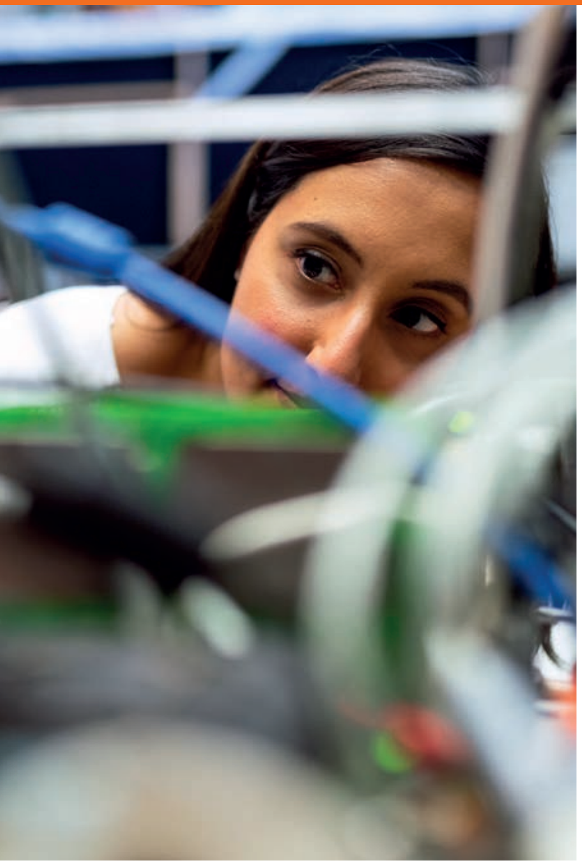


Source: RBN Energy, hydrogen-hub

CO_2/CCS

The Gulf Coast offers ample opportunities for long term CO_2 sequestration due to its vast amount of depleted oil and gas reservoirs and saline aquifers. CO_2 is currently used as one the various Enhanced Oil Recovery (EOR) techniques, involving injecting materials or energy into the reservoir to extract oil that cannot be extracted using traditional methods. In this case CO_2 is injected to increase pressure and push the oil towards the well but also dissolve in the oil, reducing its viscosity. There is an existing network of CO_2 pipelines in the Permian basin for this purpose as well as an 81-mile pipeline owned by TCV from southwest Houston to West Ranch near Lavaca Bay. There is another network of CO_2 pipelines on the Gulf Coast, the Exxon/Denbury pipeline used currently for EOR purposes but with carbon sequestration planned in so-called Class VI wells.

Source: EIA CO2 pipeline



Skilled workforce

While the Gulf Coast boasts a robust energy infrastructure, it is important to recognize the skilled workforce that underpins this industry. Decades of experience and expertise have been cultivated within the region's energy sector, ensuring the safe and efficient operation of these critical facilities. From engineers and technicians to skilled tradespeople, these individuals possess the knowledge and capabilities to maintain and innovate within the energy landscape. Their contributions are essential to the ongoing success of their state's energy industry. According to the Texas Higher Education Coordinating Board data, 989 students were enrolled in petroleum engineering programs in 2023 at Texas' 4-year public institutions. Louisiana's petroleum engineering programs collectively train on the order of 500–600 students at any given time, providing a critical talent pipeline for subsurface energy infrastructure, including hydrogen storage and carbon capture.

Electricity

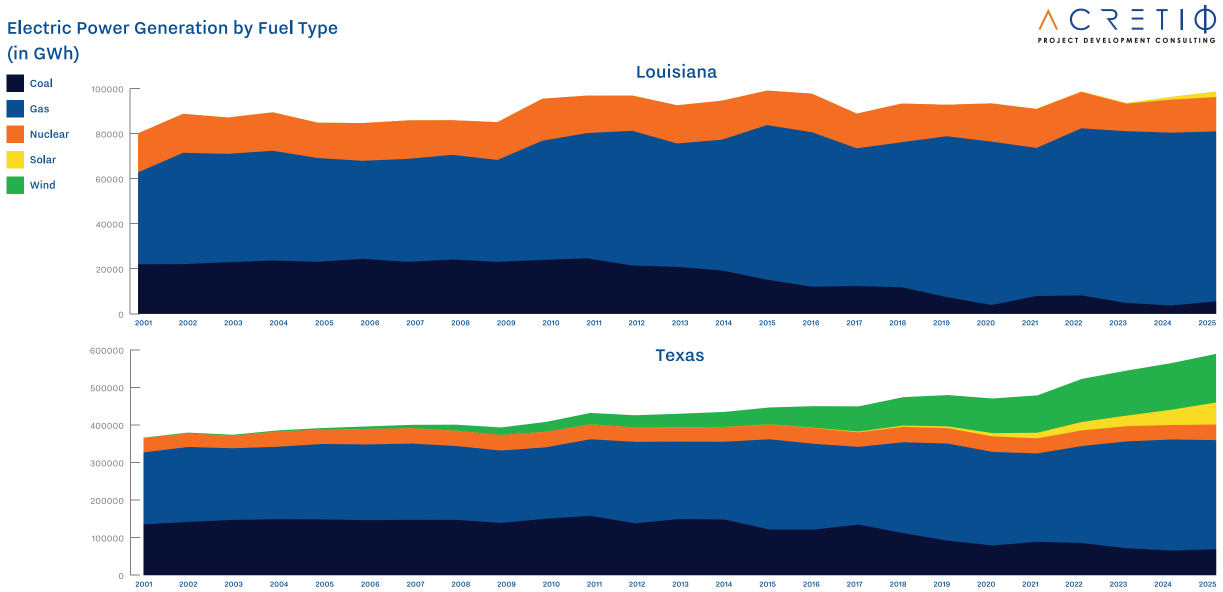
The distinct market structures of Texas and Louisiana create divergent economic environments for clean hydrogen development. Texas operates under the Electric Reliability Council of Texas (ERCOT), an "energy-only" market designed for rapid response to price signals. For an electrolyzer operator, this represents a high-beta environment. The absence of a capacity market means that during periods of high renewable penetration, particularly from West Texas wind and solar, wholesale electricity prices can drop to zero or even turn negative. Producers capable of "flexible loading" can capitalize on these intervals to drive down their operating cost, though they must remain prepared to curtail operations during extreme price spikes to avoid significant financial exposure.

In contrast, Louisiana is integrated into the Midcontinent Independent System Operator (MISO), which utilizes a capacity-based planning model. This structure provides a "generation safety net" by paying power plants to remain available, regardless of immediate demand. For the hydrogen producer, MISO offers a more predictable, lower-volatility cost profile that is often more attractive to conservative project financing. While Louisiana lacks the frequent "free power" windows found in Texas, its access to a multi-state generation portfolio reduces the operational risk of a total grid "island" event. Ultimately, the choice between the two regions often hinges on a producer's technical ability to cycle their electrolyzers: Texas favors those who can pivot with the market, while Louisiana supports those requiring 24/7 industrial consistency.

Feature	ERCOT (Texas)	MISO (Louisiana)
Market philosophy	Energy-Only: Prices dictated by real-time scarcity.	Capacity-Based: Includes "readiness" payments to generators.
Price profile	High volatility; frequent $0 or negative pricing opportunities.	Lower volatility; higher baseline stability for long-term PPA.
Renewable integration	Massive "trapped" wind/solar; easier to prove additionality.	Broad, multi-state mix; harder to "track" specific green electrons.
Operational risk	Isolated: No power imports during extreme weather events.	Interconnected: Can pull power from 15 states during local shortages.
Optimal use case	Flexible producers seeking lowest possible marginal cost.	Continuous industrial users seeking 24/7 supply security.

With almost 600 TWh electricity generated in 2025, more than twice the production of Florida, the distant second largest producer, Texas produces 13.3 % of the total U.S. energy generation through its 764 utility-scale power generating assets (power plants, wind turbines, solar farms, etc.). Louisiana with 102 TWh, 2.3% of the total US, produces twice as much as its share of the U.S. population.

Electric Power Generation by Fuel Type (in GWh)



Source U.S. Energy Information Administration (Apr. 2026)

While natural gas is still the dominant energy source at 49%, renewables already represents 32% of the 2025 electricity generation by utility-scale producers in Texas while Louisiana is still heavily relying on natural gas for 72% of its production.[4]

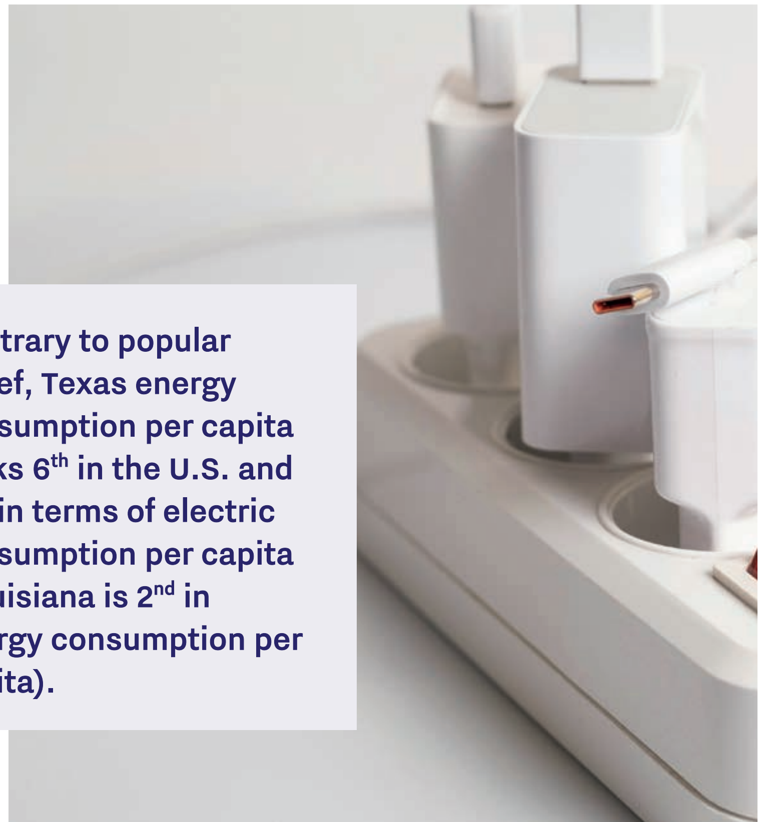
[4]. Source: U.S. Energy Information Administration (Apr. 2026)

3.3 Current renewable power in the Texas-Louisiana Gulf Coast

As mentioned earlier, Texas was the largest producer of both wind and solar energy in the U.S. in 2025. Favorable wind conditions and favorable solar irradiance as seen in chapter 2.5. are obvious large contributing factors. Land availability is another critical factor. Repsol's Frye Solar in Northwest Texas competes with Tokyo Gas' Aktina plant near Houston as the largest operational solar plants in Texas each with a capacity of 500 MW. NextEra's Great Prairie Wind farm in Northwest Texas is the largest operational wind farm in Texas with more than 1GW of installed capacity, second only in the U.S. to California's Alta Wind farm.

Not only is utility-scale renewable power generation growing significantly year over year, but small-scale solar generation is also increasing at 20-40% annual growth rate in the state to reach more than 5 TWh in 2025, enough to power more than 400.000 homes.

While Texas currently offers a more mature renewable portfolio, Louisiana is entering a period of rapid decarbonization. As of early 2026, Louisiana has over 3 GW of solar capacity in its development pipeline, with over 20 major utility-scale projects expected to achieve commercial operation in coming years. For the clean hydrogen producer, this shift represents a transition from a fossil-heavy 'gray' grid to one that increasingly offers 'green' curtailment opportunities, particularly within MISO's South Load Pockets where new renewable generation is being paired with high-intensity industrial demand.



Contrary to popular belief, Texas energy consumption per capita ranks 6th in the U.S. and 12th in terms of electric consumption per capita (Louisiana is 2nd in energy consumption per capita).

3.4 Emerging clean H_2 production

Texas, with its vast geographic expanse and strong wind and solar potential, offers a compelling opportunity for developing a robust green hydrogen industry. With abundant natural gas resources and nearby depleted oil fields for carbon sequestration, Texas also presents a compelling opportunity for blue hydrogen development. Louisiana further strengthens this positioning, with a highly concentrated industrial base, access to offshore storage formations, and proximity to key export corridors along the Gulf Coast. Together, the two states form a uniquely advantaged region for scaling both green and blue hydrogen.

While the region appears particularly well suited for green hydrogen in the long term, current project development is predominantly focused on blue hydrogen. This reflects the continued cost advantage of natural gas-based production combined with carbon capture, as well as the ability to leverage existing infrastructure and industrial demand along the Gulf Coast.

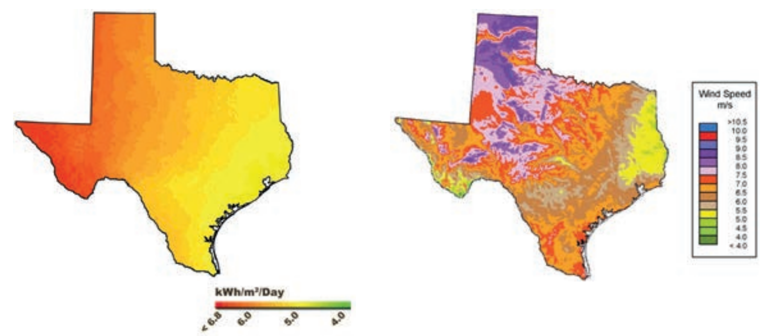
The region's existing energy infrastructure, including pipelines, ports, and a skilled workforce, combined with current tax advantages and favorable cost differentials, positions the Gulf Coast well to capitalize on the growing global demand for clean hydrogen. Finally, the region's unique access to undeveloped salt domes, alongside their established storage and industrial infrastructure, provides strong potential for large-scale storage solutions, further reinforcing the region's role as a leading hub for clean hydrogen.

3.4.1 Suitability of the Texas-Louisiana Gulf Coast for clean H_2 production

Land potential

Texas boasts an abundance of land suitable for both solar and wind energy generation. The state's vast, flat landscapes, particularly in the western and northwest regions, with miles of unbuilt land, offer ideal conditions for large-scale solar and wind farms. So called wind leases are a welcome source of additional revenues for landowners and perceived as helping reverse the economic decline affecting many rural communities (a survey found 70% of the rural population in these areas perceived wind power as improving employment and the overall economy) . Land use is around 50 acres/MW of capacity, but generally, the wind turbines do not interfere with other land uses. Selecting an optimum wind power source area will involve a trade-off between transmission cost and number of wind generators needed. Though almost the entirety of wind capacity sits on private lands, the Texas General Land Office actively leases land for renewable energy projects, further contributing to the state's potential.

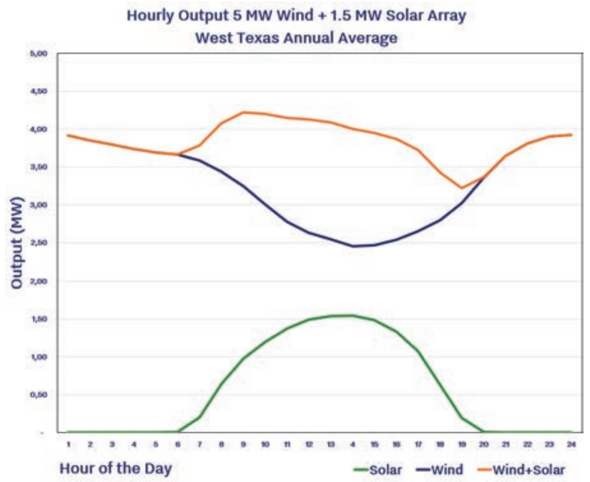
Solar Resources in Texas | **Wind Resources in Texas**



Source: Office of the Texas Governor

Green hydrogen: Unique solar and wind opportunities but water constraints

West Texas is particularly well suited for solar and wind farms, combining exceptional solar irradiance with high wind speeds at 80-100m altitude. One of the unique features of the West Texas wind resource region is that, on average, wind speeds are higher during the night than during the day, so that wind and solar power production complement each other. This unique complementarity makes West Texas one of the most attractive regions gloablly for low-cost renewable power generation and, by extension, green hydrogen production.



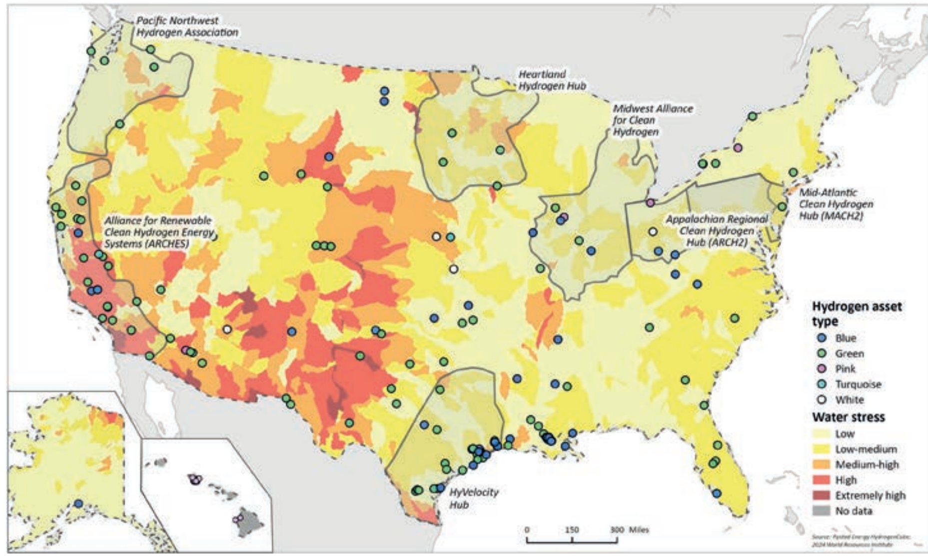
Source: Acretio LLC

Louisiana, by contrast, offers more limited potential for large-scale onshore wind and solar development due to land availability, lower wind speeds, and higher population density. While utility-scale solar projects are emerging (for example, projects developed by Lightsource bp and NextEra Energy in the state), and offshore wind potential is being explored in the Gulf coast, renewable generation remains more constrained than in West Texas. As a result, Louisiana's strength lies less in power generation and more in its industrial base, existing infrastructure, and proximity to storage and export facilities.

While this offers significant potential for green power, hydrogen production through electrolysis process requires a substantial amount of water (9 to 10 liters per kg of hydrogen produced). This raises concerns about potential water scarcity and competition with other water-intensive industries, such as agriculture and oil and gas production. The electric infrastructure to bring power from West Texas to the Gulf Coast is already at capacity and even on the Gulf Coast, with abundant water nearby in the Gulf, green hydrogen projects have faced significant backlash if they intend to tap fresh water supply.[5] However, Texas contains several large saline aquifers[6] and is home to the largest inland desalination plants in the world. The challenges are not insurmountable, but it will most likely require a combination of desalination, green power generation and new transmission lines before we can see a number of new green hydrogen projects reaching FID.

5. Texas Tribune | 12 April 2024

6. Saline Water Resources of Texas, A.G. Winslow and L. R. Kister, 1956 | Report



Locations of proposed hydrogen production projects are overlaid over the World Resources Institute's Aqueduct Water Risk Atlas map of water stress in the United States. The gray circles indicate areas included in the regional hydrogen hubs selected for funding by the U.S. Department of Energy. (Map courtesy of Rystad Energy)

Source: Floodlight News

Blue hydrogen viability

Blue hydrogen production faces similar challenges in transmitting green power from West Texas to the existing production sites on the Gulf Coast but it requires only a third of water consumption in the process (see Appendix 8.5 for details and requirements for both technologies). This advantage over green hydrogen production, coupled with its ability to leverage the existing natural gas infrastructure, to bring natural gas from the extraction sites to the Steam-Methane reformers along the Gulf Coast, and the existing infrastructure of CO_2 pipelines to send the captured CO_2 into the sinks (mostly depleted oil fields) across both Texas and Louisiana, makes blue hydrogen a more practical near-term pathway for clean hydrogen. Louisiana, in particular, benefits from a dense industrial corridor and proximity to offshore storage formations, reinforcing its role in blue hydrogen development.

Storage and export strengths

Whether the pathway to clean hydrogen production is through green or blue processes, and regardless of the export method (ammonia or other liquid hydrogen carriers), the Gulf Coast possesses a unique advantage: its extensive network of salt domes. These geological formations offer significant storage capacity for hydrogen (see below paragraph 3.4.2).

The Texas-Louisiana Gulf Coast has all the required ingredients to become a global hub for the production, storage, and export of clean hydrogen.

Furthermore, the Gulf Coast's established ammonia infrastructure provides a solid foundation for the export of clean hydrogen. The region is a major producer of ammonia, with 60% of the entire U.S. production capacity concentrated in Louisiana, Oklahoma, and Texas. Ports such as Corpus Christi, Beaumont, Houston, and Victoria in Texas, as well as key terminals along the Louisiana coast, all of which are already involved in ammonia storage and production or have advanced projects underway, are well-positioned to facilitate the export of clean hydrogen to global markets. By leveraging its existing infrastructure and geological assets, skilled workforce and decades of industrial experience, the Texas-Louisiana Gulf Coast has all the required ingredients to become a global hub for the production, storage, and export of clean hydrogen.

3.4.2 Salt caverns for hydrogen storage

A unique structural advantage of the Texas-Louisiana Gulf Coast is its vast concentration of subterranean salt domes, possessing 220 onshore formations across the two states, which provide the geological integrity and high-pressure capacity required for large-scale underground hydrogen storage. The region currently hosts the world's only established commercial high-purity hydrogen salt caverns, most notably at the Clemens, Moss Bluff, and Spindletop domes. These facilities serve as critical "instantaneous" backup for the regional refining and petrochemical network, capable of meeting peak demand or production outages on an on-line basis. While these assets currently prioritize industrial feedstock reliability, they represent the essential backbone for the next phase of the energy transition: balancing intermittent clean hydrogen production and enabling the creation of stable, multi-molecule export corridors.

For a deep dive into salt caverns, please refer to Chapter 4.

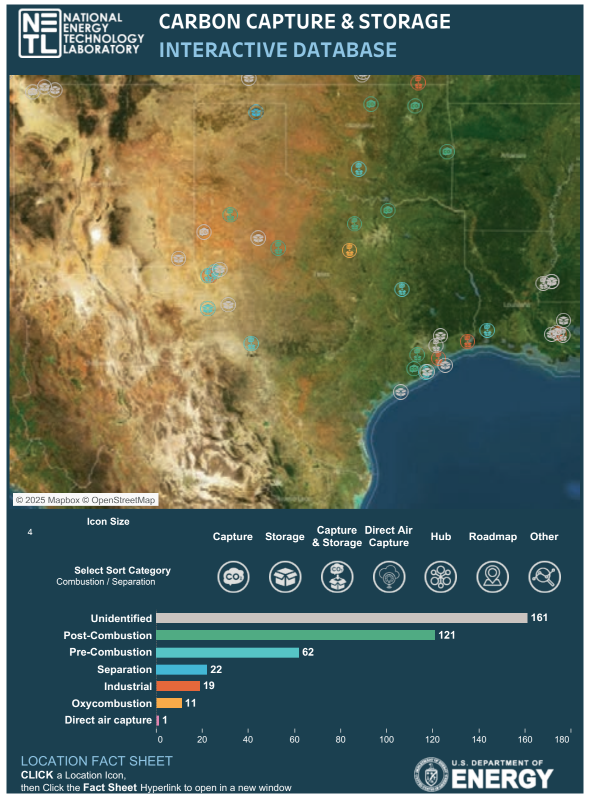
3.4.3 New hydrogen pipelines

The distance from the wind and solar resource areas in West Texas to the nearest deepwater export facilities in Corpus Christi is in the order of 800 km (500 miles). To transport the renewable energy in the form of high voltage electrical power is far more costly and more difficult to permit than building a hydrogen pipeline. Several existing rights-of-way and pipeline corridors already connect the prolific oil and gas production in West Texas with the U.S. Gulf Coast and landowners are familiar with the permitting process and the royalty system.

To illustrate its potential, we estimated that a single 36" pipeline system operating at similar pressures as used for underground storage would be able to transport 6,000 ton/day of hydrogen, enough to feed 10 world-scale ammonia plants and would carry the equivalent of 8.3 GW of electrical power. Moreover, the line fill of such an 800 km pipeline system would be in the order of 5,200 tons, enough to buffer out the daily cycle of solar power generation. One of the oddities of hydrogen is that its very low density and viscosity makes it difficult to compress, but also results in very low friction losses during pipeline transport.

3.4.4 CO_2 sequestration

As mentioned earlier, CO_2 sequestration is an essential part of the blue hydrogen production and Texas has a long history of using CO_2 for EOR (see paragraph 3.2). In September 2024, the EPA (Environmental Protection Agency) announced the first draft permits for carbon sequestration wells in Texas (so-called Class VI wells). The state, rich with on- and offshore saline and depleted hydrocarbon reservoirs, is an ideal candidate for these carbon sequestration wells and projects are popping up everywhere. The DoE's National Energy Technology Laboratory which maintains an interactive database of worldwide CCUS projects lists about 20 projects in the state at the end of 2024. Some of the key known active projects are listed below (not all listed in the DoE interactive database yet as they might still be in feasibility study stage):



Source: The global CCS interactive database

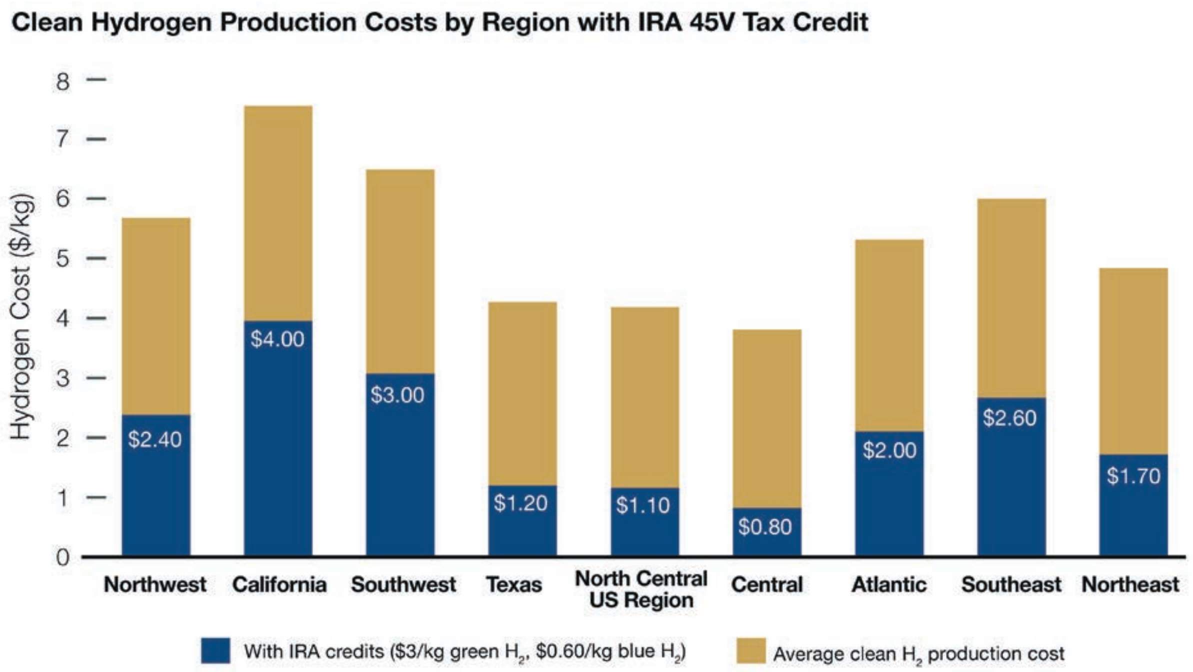
Project name	Area	Type	Acreage	CO_2
Repsol/Carbonvert	Corpus Cristi	Offshore	140,000	600 Mtons
Exxon GOM CCS Hubs I, II, III	Baytown	Offshore	271,000	
Bayou Bend (TTE, CVX, EQNR)	Port Arthur	On/Offshore	100,000 on/40,000 off	225-275 Mtons
Coastal Bend CSS (TTE)	Corpus Cristi	Onshore	13,000	50-100 Mtons
South Texas DAC Hub	Corpus Cristi	Onshore	106,000	3,000 Mtons
FRESSH	Freeport	Onshore		400 Mtons

Louisiana offers similarly attractive geological conditions, particularly along its industrial corridor and offshore basins, and has long been considered a natural extension of the Gulf Coast CCS hub. However, recent regulatory uncertainty and local opposition have slowed permitting activity in parts of the state, creating a more complex development environment compared to Texas. While Louisiana is actively working to reestablish momentum and position itself as a leading CCS hub, this temporary slowdown has led some developers to prioritize projects in Texas, where permitting visibility has been clearer.

With the increased focus on blue hydrogen across the Gulf Coast, the pipeline of CCS projects in both states is expected to grow, although the pace and timing of deployment may differ depending on regulatory clarity and local acceptance.

3.4.5 Clean H_2 cost differential within US

As mentioned earlier, the U.S. cost to produce clean hydrogen is very competitive compared to other places in the world, especially with tax incentives (see chapter 1). The vast availability of wind and solar in Texas, combined with the proximity of carbon underground sequestration options and cavern storage as well as the existing port and logistics infrastructure amongst other factors along the Gulf Coast result in the region being amongst the most competitive within the country itself. The Energy Future Initiative estimates the cost to produce clean hydrogen in Texas to about \$4/kg H_2, potentially down to \$1.20 after taking into account the full 45V tax credit.



This figure compares regional hydrogen production prices based on energy input costs, CO_2 storage, and clean energy resource availability and how those impact eligibility for the 45V hydrogen PTC. Regions with abundant CO_2 infrastructure and renewable resources overall have the lowest clean hydrogen production costs as a result of the PTC.

Source: The U.S. Hydrogen Demand Action Plan (Energy Future Initiative)

The U.S. itself being already very competitive, being amongst the lowest cost in the U.S. means for Texas and Louisiama that these states are amongst the lowest clean hydrogen cost producers in the world. Earlier analyses from the Hydrogen Council and McKinsey suggested that U.S. green hydrogen could become cost-competitive with, and in some cases outperform, blue hydrogen globally by 2030, supported by low-cost renewables and policy incentives such as tax credits. More recent assessments, however, indicate a more nuanced outlook, with both green and blue hydrogen expected to remain competitive depending on regional conditions, infrastructure, and regulatory frameworks.

Beyond tax incentives at federal levels, other incentives are available at regional and local level. For example:

- The Texas Enterprise Zone Program
- The property tax exemption for Solar and Wind-powered energy devices
- Local agreements under the Chapter 312 Property Tax Abatement Act

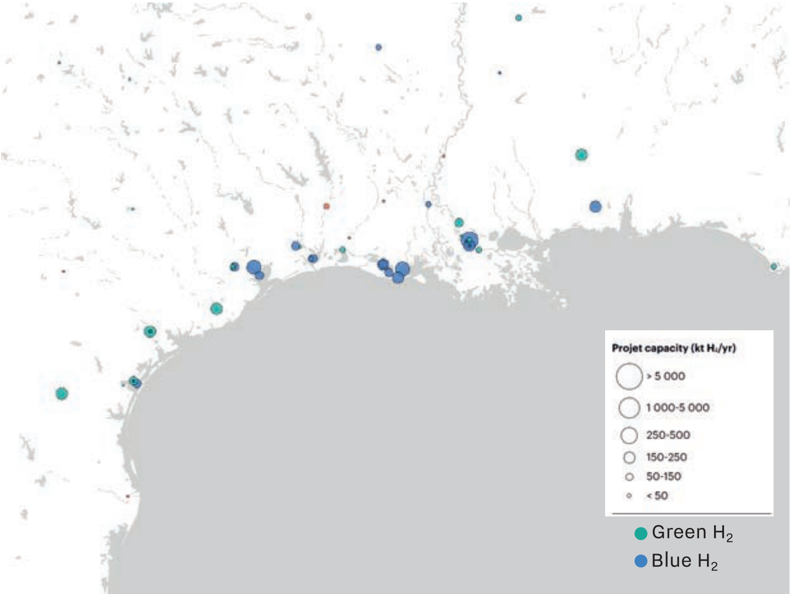
Similar incentives exist in Louisiana, which also actively supports industrial and energy investments. Key programs include:

- The Industrial Tax Exemption Program (ITEP), providing property tax abatements for manufacturing and industrial projects
- The Quality Jobs Program, offering cash rebates linked to job creation and payroll
- Restoration Tax Abatement and other local incentive agreements supporting capital investment and redevelopment

3.5 Emerging clean H_2 projects & commercial announcements

The IEA, in its Hydrogen Production database updated in late 2025, currently lists 196 projects linked to hydrogen in the USA, whether blue or green, totaling a potential H_2 capacity of 18 MTPA. 44 of these projects are large (>100 kTPA) of which 27 are located in the Gulf Coast. This is very similar to the 2024 report. What has changed significantly are the status of these projects and a series of corporate annoucements, mostly related to pauses, delays, and cancellations, that have dominated hydrogen-related news in 2025.

While the list grew significantly over the last two years, the second half of 2024 and into 2025 has seen a clear slowdown in project momentum, with a growing number of announcements shifting from new developments to project deferrals, scope reductions, or outright cancellations. A closer look at project-level data suggests a growing disconnect between announced capacity and projects that are realistically progressing toward final investment decision. While a number of projects remain listed as “active” in public databases, many have not seen meaningful updates for several years, and should be considered at risk of delay or cancellation. Based on our analysis, close to 50% of blue hydrogen projects in the Gulf Coast still appears active, whereas as much as 80% of green hydrogen capacity (4.6 MTPA vs 1.4 MTPA) is likely delayed, inactive, or shelved.



Source: IEA 2025 map & database

The higher attrition rate of green hydrogen projects reflects not only cost challenges but the complexity of aligning five interdependent systems: power, water, transmission, storage, and demand. Whereas blue hydrogen can leverage existing natural gas supply chains, proximity to established industrial demand, and, in many cases, existing CO_2 transport and storage infrastructure, green hydrogen projects require the simultaneous development of entirely new value chains, making execution significantly more complex at scale.

More fundamentally, the bottleneck is increasingly on the demand side rather than supply. The lack of firm, bankable offtake agreements continues to delay or prevent final investment decisions. While many projects report "offtake discussions," these are often limited to non-binding memoranda of understanding or early-stage agreements that do not provide sufficient revenue certainty. This is not specific to the Gulf Coast. Bloomberg estimated that as of September 2023, only about 7.9 million tons per year of hydrogen was covered by offtake agreements globally, of which only 13% were firm. More recent market evidence suggests that this situation has not materially improved. In practice, binding offtake agreements remain concentrated in a limited set of sectors such as refining, ammonia, and, to a lesser extent, steel, where hydrogen is either already required as a feedstock or supported by regulatory incentives. Outside of these sectors, demand remains largely price-sensitive and uncertain, particularly given that hydrogen in many applications competes directly with electrification alternatives that are often more efficient and lower cost.

3.6 The emerging transatlantic Netherlands-Gulf Coast clean hydrogen corridor

The emergence of large-scale hydrogen trade is increasingly structured around regional corridors linking low-cost production hubs with demand centers. The Netherlands–Gulf Coast corridor is a central focus of this report, reflecting the strong complementarities between the Texas-Louisiana Gulf Coast as a competitive production hub and the Netherlands as a key entry point into the European market. At the same time, comparing this corridor with other emerging international linkages, notably the Japan–Gulf Coast corridor, provides useful insights into how hydrogen markets may develop in practice.

Infrastructure-led development in Europe

The Netherlands is positioning itself as a key gateway for hydrogen imports into Europe, leveraging its established port infrastructure, particularly in Rotterdam and Amsterdam, and its role as a major energy and logistics hub. Several import pathways are being actively developed, including ammonia, liquid hydrogen (LH_2), and Liquid Organic Hydrogen Carriers (LOHC). Recent initiatives, such as the LOHC import corridor between Canada and the Port of Amsterdam, and the planned LH_2 terminal developments, highlight a strategy centered on building flexible import infrastructure capable of handling multiple hydrogen carriers. These developments are complemented by the rollout of a national hydrogen backbone and regional distribution networks, aimed at connecting ports to industrial demand clusters across the country and into neighboring markets. The scale of the Texas–Louisiana Gulf Coast system is particularly relevant for Northwest Europe because large import infrastructure requires aggregated, reliable volumes. European midstream operators and infrastructure developers, including those building hydrogen backbone networks and import terminals, depend on sufficient throughput to justify capital deployment. The Gulf Coast can support the scale needed to justify downstream infrastructure such as ammonia cracking capacity in Rotterdam and onward transport through the Delta Rhine Corridor toward German industrial demand centers.

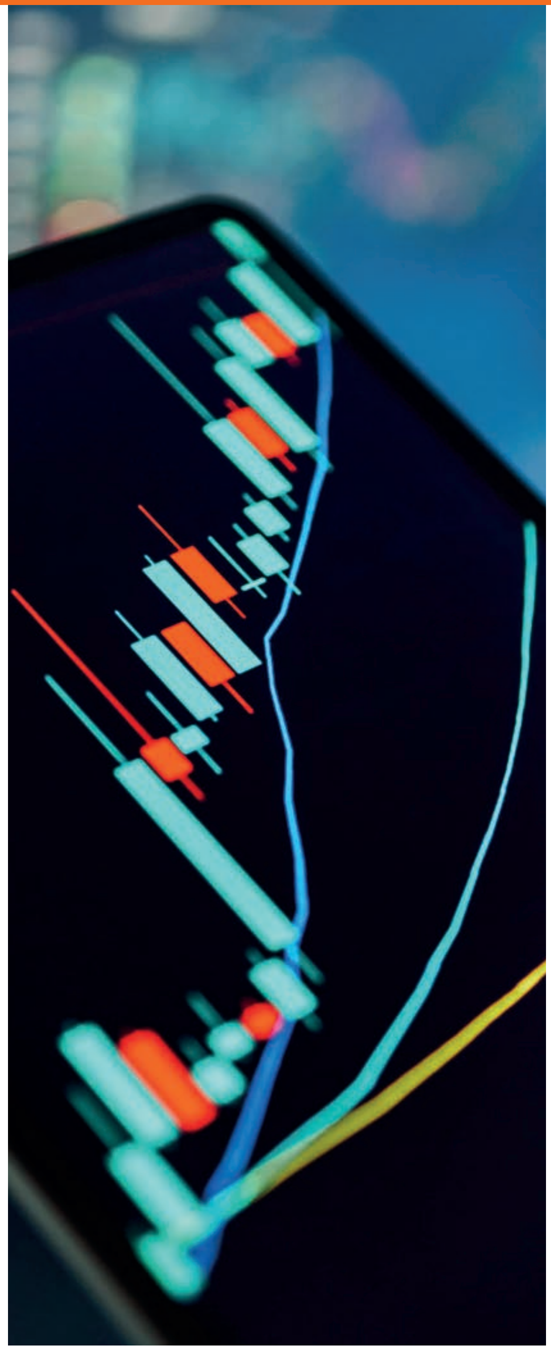
This infrastructure-led approach is strongly supported by European policy frameworks, including RED III and associated certification schemes, which aim to define and stimulate demand for renewable hydrogen. However, while significant progress has been made on infrastructure and regulation, the pace of demand materialization remains uncertain, particularly given the stringent requirements for green hydrogen and the limited number of firm offtake agreements observed to date.

Policy frameworks and demand uncertainty

A key enabler of transatlantic hydrogen trade may lie in the alignment between U.S. production incentives and European regulatory requirements. The carbon intensity tracking required to qualify for the 45V tax credit in the U.S. can provide much of the data discipline needed to satisfy European certification requirements under RED III. In practice, U.S. producers optimizing for 45V eligibility may also be building the measurement, verification, and traceability systems required by European buyers. This alignment could reduce one of the major barriers to trade and provide a practical pathway for early export projects.

Beyond regulatory alignment, the development of a functioning transatlantic hydrogen market will also depend on the ability to bridge the gap between physical infrastructure and certification requirements. European regulation currently relies on mass balancing, which requires physical connectivity between production and consumption. However, hydrogen infrastructure—particularly backbone pipelines—will only be fully operational in the early 2030s.

In this context, emerging market frameworks such as those being developed in the Netherlands, including HyXchange (see 8.3), play a critical role. These systems aim to enable price formation, certification, and trading mechanisms—such as temporary book-and-claim approaches—that allow markets to function despite incomplete infrastructure. This creates a potential pathway for Gulf Coast hydrogen imports to access European markets even before full physical integration is achieved.



Demand-led model: Japan–Gulf Coast corridor

In contrast, the emerging Japan–Gulf Coast hydrogen corridor appears to be developing along a more demand-driven and vertically integrated model. Japanese utilities and trading houses have taken early positions across the value chain, investing in upstream production while simultaneously developing downstream applications. Notably, as mentioned earlier, utilities such as JERA are actively piloting the use of ammonia as a fuel, including piloting co-firing in existing coal-fired power plants, thereby creating a tangible and scalable source of demand for imported hydrogen derivatives. This approach provides greater visibility on future revenues and supports earlier investment decisions.

This model bears strong similarities to the early development of the LNG market, where demand from Japan and other Asian economies anchored long-term supply contracts and enabled the buildout of integrated supply chains. By securing demand and aligning it with upstream and midstream investments, these projects were able to reach final investment decisions more rapidly and at scale.

By comparison, the European model, while robust in terms of infrastructure development and policy support, remains more exposed to demand-side uncertainty. The absence of sufficient firm, bankable offtake agreements continues to delay project execution, despite the availability of supply and the rapid advancement of import infrastructure. In this context, the development of multiple carrier options, including ammonia, LH_2, and LOHC, reflects both a strength in flexibility and a response to the absence of a clearly dominant pathway.

Both approaches are likely to play a role in shaping the global hydrogen market. The Netherlands–Gulf Coast corridor offers a highly structured and policy-backed pathway into Europe, while the Japan–Gulf Coast corridor provides a useful reference for demand-led market formation. Early evidence suggests that, in the current environment, models that align supply with committed demand may enable faster project realization and reduce execution risk.

Supply chains

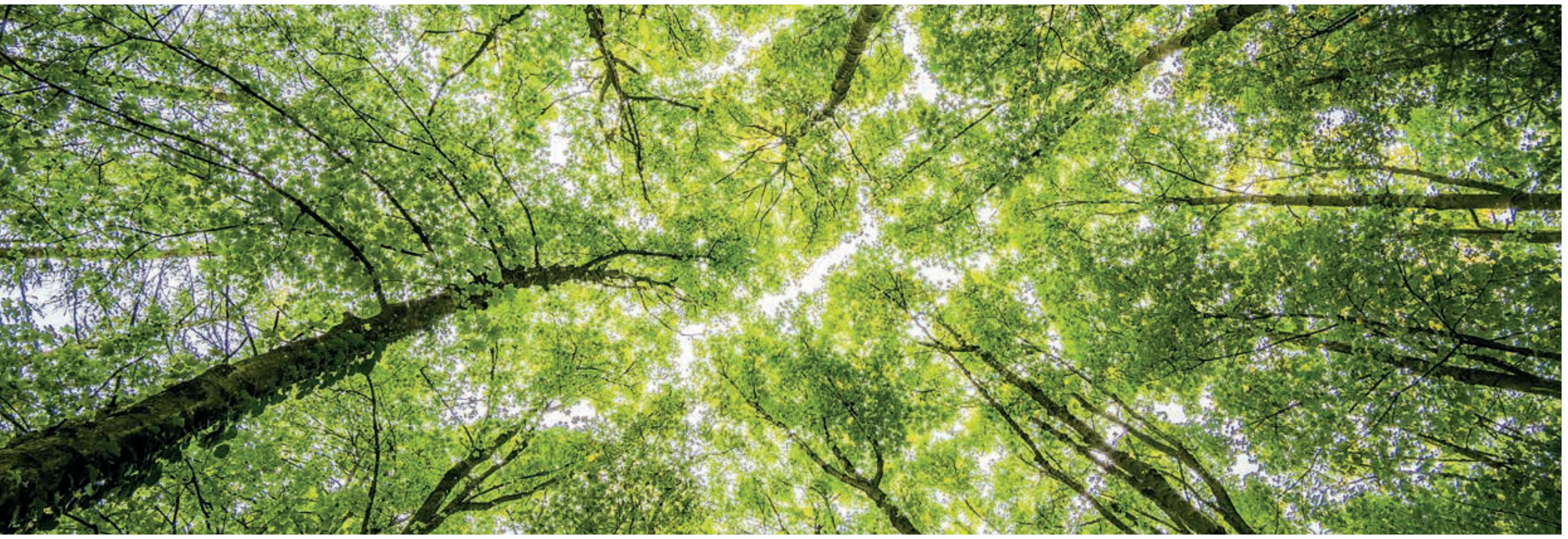
Regardless of market approach and regulatory framework, the long-term scalability of the transatlantic hydrogen corridor will also depend on the resilience of underlying technology supply chains. Key components of the hydrogen value chain, including electrolyzers, renewable power systems, and power electronics, depend on critical minerals and, in some cases, rare earth elements with concentrated global supply. This creates both a risk and an opportunity for collaboration. Dutch capabilities in system integration, technology optimization, and reduction of material intensity can complement Gulf Coast scale advantages in energy and infrastructure. As such, the Texas-Louisiana Gulf Coast and the Netherlands are not only linked through potential hydrogen trade flows, but also through shared challenges in securing and scaling the technologies that underpin the hydrogen economy.

3.7 Conclusion

The Texas–Louisiana Gulf Coast stands out as one of the most advantaged regions globally for clean hydrogen development, combining low-cost energy, extensive infrastructure, favorable geology, and a dense industrial base. These structural strengths support both green and blue hydrogen pathways and position the region as a scalable production and export hub.

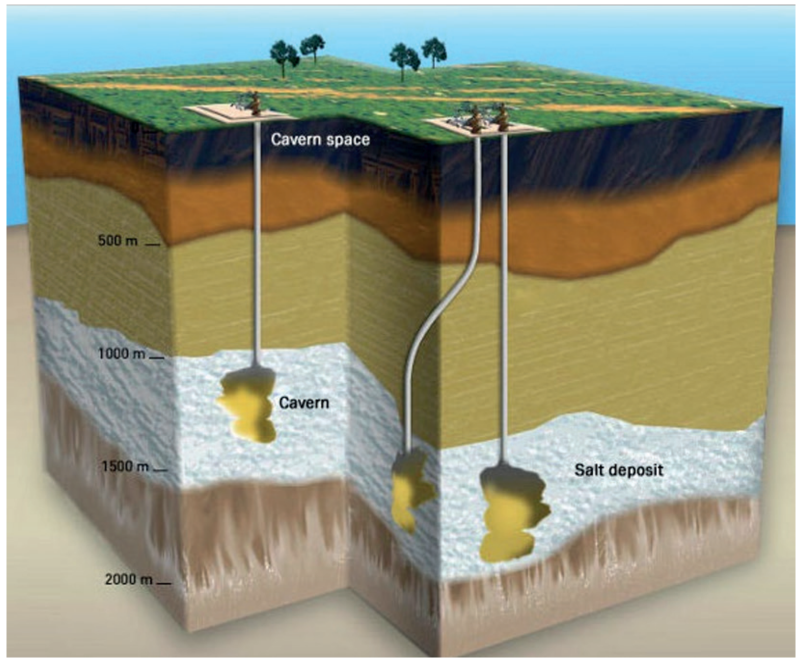
At the same time, the primary constraint has shifted from supply fundamentals to market development. While infrastructure, resources, and technology are largely in place, the absence of firm, bankable demand, particularly in export markets, continues to delay investment decisions and slow project realization.

As a result, the challenge is no longer technical feasibility but system alignment: connecting production, storage, transport, and end-use demand into viable, integrated value chains.



4. Deep-dive: salt cavern storage - the infrastructure backbone

Salt cavern storage is a key enabler of large-scale hydrogen systems, providing the flexibility required to balance production and demand. More fundamentally, it acts as a critical “midstream shock absorber”, addressing the structural mismatch between variable renewable energy production and the continuous, baseload requirements of industrial demand and export markets.



How companies store natural gas in underground salt caverns
Source: Oil & Gas Watch, news item May 30, 2024

As hydrogen production expands, the ability to store hydrogen at scale becomes essential to ensure continuity of supply and efficient system operation. This is particularly relevant in Texas, where large-scale wind and solar resources are concentrated in the western part of the state, while industrial demand and export terminals are located along the Gulf Coast, hundreds of miles away. In the Gulf Coast, favorable geology, extensive industrial infrastructure, and proximity to major demand centers combine to make salt cavern storage a foundational component of the emerging hydrogen ecosystem. This builds on decades of experience in underground storage, originally developed for hydrocarbons and strategic reserves, and now increasingly applied to hydrogen.

4.1 Geological fundamentals

Salt cavern storage builds on a long history of underground energy storage. Canada was among the pioneers in using salt caverns for hydrocarbon storage as early as the 1940s, and this approach was subsequently adopted and expanded in the United States. Over the decades, energy companies have developed extensive expertise in using naturally occurring rock salt formations to create underground storage for hydrocarbons, forming the technical and operational foundation for today's hydrogen storage applications.

One of the most prominent examples is the U.S. Strategic Petroleum Reserve (SPR). The SPR stores more than 700 million barrels of crude oil in 60 salt caverns at 4 locations along the Gulf Coast. Individual caverns can reach considerable dimensions with storage capacities ranging from 6 to 37 million barrels per cavern with the typical one holding 10 million barrels in a vertical cylinder 200 feet wide (ca. 60m) and 2,500 feet high (ca. 750m). For perspective, a single cavern of that size would represent roughly 16 days of throughput at the largest refinery in the United States.

Salt caverns are created through solution mining, where water is injected into the salt formation to dissolve it and the resulting brine is extracted, leaving a controlled underground void, that can be filled with natural gas or other petroleum products. The process allows operators to tailor cavern size and shape to storage requirements. Salt's physical properties make it particularly suitable for hydrogen storage: its extremely low permeability limits leakage, while its self-healing behavior allows fractures to close over time under geostatic pressure. In addition, salt is chemically inert with hydrogen, reducing risks associated with reactivity. Liquid hydrocarbons are typically withdrawn by pumping in brine to force the product upward. However, for hydrogen gas, operators generally utilize pressure-differential cycles, where high-capacity compressors inject gas to build pressure, and withdrawal is achieved by allowing the compressed gas to expand out of the cavern into the pipeline system.

4.2 Technical design and operations

Salt cavern storage systems are typically located at depths ranging from several hundred to over a thousand meters, depending on geological conditions. Individual caverns can store significant volumes of hydrogen, making them suitable for large industrial applications. A portion of the stored gas is retained as cushion gas to maintain pressure and cavern stability, while the remainder constitutes working gas available for injection and withdrawal.

Surface installations include compression systems, gas treatment units, and pipeline connections linking storage sites to production facilities and end users. Compression plays a central role in operations, as hydrogen must be injected at high pressure and withdrawn efficiently to meet demand. Hydrogen in salt caverns is typically stored at pressures in the range of approximately 70 to 200 bar, depending on cavern depth and geomechanical constraints, with operations maintained within a defined pressure window to ensure structural integrity and efficient cycling.

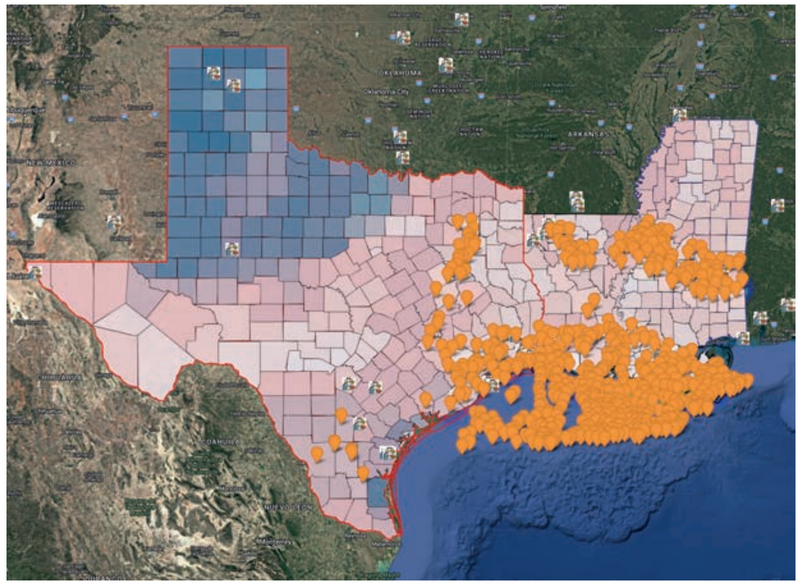
Hydrogen presents specific challenges for transport and storage due to its low volumetric energy density and its tendency to leak. As a result, part of the hydrogen value chain may involve conversion into carriers such as ammonia, which can be liquefied at relatively moderate conditions (−33.1°C at atmospheric pressure) and transported more efficiently over long distances. However, such conversion pathways require a continuous and reliable hydrogen supply.

In this context, salt cavern storage plays a critical role by enabling stable hydrogen availability despite variability in production, particularly when linked to intermittent renewable energy sources. Caverns can support both frequent injection and withdrawal cycles, allowing them to balance supply fluctuations while ensuring continuity for downstream processes, including hydrogen conversion and industrial use.

The Gulf Coast benefits from extensive integration between storage sites and existing infrastructure, including pipelines, gas processing facilities, and export terminals. Locations such as Mt Belvieu near Houston illustrate how salt cavern storage, combined with infrastructure connectivity, has enabled the development of major hubs for LPG processing, storage, and trading, a model increasingly relevant for hydrogen.

4.3 Texas-Louisiana Gulf Coast context

The Texas–Louisiana Gulf Coast represents one of the most favorable regions globally for the development of salt cavern hydrogen storage. The area combines extensive salt dome formations with a dense concentration of hydrogen demand, particularly in refining, petrochemicals, and ammonia production.



Each orange dot represents one of the 589 salt domes along the Gulf Coast. Source: State of Texas Advanced Resource Recovery (STARR)

The scale of the geological resource is significant. More than 500 onshore and offshore salt domes have been identified along the Gulf Coast. Each dome is unique and can accommodate dozens of caverns, often in the range of 60 to 70 per formation depending on its structure and development.

This translates into substantial storage potential. A study conducted by the STARR program at the University of Texas estimated, in a base scenario, that approximately 368 TWh of energy could be stored across 2,550 caverns within 98 domes, representing roughly 82% of Texas' annual electricity generation. These figures illustrate the scale at which underground storage could support the development of large hydrogen systems.

Looking ahead, the scale of storage required to support a fully developed hydrogen economy is substantial. Estimates suggest that Texas alone could require between approximately 1 and 2 mln tons (MT) of geological hydrogen storage by 2035 to support production levels of around 8 mln tons per annum (MTA). By 2050, as hydrogen production potentially scales toward 20 MTA or more, storage requirements could increase to approximately 3 MT. These figures illustrate that storage is not a marginal component of the system, but a core infrastructure requirement necessary to ensure reliability, enable continuous export flows, and support industrial demand.

The Gulf Coast combines extensive salt formations, established energy infrastructure, and a dense industrial base. Alongside this, the development of carbon capture and storage (CCS) across the region supports low-carbon hydrogen pathways. Together, these elements create a highly integrated environment for hydrogen production, storage, and use, enabling efficient scaling of hydrogen value chains.

4.4 Safety and risk

Salt cavern storage benefits from decades of operational experience in storing hydrocarbons and industrial gases. The primary risks are associated with well integrity and surface installations rather than the caverns themselves. Proper well design, construction, and monitoring are essential to ensure containment and long-term performance.

Hydrogen introduces additional technical considerations, including its small molecular size and potential effects on certain materials. These require careful engineering choices, particularly in well completions and surface equipment. Monitoring and leak detection systems must also be adapted to hydrogen's properties.

Overall, salt cavern storage is considered a safe and reliable solution when designed and operated according to established industry standards. Existing experience in the Gulf Coast provides a strong foundation for further deployment.

4.5 Regulatory landscape

The development of salt cavern storage in the United States is governed by both state and federal regulations. In Texas and Louisiana, state authorities oversee underground storage permitting and operations, while the Environmental Protection Agency regulates subsurface injection through the Underground Injection Control (UIC) program.

Project development involves environmental assessments, engineering validation, and permitting processes that can extend over several years. Key considerations include brine disposal, environmental impact, and land use. The regulatory framework benefits from long-standing experience with hydrocarbon storage, although hydrogen-specific applications may require further clarification as deployment scales.

Compared to Europe, where regulatory frameworks are often more fragmented, the Gulf Coast offers a relatively mature environment for large-scale underground storage development.

4.6 Linkage to the Netherlands and European demand

Salt cavern storage could play an important role in enabling the connection between Gulf Coast hydrogen production and European demand, particularly through the Netherlands. As Europe advances its decarbonization strategy, hydrogen imports are expected to complement domestic production, especially in industrial sectors.

The Netherlands is positioning itself as a key hydrogen import and distribution hub, leveraging its port infrastructure, gas networks, and experience in energy logistics. In this context, large-scale storage capacity on the production side supports reliable supply for export and helps manage variability in production. This reliability is essential to support continuous export operations, including liquefaction, conversion (e.g. ammonia), and terminal loading, which require stable and predictable supply flows rather than intermittent production tied to renewable generation.

By enabling the aggregation and buffering of hydrogen volumes, salt cavern storage contributes to the stability and efficiency of transatlantic supply chains, supporting the development of a structured corridor between the Gulf Coast and Northwest Europe.

4.7 Strategic implications

As hydrogen systems scale, storage infrastructure becomes a critical component of system design. Salt cavern storage combines high capacity with operational flexibility, making it well suited to support industrial demand, system balancing, and export logistics.

In the Gulf Coast, the integration of storage with production, transport, and end-use infrastructure enables a more resilient and efficient hydrogen system. It allows production to be optimized independently of consumption patterns and supports the scaling of hydrogen volumes required for both domestic use and international trade.

Crucially, while many regions globally may offer competitive hydrogen production potential, few combine this with the geological capacity required for large-scale, flexible storage. This gives the Gulf Coast a structural advantage in delivering the reliability and scale required by international markets, including the Netherlands and broader Northwest Europe.

5. Dutch expertise and innovations in hydrogen

5.1 The Dutch hydrogen program and strategy

The national hydrogen program of the Netherlands (“Nationaal Waterstof Programma” NWP) aims to accelerate the development of a sustainable hydrogen ecosystem. The program involves collaboration between public and private parties and seeks to give hydrogen a central role in the energy transition. Key elements of the NWP include:

Holistic approach
The program connects all aspects of the hydrogen value chain, including production, transport, distribution, storage, and applications.

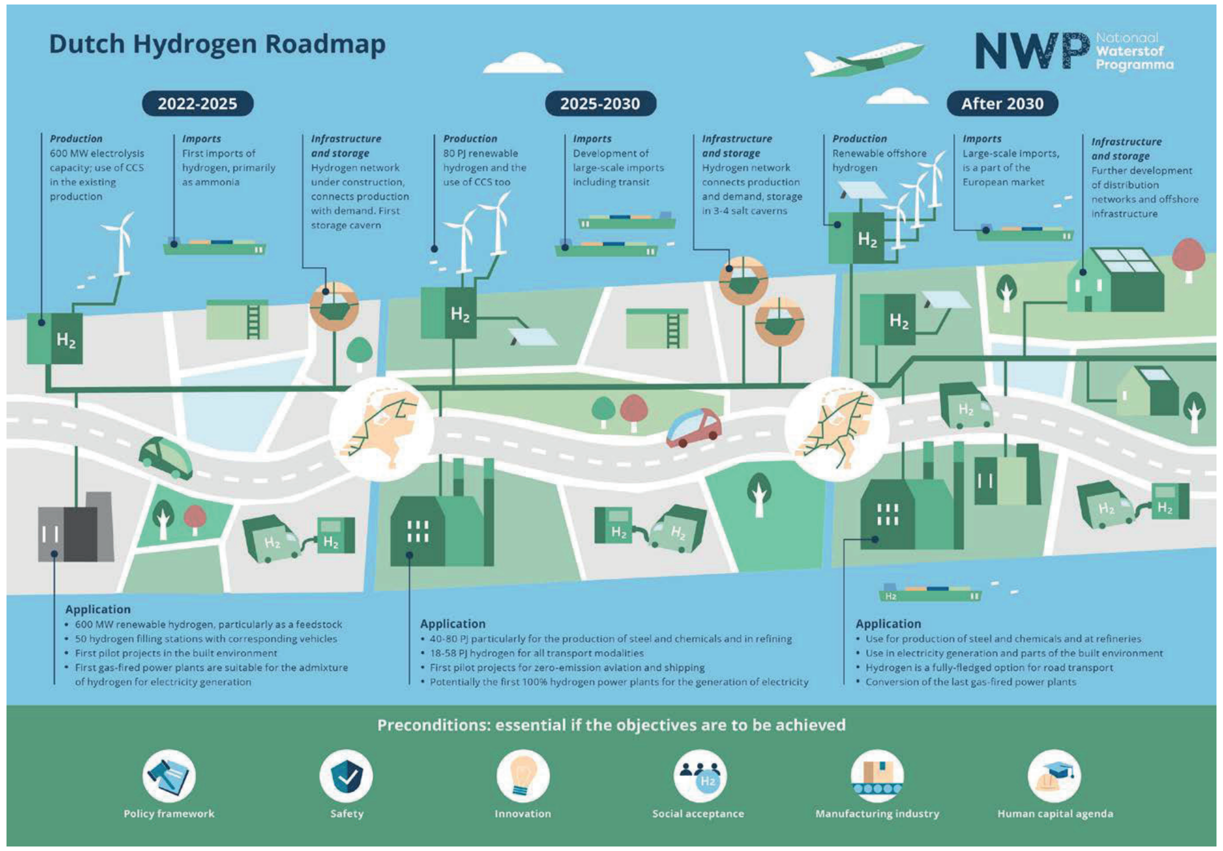
Innovation and research
Promoting research and development of hydrogen technologies to reduce costs and improve efficiency.

Infrastructure
Promoting investment in infrastructure to ensure a reliable and safe hydrogen supply.

International cooperation
Encouraging collaboration with other countries to exchange knowledge and experience and strengthen the global hydrogen market.

Roadmaps

The National Hydrogen Roadmap (Routekaart Waterstof, 2020) outlines the Dutch national strategy and how a broad group of stakeholders aims to make progress in the coming years to achieve the Netherlands' hydrogen ambitions and climate goals. It involves both public and private parties that have committed to the National Hydrogen Program (NWP). This roadmap has been further detailed in the National Plan Energy System (NPE – Nationaal Plan Energiesysteem) which is currently under review.



Source: National Hydrogen Roadmap (Routekaart Waterstof)

Another valuable resource is the Dutch Hydrogen Map (Waterstofkaart). It was originally developed by Mission H2 NL and EnergyInnovationNL. Mission H2 NL is a coalition of Dutch companies and government entities which recently changed to NederlandWatertsofland.NL with new partners. Their goal is to position the Netherlands as a leading hydrogen nation by 2030. EnergyInnovationNL focuses on driving the energy transition. It facilitates collaboration in the field of innovation between public and private stakeholders to achieve rapid and effective results.

This comprehensive and up-to-date Hydrogen map highlights the various hydrogen initiatives and projects currently underway in the Dutch hydrogen sector. Moreover, the interactive map offers a unique opportunity to travel through time to see the development of the Netherlands as the Hydrogen Country 2030. Check out the hydrogen map here.

Dutch Hydrogen Map (Waterstofkaart)

5.2 Incentives and participation in product auctions

The government of the Netherlands has implemented several initiatives to support its hydrogen market. Through these measures, the Netherlands actively fosters its hydrogen market, aligning with European efforts to promote renewable hydrogen production and utilization.

Subsidy schemes for hydrogen production

The Dutch government offers subsidies to bridge the cost gap between renewable hydrogen and fossil-based alternatives. For instance, a recent €998 million scheme supports large-scale renewable hydrogen production, covering both investment and operational costs (source: RVO), for example the Shell HH1 project that is currently under construction. It is expected that this subsidy will be continued in 2026 or 2027 with a budget of €500 million.

Collaborative auctions with Germany

In partnership with Germany, the Netherlands will host a joint auction to import RFNBO compliant hydrogen, utilizing the H2Global mechanism. Both countries have committed €300 million each to procure RFNBO hydrogen from international suppliers, aiming to stimulate the hydrogen market and ensure competitive pricing (source: Hydrogen Insight).

Infrastructure support

The Dutch government supports the development of a national hydrogen infrastructure through the Hydrogen Backbone, led by Gasunie. This network repurposes a large share of existing gas pipelines to transport hydrogen between industrial clusters and across borders. Backed by €750 mln in public funding to cover start-up losses, the first phase is expected to be operational by 2026 and the full network by 2033 (source: Gasunie). Financial support is available as well to stimulate the development of the first salt caverns for underground hydrogen storage.

Subsidies for hydrogen equipment manufacturing

The Dutch government offers subsidies covering up to 15% of eligible costs for companies establishing facilities to produce electrolyzers and other green hydrogen components. In designated EU regional aid areas, this subsidy can increase to 20% (source: Hydrogen Europe).

Hydrogen mobility subsidy scheme

Between 2024 and 2028, the Netherlands has allocated €125 mln to promote hydrogen-powered vehicles and infrastructure. This program subsidizes up to 80% of the price difference between hydrogen and diesel vehicles and covers 40% of the construction costs for new hydrogen refueling stations. (sources: Electrive and RVO). Consult also the most recent RVO report on RFNBO-certification process.

The recent shift of attention toward stimulating the offtake side has led to the development of a new instrument in the Netherlands to stimulate demand in industry. The demand subsidy will be implemented beginning in 2027 and has a reserved budget of €662 mln. In addition, a new instrument for hydrogen hubs is under development. €125 mln will be allocated to support the development of small-scale hydrogen hubs (up to 15 MW electrolyser projects connected in hubs).

5.3 Dutch ports: relations to U.S. ports and the hydrogen ecosystem

Port of Rotterdam

The Port of Rotterdam has been actively collaborating with counterparts in the Gulf Coast to establish a Clean Hydrogen Atlantic Corridor, aiming to commence the transportation of clean hydrogen molecules by 2027. This initiative is part of the broader Transatlantic Clean Hydrogen Trade Coalition (H2TC), which aspires to facilitate the trade of over three million metric tons of hydrogen annually, in forms such as ammonia and methanol, between the U.S. Gulf Coast and Northwestern Europe by 2030.

In February 2021, the Port of Rotterdam and the Port of Corpus Christi signed a Memorandum of Understanding (MoU) to collaborate on energy transition initiatives and strengthen their role as key hubs in future transatlantic energy supply chains. Their cooperation includes efforts to reduce carbon footprints, for example through the deployment of carbon capture and storage technologies, the use of hybrid, electric, or hydrogen-powered vehicles in port operations, and the introduction of incentives for vessels that exceed environmental standards.

Beyond these operational measures, the MoU also aims to advance hydrogen initiatives and foster partnerships with industrial players on both sides of the Atlantic. While it does not establish immediate trade flows, it reflects a clear strategic intent to develop the infrastructure, capabilities, and relationships required to enable future trade in hydrogen and its derivatives between the U.S. Gulf Coast and Europe.[7]

Nine terminals have now announced plans to import hydrogen through the Port of Rotterdam, using carriers such as ammonia, LOHCs, LH_2, and (e-)SAF. In Europe, Rotterdam port closely collaborates with Duisport in Germany and the Port of Antwerp in Belgium on hydrogen initiatives.

In 2020, the cities of Rotterdam and Houston signed an MoU to strengthen economic collaboration between their energy hubs and ports. This partnership led to a digital trade forum in October 2020, focusing on energy transition topics such as hydrogen application, CO_2 capture, and digital technologies in the energy sector. The MoU between Rotterdam Partners and the Greater Houston Partnership aimed to support companies in starting up, expanding, and investing in both cities. Ongoing discussions have been taking place since as there is interest in continuing the economic ties with collaboration in the energy sector.

Port of Amsterdam

In 2022, the Port of Amsterdam signed an MoU with Evos and Hydrogenious to explore the development of a green hydrogen import facility based on Liquid Organic Hydrogen Carrier (LOHC) technology. Since then, the project has evolved, with North Atlantic emerging as a key partner. The company is developing a hydrogenation plant in Newfoundland and Labrador (Canada), alongside plans for a corresponding dehydrogenation facility in the Port of Amsterdam. The Amsterdam-based dehydrogenation facility and import terminal is being developed in collaboration with Evos, leveraging existing terminal infrastructure to enable an efficient LOHC import corridor.

7. Source: Horizons Hydrogen Hub

The timeline for LOHC imports is increasingly aligned with the development of supporting hydrogen infrastructure in the Netherlands, including the national hydrogen backbone (HyNetwork Services) and regional distribution networks such as H2avennet (developed by Firan). Initial operations are currently foreseen around the beginning of the next decade, subject to these interdependencies (2029-2030).

Alongside LOHC-based developments, EcoLog works on the development of a liquid hydrogen (LH_2) import facility in Amsterdam. The EcoLog Terminal Amsterdam is expected to become operational in Q4 2030, with a first phase annual throughput capacity of 200,000 tonnes of LH_2. The terminal will have the ability to deliver hydrogen in gaseous form, through two pipeline systems, or as a liquid via barge, rail or truck, to industrial and mobility end users in the Netherlands and Germany. EcoLog offers a fully integrated midstream, as the company also develops its own LH_2-carriers.

Port of Eemshaven (Northern Netherlands)

Europe's first official Hydrogen Valley, known as HEAVENN (Hydrogen Energy Applications for Valley Environments in Northern Netherlands), is situated in the northern Netherlands. This initiative plays a crucial role in the European energy transition, aiming to establish an integrated green hydrogen value chain encompassing production, distribution, storage, and utilization across six locations: Eemshaven, Delfzijl, Zuidwending, Emmen, Hoogeveen, and Groningen. Supported by European subsidies and a consortium of 31 public and private entities from six European countries, the northern Netherlands is well-positioned to play a leading role in the sustainable energy supply of the near future.

5.4 The hydrogen pipeline corridors towards Belgium and the German hinterland

Dutch National Hydrogen network: HyNetwork

HyNetworkServices, a 100% subsidiary of Gasunie (the Dutch Transmission System Operator), is responsible for creating the national hydrogen network in the Netherlands. This network will connect five key industrial clusters—located at the ports of Rotterdam, Amsterdam, Northern Netherlands, Zeeland, and Geleen/Chemelot. Ultimately, the EU Hydrogen Backbone will connect with the Port of Antwerp, and beyond that with key locations in Germany, and other countries. It will also link to hydrogen storage facilities and import locations.

The hydrogen network is being developed partly through the retrofitting of existing natural gas pipelines. In locations where existing pipelines are insufficient or unavailable, new construction will occur.

The hydrogen backbone is crucial for the connection between industrial clusters in the Netherlands and the locations where hydrogen will be stored. Also in the Northern Netherlands, at Zuidwending, 4 to 6 large empty salt caverns are projected to be used as seasonal storage for hydrogen; the first salt cavern for hydrogen is expected to be ready by 2030.

Connections to Germany and Belgium

The Delta Rhine Corridor (DRC) is a crucial East-West link connecting the Rotterdam industrial cluster to the Eastern part of the Netherlands and to Germany. The DRC is expected to be operational in 2032, based on high probability planning. The ambitious infrastructure project is designed to establish a network of underground pipelines for transporting hydrogen and CO_2 between Rotterdam, Moerdijk, Geleen, and into Germany. The project's complexity arises from its integrated approach, aiming to install multiple pipelines and cables within a single corridor.

In June 2024, the Dutch Ministry of Economic Affairs and Climate Policy announced a delay in the DRC's timeline, shifting the expected completion from 2028 to 2032. This postponement is attributed to the intricate coordination required for the simultaneous installation of diverse infrastructures and the alignment of procedures between the Netherlands and Germany. Nevertheless, when compared with the expected start dates of large export projects, this timeline does not present a constraint. In the meantime, projects can rely on existing transport modalities such as shipping, rail, and trucking.

Belgium and the Netherlands collaborate in WaterstofNet, a knowledge and collaboration platform promoting hydrogen technology and system development. It supports and implements hydrogen projects through partnerships with industry, research institutions, and governments. The organization focuses on four key areas: fostering a hydrogen network, serving as a knowledge center, developing projects, and advising governments on hydrogen policies. WaterstofNet advocates for hydrogen's role in transportation, industry, and energy storage with projects and coordinates initiatives like RH2INE, a European network that aims to establish a zero-emission transport corridor along the Rhine.

5.5 The strengths of Dutch industry sectors

Kickstarting the hydrogen economy necessitates significant investments in supply and infrastructure, alongside establishing a stable demand for hydrogen applications. Dutch researchers and companies are exploring various uses of hydrogen, focusing on those that can substantially reduce carbon emissions.

Mobility

In mobility, Dutch innovations are targeting transportation modes where electrification is less feasible, such as shipping and long-distance trucking. Plans include introducing 150 hydrogen-powered barges over the next 10 years, establishing hydrogen bunkering stations along key European shipping routes, hydrogen-fueled buses and trucks, range extenders for electric vehicles, and the technology needed for hydrogen refueling stations. As of 2025, more than 20 hydrogen retail stations are in operation.

Residential heating

For residential heating, traditional gas-fired systems are being phased out in favor of sustainable alternatives. While newer homes utilize solar energy and heat pumps, older homes may benefit from hydrogen, utilizing adapted existing gas infrastructure. The Netherlands has a strong ecosystem of condensing boiler manufacturers who are investing heavily in transitioning from natural gas to hydrogen. Several have marketed models suitable for gas mixtures with up to 30% hydrogen and have showcased 100%-hydrogen boilers. Others are working on technology that would allow existing gas-fueled condensing boilers to be retrofitted for use with hydrogen. Several demonstration projects are currently running to test how hydrogen works in practice. That said, even if the technology proves viable, large-scale deployment would likely not occur before 2040. For now, options like district heating, heat pumps, and geothermal energy are deemed more practical.

Power infrastructure

As reliance on renewable energy grows, developing flexible power infrastructure is crucial. This includes converting gas power plants to operate on hydrogen and creating storage solutions to manage fluctuations in renewable energy supply. Other innovations include flexible electrolyzers that can be used for grid balancing, frequency containment or - combined with fuel cells for example - as emergency power systems.

High temperature applications

In industrial processes, hydrogen is poised to play a vital role in high-temperature applications traditionally reliant on fossil fuels. The Netherlands goal is to adapt industrial burner systems and ensure they can deal with hydrogen's somewhat different combustion characteristics to achieve significant reductions in CO_2 and other emissions. Additionally, hydrogen, when combined with CO or CO_2, provides opportunity to produce synthetic fuels and sustainable bulk chemicals, such as methanol, alkenes and aromatics.

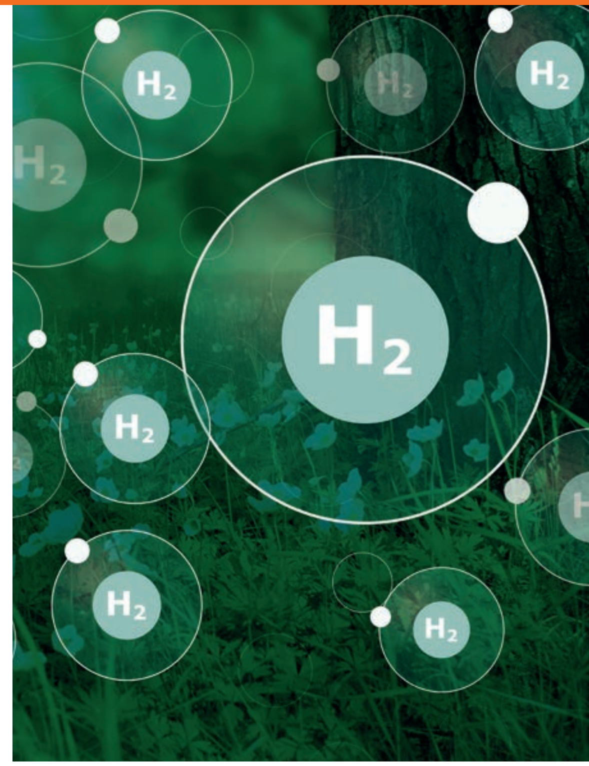
5.6 Dutch R&D efforts with innovations in the hydrogen ecosystem

The Netherlands plays a significant role in the hydrogen economy with innovative projects and collaborations advancing the energy transition. Through initiatives like GroenvermogenNL, the Netherlands has set a clear ambition to act as a hydrogen hub. Supported by the National Growth Fund, GroenvermogenNL is investing €838 million in public funds to scale up technology and innovation in hydrogen and green chemistry. This approach focuses on developing national and international hydrogen supply chains, positioning the Netherlands as a central hub. Key priorities include expanding electrolyzer capacity, improving hydrogen infrastructure, and accelerating technological innovation through pilot projects.

The Netherlands is a frontrunner in hydrogen R&D, which can be determined from the number of patents registered in the country. In Europe, the Netherlands is the second largest applicant for green hydrogen patents, according to research by the European Patent Office and the International Energy Agency. Large multinationals as well as small start-ups are responsible for this great power of innovation in the Netherlands.

Dutch R&D efforts applicable to the hydrogen supply chain

Hydrogen at sea:
TNO and its partners are developing the PosHYdon project, an offshore hydrogen production platform. The initiative aims to produce hydrogen directly from offshore wind energy in the North Sea, which is becoming increasingly populated with wind turbines. This pilot project is the first of its kind globally and serves as a crucial foundation for future large-scale hydrogen production. It consists of a gas production platform located 13 kilometers (8 miles) off the coast of Scheveningen. The existing oil and gas installations are being expanded with an electrolyzer that converts seawater into green hydrogen using electricity from an adjacent wind farm. The hydrogen is then mixed with natural gas and transported to land via existing gas pipelines. This combination of offshore wind energy, offshore hydrogen production, and existing natural gas infrastructure is unique. Mixing the hydrogen with natural gas allows for easier integration into the existing energy grid. While still in the testing phase, the first hydrogen is expected to flow through the gas pipelines in 2026.



Hydrogen in the city:
The small city of Stad aan 't Haringvliet, with approximately 600 houses, aims to connect to a green hydrogen network. A few enthusiastic residents initiated this project and are achieving concrete results. In 2022, the first house was taken off natural gas and connected to hydrogen for heating via the existing gas infrastructure. This initiative has garnered support from various stakeholders, including grid operator Stedin, housing corporations, and the municipality. The Dutch government has also provided 5.6 million euros in subsidies. The city aims to transition to 100% hydrogen to reduce its carbon footprint and contribute to national sustainability goals. To achieve this, a village council was formed to ensure community involvement. The village council established a 70% approval threshold for residents and business owners, a requirement for Stad aan 't Haringvliet to become the first city heated entirely with hydrogen. This high threshold ensures strong community support (in the summer of 2024, more than three quarters of residents voted in favor of the project) and commitment to the project's success.

Hydrogen production:
In the port of Rotterdam (Tweede Maasvlakte), Shell is constructing one of Europe's largest green hydrogen plants. The plant, Holland Hydrogen I, will utilize power from the offshore wind turbine park Hollandse Kust Noord, which is partly owned by Shell. A 200-megawatt electrolyzer will produce 60,000 kilograms of green hydrogen daily. The plant incorporates several innovative features, including a futuristic design and a visitor's center housed in a distinctive wooden tower. The hydrogen will be used for various applications at nearby chemical plants and oil refineries. It is expected to be operational in 2026. The green hydrogen will supply the Shell Energy and Chemicals Park Rotterdam via the HyTransPort pipeline.

The hydrogen will partially decarbonize the production of energy products such as gasoline, diesel, and kerosene by replacing some of the gray hydrogen currently used at the refinery. As the market expands to include more hydrogen trucks and a growing network of hydrogen refueling points for heavy transport, the supply of green hydrogen can contribute to the decarbonization of road transport.

Hydrogen in mobility:
Dutch ports are pioneering the use of hydrogen-powered vessels for sustainable transportation. In Rotterdam, a hydrogen-powered water taxi has been operating since the beginning of 2023. This twelve-person boat was developed by a consortium of Dutch companies, including innovation developer Enviu, Watertaxi Rotterdam, and the start-ups Flying Fish and ZEPP.solutions. This collaboration enabled the companies to design and launch the first hydrogen-powered water taxi. While initially the port lacked the infrastructure to refuel the boat with hydrogen regularly, it is now fully operational with regular passengers.

The Port of Amsterdam is also at the forefront of hydrogen-powered shipping with the Neo Orbis, the world's first hydrogen-powered ship using sodium borohydride ($NaBH_4$) as a solid hydrogen carrier. This innovative ferry operates by reacting $NaBH_4$ with ultrapure water onboard to produce hydrogen on demand. The released hydrogen is converted into electricity via a fuel cell, enabling completely emission-free propulsion. Sodium borohydride offers significant safety and storage advantages over gaseous hydrogen due to its stability and compactness. This technology could revolutionize maritime transport by providing a safe and efficient way to power vessels with zero emissions.

5.7 Specific competencies and innovations of Dutch SMEs

Not only the large companies, but especially also small and medium-sized enterprises (SMEs) in the Netherlands are driving advances in hydrogen technology. They contribute niche expertise in electrolysis efficiency, storage solutions, and flexible hydrogen applications. Supported by GroenvermogenNL, many of these SMEs are accelerating the scaling of electrolysis capacity and refining processes to reduce the use of critical materials. A recent example is the H_2 Experience Center, opened in December 2024 by the Dutch Minister of Climate and Green Growth in Kootwijkerbroek. This unique Dutch electrolyzer design developed by XINTC is the first all-plastic gas module (stack) without critical materials. This design will enable mass production at lower costs (unlike normal electrolyzers) thanks to cheaper parts and be nearly maintenance-free.

Dutch SMEs play a critical role in strengthening the hydrogen value chain. The Netherlands is known for its integrated approach across diverse sectors, and this is also true in the hydrogen domain. Large-scale projects often combine specialized knowledge and technological innovations from SMEs, enabling them to act as crucial players in advancing hydrogen solutions on a global scale. These companies contribute to the development and implementation of innovative technologies, ensuring that the Netherlands remains at the forefront of the hydrogen transition.

Innovative solutions

Dutch SMEs excel in creating innovative solutions for hydrogen production and storage. Companies like Battolyser B.V., Desu Systems B.V. and HyET Hydrogen B.V. in the storage space are integral to the development of efficient electrolyzer technologies and advanced storage systems, ensuring scalability and reliability in the various hydrogen supply chains. SMEs also contribute to retrofitting existing infrastructures, such as pipelines, to accommodate hydrogen, enhancing the transition to renewable energy sources. Companies like Groningen Seaports, Fluor, gAvilar B.V., and Demaco Holland B.V are some examples of Dutch players focusing on infrastructure.

SMEs are also instrumental in integrating hydrogen into mobility solutions, such as emission-free transport systems and infrastructure like fueling stations. In industrial sectors, they contribute specialized components and technologies that enable hydrogen use in processes such as energy generation and manufacturing, helping reduce emissions. Example of companies like Ekinetix B.V., Holthausen, Resato, NXT Mobility and ZEPP solutions are active in this mobility solution space.

Through participation in public-private initiatives and innovation programs, Dutch SMEs are closely aligned with government policies promoting the hydrogen economy. These collaborations support the development of technologies that are adaptable to diverse markets and ensure SMEs remain competitive and innovative.

5.8 Key Dutch sectors and innovations with potential to succeed in the Texas-Louisiana Gulf Coast market

The Netherlands is well-positioned to contribute to the hydrogen sector in the Gulf Coast with unique capabilities and innovations that align with the 2 states' hydrogen growth ambitions. According to the Netherlands Enterprise Agency (RVO, part of the Ministry of Economic Affairs and Climate Policy) report 'Excelling in Hydrogen – Dutch Technology for a Climate Neutral World', the Netherlands' hydrogen sector is strategically integrated, enabling collaboration across multiple areas, including offshore hydrogen production, electrolysis, and infrastructure development.

The Dutch focus on green hydrogen production technologies and their expertise in regulatory frameworks further enable them to address specific challenges in the Gulf Coast market, such as reducing carbon emissions and meeting environmental standards. With the two states' ambition to lead in hydrogen, these Dutch capabilities could strengthen the Gulf Coast's hydrogen infrastructure, from production and storage to distribution and regulatory compliance, thus facilitating the state's goal of becoming a leader in the hydrogen economy.

Key Dutch innovation sectors and companies:

- Large-scale hydrogen production and infrastructure, and (offshore) hydrogen generation using wind power are led by large (non-SME) organizations like Shell, TSO Gasunie, and TNO. This is a model highly relevant to the Gulf Coast's offshore capabilities. This innovation aligns with the region's goals for diverse energy sources and robust infrastructure integration.
- Dutch SMEs bring specialized solutions in areas like electrolysis efficiency, flexible hydrogen storage, and transport, making them well-suited to support Texas' hydrogen projects with tailored, scalable solutions. Innovative Dutch SME's are mentioned in the report 'Excelling in Hydrogen – Dutch technology for a climate neutral world' by RVO – (For a complete overview of Dutch companies in the Hydrogen space, consult Appendix 8.6).

5.9 Specific focus: liquid hydrogen

In the domain of liquid hydrogen (LH_2), Dutch companies and research institutions are advancing key technologies in transport and storage, which hold strong potential for the Gulf Coast markets. A selection of Dutch companies related to LH_2 (liquid hydrogen) in the storage and transportation realm:

Cryovat

Cryovat International B.V. is a Dutch company that designs and manufactures a wide range of products for industrial gases and liquids such as Hydrogen (LH_2), LNG, LCO_2, LOX, LIN. With more than 65 years of experience in custom cryogenic storage tanks, transport tanks (ISO containers), vaporisers for liquid gases, water batch and pressure build up equipment. While serving worldwide clients, we are still a family-owned business with corresponding company culture, personally involved in every project, quick to respond to customer requests, and set a high bar in terms of product innovation and quality. Cryovat collaborates with engineering firm Hadetec to deliver complete storage systems, ASU's and provides repair services to maintain the integrity and performance of cryogenic equipment. Being a part of the Rootselaar Group, Cryovat combines Dutch craftsmanship with international reach, delivering high-quality solutions tailored to client specifications.

Cryoworld

Cryoworld BV is a Dutch engineering company specializing in the design and manufacture of advanced cryogenic systems for liquefied gases, including liquid hydrogen. Founded in 2012, Cryoworld has established itself as a key player in the field of cryogenics, serving industries such as aerospace, big science/research, and energy. In the realm of liquid hydrogen, Cryoworld is involved in several notable projects, such as AeroDelft Project Phoenix, NLR Collaboration and ICEFlight Consortium. Next to this Cryoworld cooperates with major gas suppliers and deliver them the hardware for numerous applications (flexible and rigid transfer lines for liquid hydrogen, vent stacks). We have built equipment ranging from 500l (35kg) storage dewar to a rocket test bench with LH_2 for DLR. Our latest development is that we now build a liquid hydrogen liquefier for small scale testing with liquid hydrogen at laboratories. Through these initiatives, Cryoworld is actively contributing to the development and implementation of liquid hydrogen technologies, supporting the transition to a sustainable energy future. In the vision of Cryoworld liquid hydrogen is an essential part of the solution to provide sustainable energy to high energy consuming mobile applications, and we want to accelerate this development by providing solutions that simply work safely.

Demaco

Demaco is a leading specialist in the design, manufacturing and installation of cryogenic infrastructure for the conditioning, control and transport liquefied gases such as liquid hydrogen (LH_2), liquid helium (LHe) liquid nitrogen (LIN), liquid Argon (LAR) and liquid oxygen (LOX). The company provides Vacuum insulated equipment (phase separators, subcoolers, degassers, valves, valve boxes) and vacuum insulated transfer lines (rigid, multiple and flexible) that ensure the safe and efficient handling of cryogenic fluids at extremely low temperatures. In the field of liquid hydrogen, Demaco develops custom cryogenic infrastructure for industrial, aerospace, and research applications, including LH_2 transfer lines for refueling and testing systems. The company also supplies instrumentation and monitoring systems that maintain thermal efficiency and safety across hydrogen storage and distribution processes. Through collaborations with partners in Europe and beyond, Demaco plays a key role in enabling the liquid hydrogen supply chain, supporting the transition toward a clean hydrogen economy.

Ekinetix

Ekinetix is a Dutch technical consultancy and engineering services company specializing in high-pressure compressed- and liquid hydrogen, CO_2 utilization and storage (CCUS). The company provides deep expertise from experience in the development and implementation of hydrogen infrastructure, including green hydrogen production, storage systems, and logistics solutions. Ekinetix has been involved in many pioneering hydrogen projects across Europe, such as the realization of blueprint hydrogen refueling stations for road and maritime applications. Ekinetix' designed MEGC trailers recently gained a lot of attention for world record payload capacity and proven robustness in the industrial gases business. For the professional hydrogen industry, Ekinetix offers state-of-the-art industrial hydrogen trailer filling solutions up to 50MPa. For the Porthos CO_2 project, Ekinetix specialists take care of one of the most complex engineering tasks, gas analysis. In 2024, Ekinetix became a member of Ballast Nedam Group, enhancing its capabilities in delivering sustainable energy solutions. The company's commitment to innovation and sustainability positions it as a key player at the forefront in the transition to a fossil-free energy system.

Futura Composites

Futura Composites is a Dutch specialist in fibre-reinforced composite materials, recognized for their expertise in designing and manufacturing custom industrial components. The company employs advanced production techniques such as filament winding, prepreg molding, and resin infusion to create lightweight, durable, and thermally stable structures. These capabilities are particularly relevant in the development of composite structural components working at cryogenic temperatures like tanks for liquid hydrogen (LH_2) storage, cryostats, formers for superconducting coils, suspension bands. Composites offer significant weight savings and thermal insulation advantages over traditional metallic materials. Futura Composites has contributed to research initiatives focused on developing composite LH_2 tanks for civil aviation, aiming to enhance the efficiency and sustainability of hydrogen-powered aircraft. Their involvement in these projects underscores their commitment to advancing hydrogen technologies and supporting the energy transition.

J. de Jonge Group

J. de Jonge Group is a family-owned company EPC contractor specializing in mechanical and piping systems, loading technologies, storage tank services and specialized industrial equipment. The company designs, builds, and maintains infrastructure for complex industrial systems, including installations related to gases and energy carriers. Within LH_2 activities, the company develops innovative solutions for safe, efficient storage and transport, including marine loading arms enabling large-scale hydrogen import and distribution.

KIWA

Kiwa is a leading global provider of testing, inspection, certification, consultancy, and training services, with a strong emphasis on the energy sector. In the field of hydrogen, Kiwa offers a comprehensive range of services, including testing and certification of components for hydrogen vehicles, refuelling stations, and industrial applications. Their expertise extends to both gaseous and liquid hydrogen systems, providing support for the development and implementation of safe and efficient hydrogen technologies. Kiwa's involvement in liquid hydrogen includes R&D activities and testing of components such as cryogenic valves, pumps, and storage systems, as well as the development of safety solutions like boil-off gas management systems. We have a state-of the art laboratory for testing with LH_2 transport, mobility, industrial, space, and aviation applications. This also includes material characterisation. Through their extensive experience and global presence, Kiwa plays a pivotal role in advancing the hydrogen economy and supporting the transition to sustainable energy solutions

PD Gas Technology

PD Gas Technology is a Dutch industrial wholesaler specializing in gas technology, with over 30 years of experience in the field. The company offers a wide range of products and services tailored to various industries, including hydrogen applications. Key Involvements in Liquid Hydrogen:

- Hydrogen Equipment Supply: PD Gas Technology provides equipment for hydrogen applications, including components for gas mixing and analysis, which are essential for the safe handling and utilization of liquid hydrogen.
- Calibration and Certification Services: The company has calibrated and certified over 10,000 devices, ensuring the accuracy and reliability of instruments used in hydrogen systems.
- Partnerships with Industry Leaders: PD Gas Technology collaborates with renowned manufacturers such as WITT, GSR Ventiltechnik, and Rotarex, providing access to high-quality components for hydrogen applications.

Through these initiatives, PD Gas Technology contributes to the development and implementation of safe and efficient liquid hydrogen systems, supporting the transition to a hydrogen-based economy.

Pro Control

Pro Control Process Automation B.V. specializes in designing and implementing process control systems and data acquisition systems for research and production installations. With over 30 years of experience, the company collaborates closely with European plant builders to execute turnkey projects, particularly in high-pressure and high-temperature environments. Their expertise spans electrical and instrumentation engineering, software development, and automation solutions. Key Involvements in Liquid Hydrogen:

- Automation Systems for Hydrogen Applications: Pro Control provides automation solutions for various hydrogen-related applications, including gasification plants. Their systems encompass a wide range of valve sizes and stroking times, ensuring precise control in critical processes such as hydrogen production and handling.
- Collaboration with Industry Leaders: The company works alongside European plant builders to design and construct complex research installations, integrating process, chemical, mechanical, and electrical engineering disciplines. This collaborative approach ensures the development of advanced systems for hydrogen research and production.
- Turnkey Project Execution: Pro Control offers turnkey solutions, handling the complete project lifecycle from design to implementation. This includes revamping existing systems and providing servicing and calibration for instrumentation, ensuring optimal performance in hydrogen-related operations.

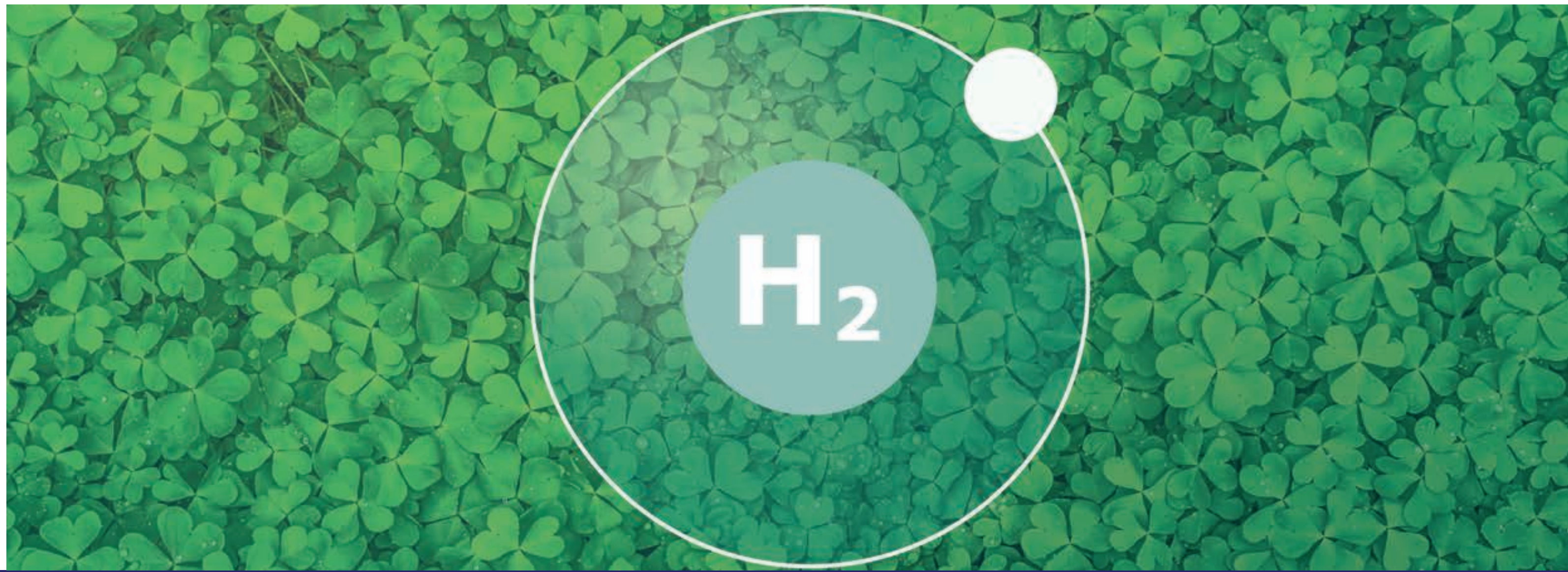
Through these initiatives, Pro Control Process Automation B.V. contributes to the advancement of liquid hydrogen technologies, providing critical automation and control systems that enhance the efficiency and safety of hydrogen production and utilization.

Somni Solutions

Somni Solutions specializes in the development and manufacture of high-performance fiber optic sensors, particularly those based on Fiber Bragg Grating (FBG) technology. These sensors are known for their robustness, long lifespan, and immunity to electromagnetic interference, making them ideal for challenging environments. In the context of liquid hydrogen, Somni Solutions is actively involved in several initiatives:

- Hydrogen Leak Detection: Somni has developed a fiber optic hydrogen leak detector capable of sensing molecular hydrogen leaks at concentrations as low as 0.1% in normal atmospheric conditions. This sensor operates passively without electronics, enhancing safety in hydrogen-rich environments. It has been evaluated for safe use at hydrogen concentrations up to 30% and remains operational even after exposure to such levels
- H_2 Sensible Project: In collaboration with industry partners and the Dutch Ministry of Infrastructure and Water Management, Somni Solutions is part of the H2 Sensible project. This initiative aims to determine the technical, economic, and social impacts of fiber optic sensing in environmental safety, focusing on hydrogen leak detection methodologies.
- Liquid Hydrogen Composite Tank Development: Somni Solutions is contributing to the development of a composite liquid hydrogen tank for commercial aircraft. Their role includes designing and producing fiber optic sensors for cryogenic level, pressure, and temperature measurements, as well as hydrogen leak detection. This project involves collaboration with organizations such as NLR – Netherlands Aerospace Centre and Toray Advanced Composites

Through these projects, Somni Solutions is playing a significant role in advancing the safety and efficiency of liquid hydrogen systems, particularly in aerospace and industrial applications.



Stirling Cryogenics

Stirling Cryogenics is a leading specialist in stand-alone cryogenic cooling systems, with a legacy dating back to 1954 as part of Philips. The company has developed the Stirling Cryogenerator, enabling temperature production ranging from -75°C to -250°C. In the field of liquid hydrogen, Stirling offers systems for both production and reliquefaction of LH_2. Their liquid hydrogen plants utilize two-stage Stirling Cryogenerators to liquefy hydrogen gas, with capacities ranging from 5 kg/day to 2,000 kg/day. These systems are designed for modular integration, allowing scalability and flexibility in various applications. Additionally, Stirling's technology is employed in hydrogen boil-off gas (BOG) management, where cryogenerators are used to reliquefy evaporated hydrogen, enhancing storage efficiency and reducing emissions. Stirling Cryogenics' solutions are particularly suited for decentralized hydrogen production, such as at solar and wind farms, and are utilized in research, aerospace, and industrial sectors worldwide.

TNO

TNO is an independent research organization with the mission to create impactful advancements for the wellbeing and prosperity of society. TNO is active in the societal challenges: a healthy society, a sustainable society, a digital society and a society that is safe & secure. In all these domains TNO has activities that involve Hydrogen. The many scientific expertise areas, fields of application and specialised research infrastructures work complementary with each other to advance developments that answer client's needs. Hydrogen is an essential component for a sustainable energy infrastructure and TNO is actively involved in the application of hydrogen in areas such as maritime, aviation, industries and defence. As part of TNO's Safety & Material testing expertise, TNO possesses the expertise and infrastructure to conduct assessments using its Liquid Hydrogen test facility. Here TNO can safely store liquid hydrogen and conduct tests in a controlled environment, where clients can observe the process. The facility for example supports:

- the development of electric propulsion system for aircraft powered by liquid hydrogen
- the safety and integration of cryogenic tank, designed for the safe storage of liquid hydrogen
- experiments with liquid hydrogen
- assessments and trainings for liquid hydrogen safety and handling

With these efforts, TNO plays a pivotal role in advancing the development and implementation of liquid hydrogen technologies, contributing to the global transition towards sustainable energy systems.

Ventil

A family-owned business in the valve industry since 1954, Ventil has evolved into a specialist provider of pressure test and repair equipment for valves and other pressure-containing components. From its manufacturing facilities in the Netherlands, the USA, and the UAE, Ventil supplies to various energy and oil & gas companies, inspection bodies, valve manufacturers, and service providers worldwide. Ventil frequently delivers cryogenic test benches rated down to −196°C for LNG applications, where design validation testing and quality control are essential to ensure safe, reliable, and effective operation. This experience forms an important foundation for Ventil's work in cryogenic and hydrogen-related developments.

Ventil is currently developing a prototype test bench for liquid hydrogen (LH_2) valves and components, enabling pressure testing under true operating temperature conditions down to −253°C. The focus of this development is testing under realistic LH_2 service conditions, with an emphasis on practical and affordable test processes that can be adopted across the value chain. By lowering the barrier to entry for advanced LH_2 testing, Ventil aims to support improved reliability and integrity of components used in liquid hydrogen applications.

Royal Vopak

Royal Vopak is a leading global provider of independent tank storage services, specializing in the storage and handling of bulk liquids, gases, and chemicals. The company plays a pivotal role in the energy transition by developing infrastructure solutions that support the storage, transport, and distribution of hydrogen and hydrogen carriers. Key Involvements in Liquid Hydrogen:

- International Liquid Hydrogen Corridor: In April 2025, Vopak signed a strategic agreement to establish a joint venture with OTTCO to develop the world's first commercial export corridor for liquefied hydrogen, linking Oman, the Netherlands, and Germany. This corridor will facilitate the transport of liquefied hydrogen from the Port of Duqm in Oman to the Port of Amsterdam, supporting the development of a global hydrogen supply chain.
- Joint development agreement for hydrogen derivatives terminal in Japan: IHI and Vopak signed a joint development agreement for the proposed establishment of a joint venture for the development and operation of an ammonia terminal in Japan.
- Introducing independent infrastructure for storing hydrogen: In India, AVTL (42% Vopak), will develop a brownfield ammonia terminal at the existing Pipavav location. The terminal will be the first independent ammonia storage terminal in India.

Through these initiatives, Royal Vopak is actively contributing to the development of infrastructure that supports the storage, transport, and distribution of liquid hydrogen, playing a crucial role in the global transition to a sustainable energy future.

VSL

VSL is the National Metrology Institute of The Netherlands, designated by the Minister of Economic Affairs. It is responsible for developing and maintaining the national measurement standards, ensuring that measurements in the Netherlands are traceable/have a link to international standards. As a result, VSL is capable of measuring with the required and extreme precision and accuracy. The institute is frequently consulted when crucial decisions with significant (financial) impact rely on independent and validated measurement results. In the context of (liquid) hydrogen (LH_2), VSL is actively involved in several initiatives. Through these and other initiatives, VSL fulfils an essential role in the development of a reliable and standardized measurement infrastructure for (liquid) hydrogen, supporting its integration into various applications and advancing the energy transition.

6. Market access and collaboration opportunities in the Gulf Coast

6.1 Identification of key challenges and opportunities for entering the Gulf Coast markets

While the Gulf Coast, and the U.S. more widely, is an open, business-friendly market, there are a few points to consider. A local presence is advisable, whether through partnership with a local company or a direct presence. Setting up a Limited Liability Company (LLC) in the state of Texas takes less than an hour via the Secretary of State's self-service website and the confirmation comes by generally in less than 24h. In Louisiana, the process is also simple and new companies can be created via the Secretary of State's geauxBIZ website.

Texas does not levy a personal or corporate income tax at the state level. However, businesses are subject to federal taxation, as well as state and local sales taxes, and a "franchise tax" (margin-based) applies above certain thresholds. In Louisiana, businesses are subject to both corporate income tax and a corporate franchise tax, depending on the legal structure.

A key difference between Texas and Louisiana lies in the legal system. While Texas follows common law like the rest of the US, Louisiana operates under a civil law system rooted in its French legal heritage. In practice, this results in some differences in contract structure and legal interpretation, but does not represent a barrier to doing business.

Louisiana offers a range of tax exemptions and incentives, particularly for industrial and energy-related investments, and in some cases these can be more targeted than in Texas.

If a company intends on selling to public entities, some public requests for proposal will require the bidders to ensure a certain percentage of subcontracting will be awarded to MWBE (Minority-and/or Women-owned Business Enterprises). Some public entities are more stringent than others in these requirements (see for example Harris County's Supplier Diversity policy)

In the emerging clean H_2 space, many projects are still in early phase and as of late 2025 - early 2026, MOUs are regularly announced between technology providers and project owners, creating a wide space of opportunities. As this is an area in constant development, consult the IEA database or other sources.

6.2 Networking opportunities, associations, gatherings

Besides attending yearly scheduled conferences (see chapter 10 for a selected list) or joining/following existing associations (also in chapter 10), networking opportunities are numerous and play an important role in the Gulf Coast business environment, where face-to-face interactions are often preferred to virtual introductions.

The different ports generally have monthly meetings and public events (for example the Port of Houston hosts monthly luncheon on various topics), another example is the Port of Corpus Christi whose Commissioner meetings can be attended and watched online. The Greater Houston Partnership organize regularly conferences and events where Energy is often the main focus or a significant part of it. In Louisiana, port authorities such as the Port of South Louisiana and the Port of Greater Baton Rouge publish information on public engagement activities, including board and commission meetings, on their respective websites.

In the last decade, a series of startup incubators have popped up in the different large cities of the region. Most have social and networking events (e.g. the Cup of Joey at Houston's ION District, events organized by the Greentown Labs at ION, those by the Energy Tech Nexus or those by The Beach at UNO in New Orleans. Other incubators offer Education or connect with academia (e.g. Port San Antonio).

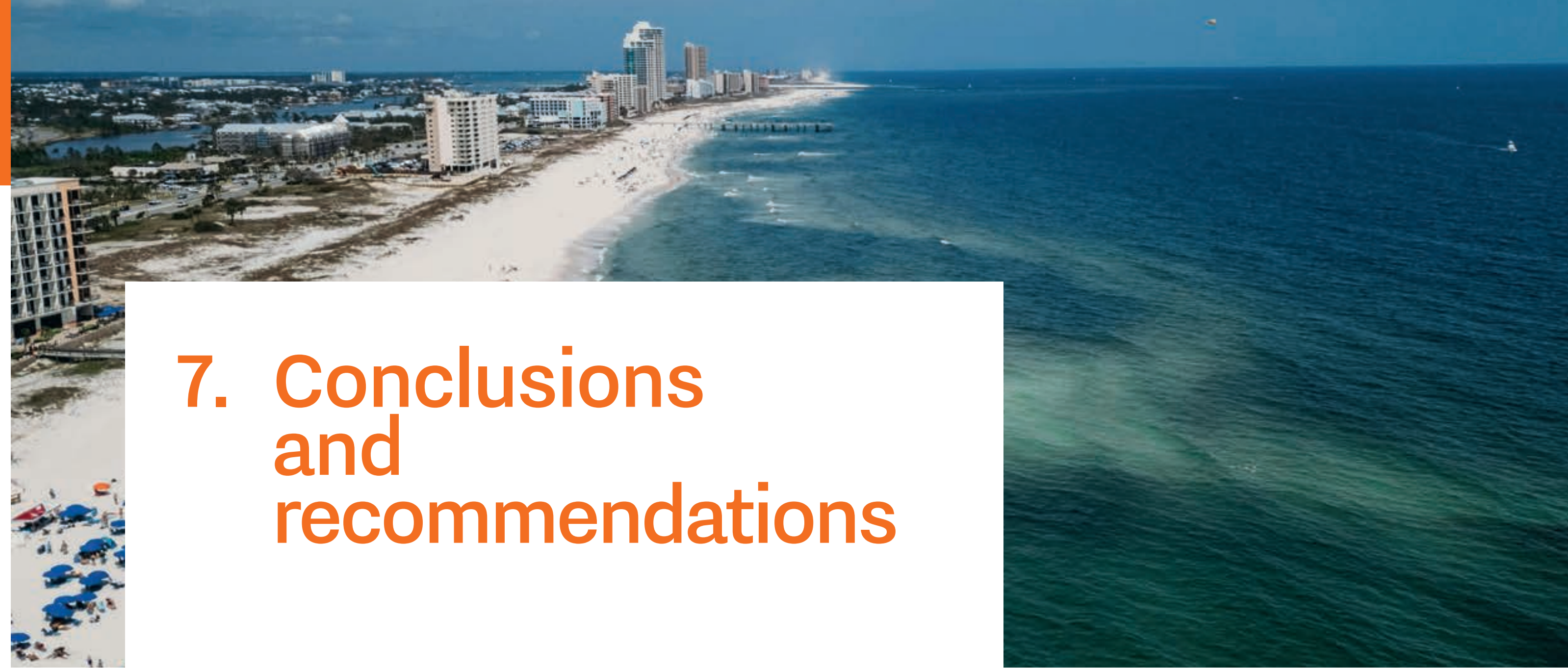
6.3 Potential synergies between the hydrogen value chain and Dutch expertise

While many aspects of the hydrogen value chain are already well-established, with both the Gulf Coast and the Netherlands enjoying decades of experience in areas such as natural gas production and transportation, the burgeoning field of clean hydrogen presents a unique set of opportunities. In this nascent market, technologies and processes are still emerging, creating a dynamic landscape ripe for innovation and competition. This presents a significant opportunity for new entrants, particularly those with specialized expertise and a drive to shape the future of the hydrogen economy.

One area of particular promise lies in the adaptation of existing infrastructure for hydrogen utilization. The conversion of existing natural gas pipelines to accommodate hydrogen transport represents a cost-effective and efficient pathway to leverage existing assets. Similarly, the development of efficient and scalable ammonia cracking technologies for hydrogen end-use is crucial. Furthermore, the exploration of non-NH_3 hydrogen carriers offers another avenue for innovation. These advancements could revolutionize hydrogen storage and transport, unlocking new possibilities for the global hydrogen economy.

In the Gulf Coast, and the U.S. in general, hydrogen liquefaction and retailing are still in their early stages, presenting a unique window of opportunity for companies with established expertise in these areas. Dutch players, with their longer history of utilizing these technologies in Europe, could leverage their experience to gain a competitive advantage in these emerging markets. By capitalizing on their technological edge and adapting their offerings to the specific needs of the Gulf Coast and U.S. markets, Dutch companies can position themselves as key players in the burgeoning clean hydrogen sector.

Technology	GC experience	NL experience
Windpower	Established	Established
Sun power	Established	Established
Large scale batteries	Established	Established
Electrolysis	Established	Established
Electrolysis at scale	Emerging	Emerging
Desalination	Emerging	Established
H_2 pipeline	Established	Established
Pipeline conversion to H_2	Emerging	Established
CCS	EOR mostly	Emerging
Salt cavern H_2 storage	Emerging	Emerging
H_2 liquefaction (large-scale / export)	Emerging	Emerging
H_2 refueling retail infrastructure (mobility)	Ermerging	Established
NH_3 storage	Established	Established
NH_3 transport	Established	Established
NH_3 shipping	Established	Established
NH_3 cracking	Emerging	Emerging
Other H_2 carriers	Emerging	Emerging
H_2 turbine	Emerging	Emerging
Conversion of gas turbine for H_2 blend	Emerging	Pilots
Green resource certification	Ermerging	Established
Critical materials (rare earths & metals)	Emerging	Emerging



7. Conclusions and recommendations

Conclusion

The development of a clean hydrogen economy is often framed in terms of production potential and technological progress. However, the analysis in this report shows that the key challenge is not the availability of resources, but the ability to integrate multiple components into a functioning system.

The Texas-Louisiana Gulf Coast illustrates this dynamic clearly. The region benefits from a unique combination of low-cost energy, extensive industrial infrastructure, carbon storage capacity, and geological advantages for hydrogen storage. These attributes position it as one of the few regions globally capable of producing hydrogen at scale while supporting both domestic use and international exports.

At the same time, the Netherlands is building the infrastructure and regulatory framework required to act as a gateway for hydrogen into Europe. Its ports, logistics networks, and hydrogen backbone projects provide the foundation for distributing imported hydrogen to industrial demand centers across Northwest Europe.

Yet, despite these favorable conditions on both sides of the Atlantic, the transition from potential to reality remains incomplete. The primary constraint is no longer technological feasibility or resource availability, but the absence of sufficient, coordinated demand. Industrial users remain cautious, offtake agreements are limited, and price uncertainty continues to delay final investment decisions.

This reflects a broader structural challenge: hydrogen systems require alignment across multiple interdependent elements, including production, storage, conversion, transport, certification, and end-use. Weakness in any one of these elements can prevent the entire system from scaling.

In this context, the role of large-scale storage emerges as critical. The Gulf Coast's salt cavern resources enable hydrogen to be stored and dispatched at scale, transforming variable production into reliable supply. This capability is essential for supporting continuous industrial demand and export operations.

Equally important is the alignment of regulatory and market frameworks. The convergence between U.S. carbon intensity accounting under 45V and European requirements under RED III provides a pathway for bridging supply and demand across jurisdictions. In parallel, the development of certification systems, pricing mechanisms, and transitional trading models will be necessary to support early market activity before full infrastructure integration is achieved.

The comparison with other emerging corridors highlights the importance of demand visibility and system integration. Regions where supply development is closely linked to defined end-use applications and long-term offtake structures are progressing more rapidly. This suggests that future success will depend not only on cost competitiveness, but on the ability to coordinate supply and demand through vertically aligned value chains.

Ultimately, the Texas-Louisiana Gulf Coast and the Netherlands form a strong foundation for a transatlantic hydrogen corridor. The underlying assets are in place, and the strategic rationale is clear. The next phase will depend on translating this potential into commercially viable systems, where production, infrastructure, and demand evolve together.

The emergence of this corridor should therefore be seen not as an established market, but as a system in formation—one that will require continued coordination between industry, infrastructure developers, and policymakers to reach scale.

Recommendations for Dutch SMEs

1. **Local Presence and Networking:**
Establish a physical presence or partner with local entities to foster trust and navigate the relationship-centric U.S. Gulf Coast markets. Actively participate in industry events and conferences to connect with potential clients and partners.

2. **Strategic Partnerships:**
Forge alliances with established players in the Gulf Coast hydrogen ecosystem, including companies, research institutions, think thanks, and government agencies, to leverage their expertise and networks.

3. **Tailored Solutions:**
Adapt products and services to meet the specific needs and expectations of the Gulf Coast markets, emphasizing niche expertise and value-added solutions. Highlight the economic benefits and job creation potential of your technologies.

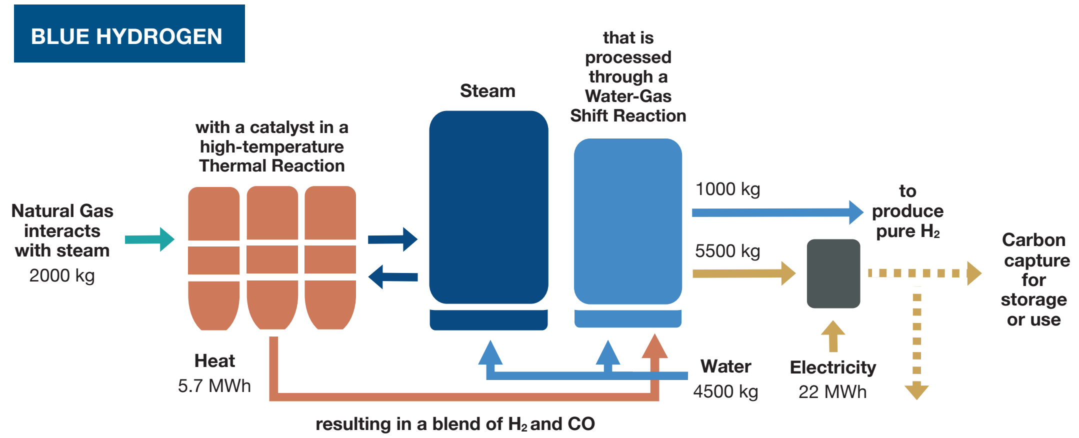
4. **Market Knowledge:**
Stay informed about the latest developments, policy changes, and funding opportunities in the Gulf Coast hydrogen sector. Engage with industry associations and utilize online resources to gather market intelligence.

5. **Flexibility and Adaptability:**
Be prepared to adjust your business strategies and offerings as the Gulf Coast hydrogen market matures and new technologies emerge. Embrace the state's openness to transitional solutions while maintaining a focus on long-term sustainability goals.

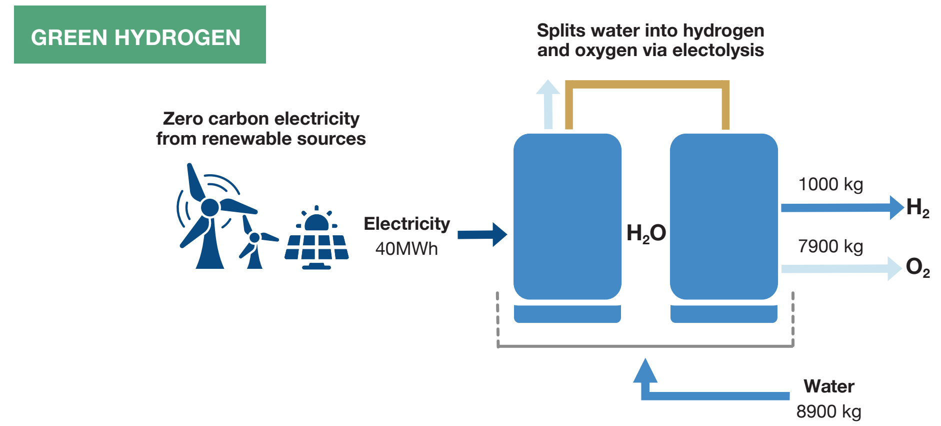
By understanding the U.S. Gulf Coast context and embracing a proactive approach, Dutch SMEs can successfully capitalize on the opportunities presented by the nascent clean hydrogen market and contribute to the global transition towards a sustainable energy future.

8. Appendix

8.1 Select clean hydrogen production pathways and resource balance

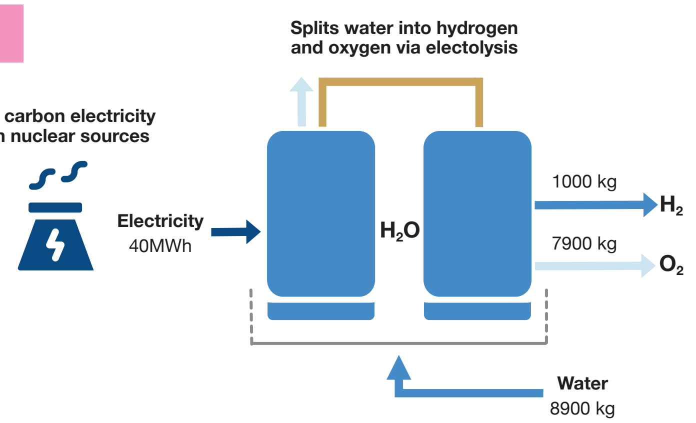


Blue hydrogen production follows the same process as gray hydrogen (i.e., SMR) to the production of pure hydrogen and CO_2. However, blue hydrogen adds a carbon capture unit to the process which requires electricity to facilitate the capture of the CO_2 for storage or utilization.



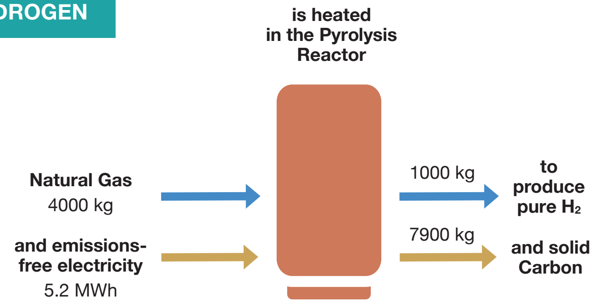
Green hydrogen is produced through the process of electrolysis, where zero-carbon electricity from renewable energy sources is used to split the component atoms of water molecules in an electrolyzer into pure hydrogen and oxygen gas. This process yields no greenhouse gas emissions.

PINK HYDROGEN



Pink hydrogen is produced through the process of electrolysis, where zero-carbon electricity from a nuclear power plant is used to split the component atoms of water molecules in an electrolyzer into pure hydrogen and oxygen gas. This process yields no greenhouse gas emissions.

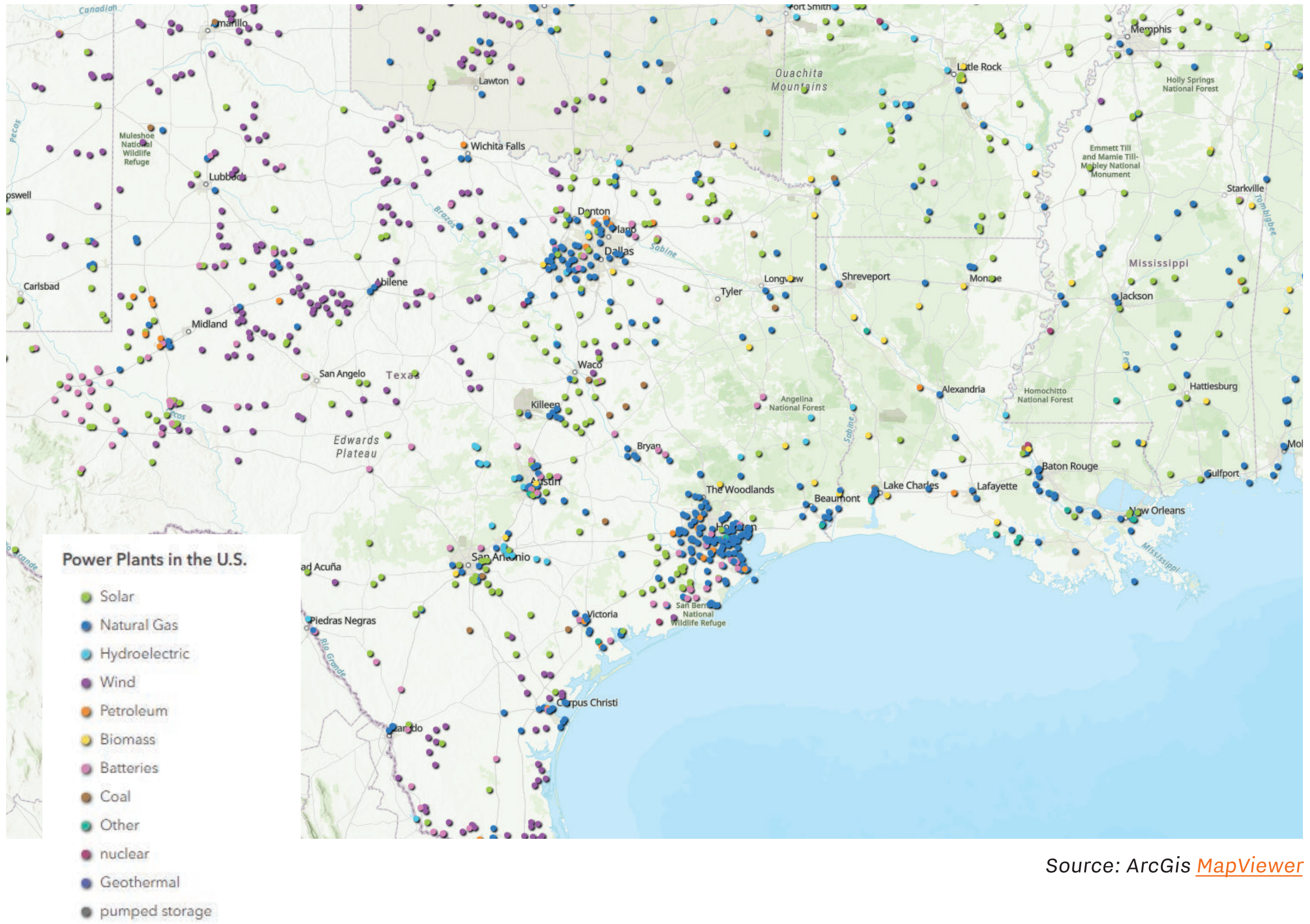
TURQUOISE HYDROGEN



Turquoise hydrogen is produced through methane pyrolysis, which requires inputs of natural gas and low- to zero-emissions electricity. Pyrolysis uses these inputs to produce pure hydrogen gas and a solid carbon byproduct known as carbon black, as opposed to carbon emissions.

Source: The U.S. Hydrogen Demand – [Action Plan by Energy Futures Initiatives]

8.2 Power generation



Source: ArcGis [MapViewer]

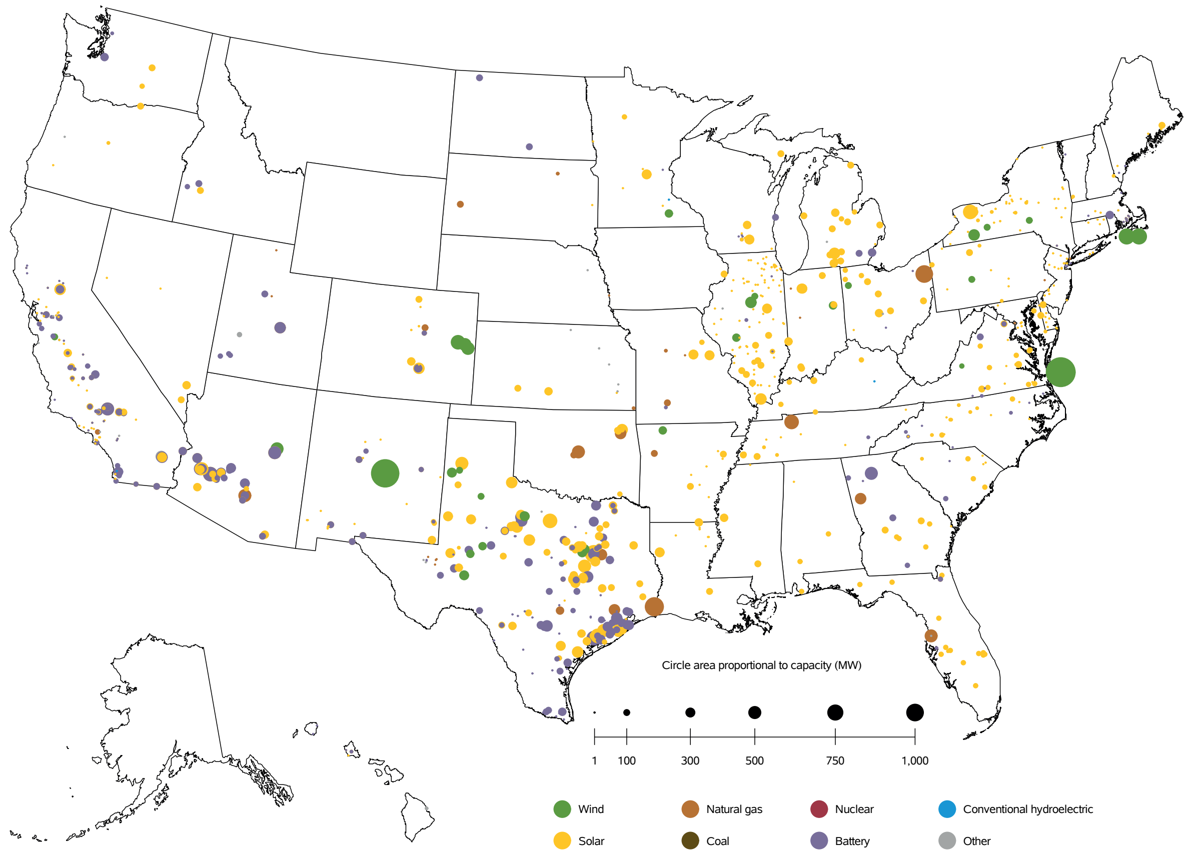
8.3 HyXchange.org

HyXchange is a Dutch initiative focused on developing the market infrastructure required for hydrogen to be traded as a commodity. Its work covers certification (e.g., Guarantees of Origin and sustainability tracking), market design (including spot and balancing mechanisms), and early price discovery through indices such as HYCLICX.

A key feature of the current approach is the temporary use of "book-and-claim" mechanisms, which allow the environmental attributes of hydrogen to be traded independently of physical delivery. This provides a transitional solution in a context where hydrogen infrastructure is not yet fully interconnected.

More broadly, initiatives such as HyXchange illustrate the importance of combining certification, market design, and pricing transparency alongside physical infrastructure in the development of scalable hydrogen markets.

8.4 Utility scale generating units planned to come online Mar 2026 - Feb 2027



Sources: U.S. Energy Information Administration, Form EIA-860, 'Annual Electric Generator Report' and Form EIA-860M, 'Monthly Update to the Annual Electric Generator Report'

Source: EIA, [Report April 2026]

8.5 Water consumption by technology

Technology	Water consumption (kg H_2O/t NH_3)	(kg of CO_2 emitted /t NH_3)	Energy - electricity and heat consumption (kWh/Tonne NH_3)	Efficiency %	Capital cost per ton/day NH_3 capacity
Steam methane reforming coupled with Haber-Bosch	Ca.0.656	Ca.1.8	Ca. 9,500	Ca. 61-66%	500,000
Water electrolysis coupled with Haber-Bosch powered by solar/ wind	Ca. 1.588	negligible	Ca. 12,000	Ca. 54%	700,000

Source: Ghavam S, Vahdati M, Wilson IAG and Styring P (2021): "Sustainable Ammonia Production Processes." Front. Energy Res. 9:580808. doi: 10.3389/fenrg.2021.580808

A recent analysis evaluated traditional ammonia production against its renewable counterpart by examining key factors such as water usage, carbon emissions, energy demands, process efficiency, and capital investment. While it comes as no surprise that renewable ammonia production results in minimal CO_2 emissions, it is noteworthy that this method requires significantly more water than the conventional process. Additionally, both the energy requirements and capital cost are greater for renewable ammonia.

Even though coal or biomass gasification with carbon capture uses more water than ammonia production via conventional natural gas reforming, fossil-based methods still generally maintain a water-use advantage over renewable ammonia pathways.

Source: National Energy Technology Laboratory (NETL)

8.6 List of Dutch companies active in the hydrogen space

	ELECTRICITY	H_2 PRODUCTION	ENGINEERING / INSTALLATION	INFRASTRUCTURE	FLOW SOLUTIONS	STORAGE	MOBILITY	MARITIME	INDUSTRY	BUILT ENVIRONMENT	INFRASTRUCTURE AND STORAGE	RESEARCH / ADVISORY	ASSOCIATION	PAGENUMBER
&Flux												●		40
20K Hydrogen B.V.				●	●		●	●	●		●			40
ABB B.V.	●	●	●	●	●	●	●	●	●	●	●			41
ABC-Techniek B.V.			●		●		●	●	●		●			41
ACE Terminal				●							●			42
Adsensys H2 Solutions		●	●						●		●			42
AECOM Netherlands B.V.	●	●	●	●		●	●	●	●	●	●	●		43
AEG Power Solutions B.V.	●	●	●						●	●				43
Air Liquide B.V.		●	●	●	●	●	●	●	●	●	●	●	●	44
Air Products Nederland B.V.		●	●	●		●	●	●	●	●	●			44
Alkalium B.V.		●	●			●								45
Alles over Waterstof BV							●			●		●	●	45
AMF Bakery Systems B.V.									●					46
Ansaldo Thomassen B.V.									●					46
Antonius				●		●		●	●		●			47
AquaBattery B.V.		●				●		●	●	●	●	●		47
Arcadis			●	●			●		●	●	●	●		48
Atlas Copco			●				●	●	●					48
AVK Nederland B.V.			●		●				●	●	●			49
AVOXT B.V.		●	●				●	●	●	●				49
AWL Techniek B.V.			●						●			●		50
BA2C Europe/Latin America														50
Ballast Nedam	●	●	●	●	●	●	●	●	●	●	●	●	●	51
Battolyser B.V.	●	●	●			●	●		●	●	●			51
Berenschot Groep B.V.												●		52
Bilfinger Engineering	●	●	●	●		●			●		●			52
Bosal Nederland B.V.	●	●					●	●	●	●	●			53
Bosch Rexroth B.V.				●	●	●	●	●	●	●	●			53
Bosch Thin Metal Technologies			●			●	●		●		●	●		54
Bout Hydrogen Consultancy			●	●		●	●	●	●					54
Bredenoord B.V.	●					●	●				●			55
Brigh2		●					●		●			●		55
Bronkhorst Nederland B.V.					●				●			●		56
Brunel														56
Burckhardt Compression Nederland B.V.			●	●		●			●	●	●	●		57
Bureau Veritas		●	●	●		●	●		●	●	●	●		57
Bürkert Fluid Control Systems		●			●		●	●	●	●	●			58
Capgemini			●									●		58
Cenex NL							●					●		59
Circonica Circular Energy B.V.	●	●	●			●	●	●	●	●				59
Clear												●		60
CoheSys												●		60
Connectr Energy Innovation	●	●	●	●	●	●	●	●	●	●	●	●	●	61
Conpacksys			●	●	●	●			●		●			61
Corre Energy Storage B.V.						●								62
Cryoworld B.V.				●	●	●	●	●	●		●	●		62
Danfoss B.V.	●	●		●	●	●		●	●	●	●			63
De Boer Sustainable Project Solutions		●	●	●		●			●		●			63
Deelrijk		●	●	●		●	●	●	●			●		64
Deerns Nederland B.V.		●	●	●	●	●			●	●	●	●		64
Deltalinqs													●	65
Demaco Holland B.V.		●	●	●	●		●	●	●		●	●		65
Demcon Production B.V.		●	●				●		●			●		66
Desu Systems		●				●	●	●	●		●	●		66
Development Agency Noord Holland Noord (ONHN)	●	●	●	●	●	●	●	●		●	●	●	●	67
Development Agency OostNL	●	●	●	●	●		●		●	●		●		67
DLS B.V.			●				●	●	●					68
Doeko B.V.		●	●	●		●		●	●	●	●			68
Douna Machinery		●	●		●	●			●	●		●		69
Drenthe College		●	●	●	●		●	●	●		●	●		69
Duiker Combustion Engineers B.V.			●			●			●	●		●		70
Dumaco Woerden B.V.			●											70
Dutch Boosting Group							●		●	●	●	●		71
Dutch Marine Energy Center	●	●						●	●			●		71
Duurzaam Energie Perspectief		●	●	●		●	●		●	●	●	●		72
DWG			●	●		●		●	●					72
E&E advies												●		73
Eekels Technology B.V.	●					●		●	●		●	●		73

Source: Dutch solutions for a hydrogen economy, pages 36-39

NBSO Texas

	ELECTRICITY	H_2 PRODUCTION	ENGINEERING / INSTALLATION	INFRASTRUCTURE	FLOW SOLUTIONS	STORAGE	MOBILITY	MARITIME	INDUSTRY	BUILT ENVIRONMENT	INFRASTRUCTURE AND STORAGE	RESEARCH / ADVISORY	ASSOCIATION	PAGENUMBER
Ekinetix B.V.		●	●	●		●	●	●	●	●		●		74
Ekwadraat advies B.V.												●		74
ElecHydro B.V.		●												75
Elestor B.V.		●				●			●	●				75
E-Lions H2 B.V.		●	●				●							76
Eltacon Engineering B.V.	●	●							●		●			76
Emerson		●	●		●		●	●	●		●	●		77
Emmett Green	●	●	●	●		●	●	●	●	●		●		77
Enablemi												●		78
Endress Hauser					●									78
Enercy B.V.			●	●								●		79
Energy Storage NL													●	79
ENGIE	●	●			●		●	●	●	●		●		80
EnginX	●	●	●	●	●	●	●	●	●	●	●			80
ENI		●		●		●					●			81
EnTranCe		●	●	●	●		●	●	●	●	●	●		81
EoxTractors B.V.							●		●	●				82
Erez Energy		●					●		●					82
Eriks B.V.					●			●	●			●		83
E-Trucks Europe B.V.							●							83
Ernst & Young												●		84
Feenstra Verwarming B.V.			●							●				84
Festo			●		●				●					85
Fijnmechanische Industrie Noord-Nederland Finn B.V.		●					●	●				●		85
Firan				●										86
Fluidwell B.V.		●	●	●	●	●	●	●	●	●			●	86
Fluor		●	●	●	●	●			●		●	●		87
FME												●	●	87
Fountain Fuel				●			●							88
Fujifilm		●										●		88
Future Proof Shipping							●	●	●	●		●		89
Gasunie				●		●					●			89
gAvilar B.V.			●	●					●	●		●		90
Georg Fischer N.V.		●		●	●			●	●		●			90
Green Energy Park Global B.V.		●		●		●			●		●			91
Greenwise Campus Innovatiecentrum		●	●	●	●		●		●	●		●		91
Groene Hart Werkt													●	92
Groningen airport Eelde N.V.	●	●		●			●					●		92
Groningen Seaports N.V.	●	●	●	●	●	●	●	●	●		●	●		93
H2 Academy												●		93
H2ARVESTER	●		●				●	●	●			●		94
H2 Circulair Fuel B.V.		●				●	●	●	●	●	●			94
H2Do		●	●											95
H2Dock BV		●												95
H2 Hub Twente	●	●		●			●		●	●	●	●		96
H2O Systems		●		●						●	●	●		96
H2Storage B.V.			●	●		●	●	●	●	●	●			97
H2XP		●					●	●	●					97
HAN University of Applied Sciences												●		98
Heattec heat Technology B.V.		●	●						●	●				98
Hermanos Energy	●	●				●	●		●		●			99
Hexwise									●			●		99
Hinicio												●		100
HINT Global B.V.														100
Hobre Instruments B.V.	●	●							●					101
Howden Thomassen Compressors B.V.		●		●	●	●	●	●	●		●			101
HSM Offshore Energy BV		●	●	●					●		●			102
HyCC B.V.		●							●					102
HyDevCo BV		●	●				●	●	●	●				103
HydraSun		●	●	●	●		●		●		●			103
Hydrogen Architects		●	●	●		●	●	●	●		●	●		104
Hydrogen Powered Solutions		●	●			●			●	●	●	●		104
Hydrogreenn		●	●	●	●	●	●	●	●	●	●	●	●	105
Hydro Motion Team TU Delft			●		●	●	●	●						105
Hydronex B.V.	●	●		●			●	●	●			●		106
HyEnergy Consultancy BV		●	●	●		●	●	●	●			●		106
Hyer Power	●		●		●				●	●	●			107
Hyet Hydrogen B.V				●	●	●	●	●	●	●	●	●		107

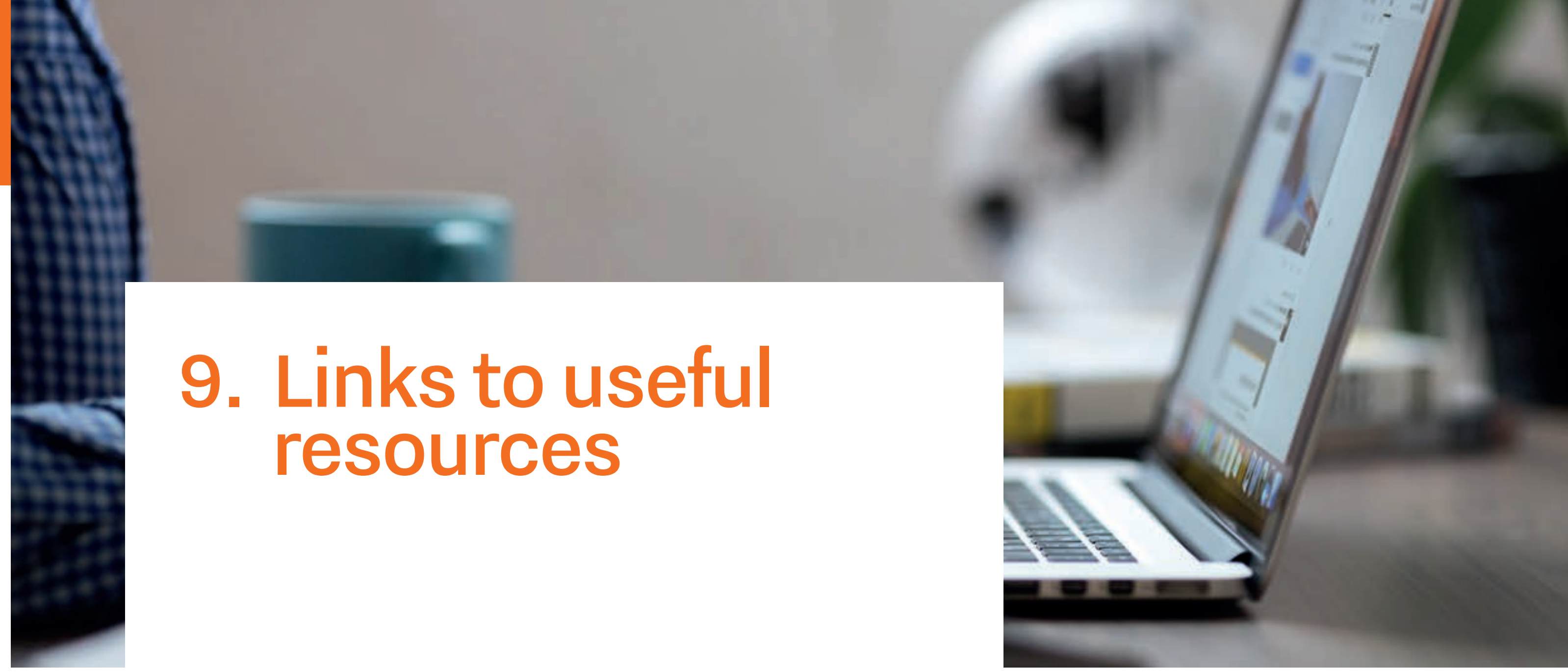
	ELECTRICITY	H_2 PRODUCTION	ENGINEERING / INSTALLATION	INFRASTRUCTURE	FLOW SOLUTIONS	STORAGE	MOBILITY	MARITIME	INDUSTRY	BUILT ENVIRONMENT	INFRASTRUCTURE AND STORAGE	RESEARCH / ADVISORY	ASSOCIATION	PAGENUMBER
Hygear		●	●	●		●	●	●	●	●		●		108
HyMatters Operations B.V.	●	●	●	●	●	●	●	●	●	●	●	●		108
HyNetwork				●										109
HyNorth												●		109
HyPlanet		●		●		●	●	●	●					110
Hysolar		●		●			●	●				●		110
Hystream B.V.	●	●	●	●		●	●	●	●	●	●	●		111
HyStock						●								111
ISPT									●			●		112
Invest International	●	●	●	●	●	●	●	●	●		●			112
IV-groep BV	●	●	●			●								113
Ionbond		●					●	●	●					113
JP Energy Systems		●	●			●	●		●	●				114
Kapp Nederland B.V.		●	●		●		●	●	●	●				114
Kelvion B.V.		●	●			●	●		●		●			115
Kenter B.V.				●										115
Kiwa Nederland N.V.	●	●	●	●	●	●	●	●	●	●	●	●		116
KLINGER The Netherlands		●	●		●				●		●			116
Koedood Dieselservice B.V.	●		●			●	●	●	●			●	●	117
Koninklijke Van Twist B.V.	●								●					117
Krock H2 Boats								●						118
LFF Glamal Europe B.V.					●									118
Lhyfe		●	●				●	●	●					119
MAGNETO special anodes B.V.		●			●		●	●	●	●	●	●		119
Magnus Energy B.V.				●					●		●	●		120
Marsh Netherlands						●			●		●	●		120
Maximator			●	●	●	●	●	●	●		●			121
Mechatest sampling Solutions									●					121
Metalot Future Energy Lab B.V.												●		122
Mokveld Valves B.V.					●				●		●			122
Mott Macdonald BV		●	●	●	●	●	●	●	●		●	●		123
MTSA Technopower B.V.		●				●	●	●	●	●	●			123
Micro Turbine Technology B.V.	●		●						●	●		●	●	124
MV Energietechniek	●	●	●	●	●	●	●		●	●	●	●		124
Nedstack BV	●							●	●	●		●		125
Netherlands Enterprise Agency (RVO)												●		125
Nettenergy B.V.	●	●	●									●		126
New Cosmos-BIE B.V.	●	●	●	●		●	●	●	●	●	●	●		126
New Energy Business School							●	●	●	●	●	●	●	127
New Energy Coalition		●		●		●	●	●	●	●	●	●	●	127
Nexus Energy			●	●				●	●	●	●			128
Noordgastransport B.V. NGT		●		●	●	●			●		●			128
Nederlandse Innovatie Maatschappij B.V. (NIM)	●	●	●	●	●	●		●	●		●	●	●	129
NL Hydrogen													●	129
Nogat B.V	●	●		●		●					●			130
North Sea Port Netherlands N.V.				●				●						130
Nuvera Fuel cells Europe	●						●	●	●					131
NWBA													●	131
NXT Mobility				●			●							132
Nijhuis Saur Industries B.V.		●							●					132
OCI Global		●		●			●	●	●					133
On2Quest		●	●				●	●	●	●		●		133
Peutz bv		●	●	●	●	●	●	●	●	●	●	●		134
Plug Power		●	●	●		●	●	●	●	●	●			134
Pondera Consult BV	●	●	●			●	●		●	●	●	●	●	135
Port of Amsterdam	●	●		●			●	●	●		●			135
Port of Rotterdam	●	●		●			●	●	●		●			136
Power2X		●		●		●		●	●		●	●		136
Pro Control Process Automation B.V.					●		●	●	●					137
Prodrive Technologies B.V.	●	●		●					●		●			137
Promotec					●	●			●		●			138
Proton Ventures B.V.			●			●		●	●			●		138
Pure Water Group	●	●							●					139
PwC												●		139
RAI Automotive Industry NL							●	●	●			●	●	140
RAP Clean Vehicle Technology							●		●		●	●		140
REDstack B.V.	●	●			●				●					141
Remeha B.V.			●							●		●		141

	ELECTRICITY	H_2 PRODUCTION	ENGINEERING / INSTALLATION	INFRASTRUCTURE	FLOW SOLUTIONS	STORAGE	MOBILITY	MARITIME	INDUSTRY	BUILT ENVIRONMENT	INFRASTRUCTURE AND STORAGE	RESEARCH / ADVISORY	ASSOCIATION	PAGENUMBER
Resato Hydrogen Technology			●	●			●							142
ResH2		●												142
RN Solutions									●					143
Royal HaskoningDHV												●		143
RWE	●	●				●	●	●	●					144
SALD BV			●				●	●	●	●		●		144
Samotics BV									●					145
Saxion Hogeschool Enschede							●		●	●	●	●		145
Schaeffler Nederland B.V.		●					●	●	●	●	●			146
Schwank BV		●	●	●	●				●	●	●	●	●	146
SHV Energy				●		●	●		●	●	●			147
SIA Partners	●	●		●	●							●		147
Siemens Nederland N.V.	●	●	●	●		●	●	●	●		●			148
Solstice management BV												●		148
Soluforce				●	●						●			149
Sorama		●	●	●	●	●	●	●	●	●	●	●		149
Sparknano			●						●			●		150
R. Stahl Electromach				●			●	●	●		●	●		150
Stirling Cryogenics				●		●	●	●	●		●			151
Strohm BV					●	●		●			●			151
Summit Engineering		●	●	●		●	●	●	●	●	●	●		152
SUWOTEC B.V.		●					●	●	●	●	●	●		152
Swagelok Nederland					●		●	●	●	●	●	●		153
Tebulo Engineering bv	●	●	●	●	●	●		●	●		●			153
Teesing B.V.			●		●				●					154
T.EN Technip Energies		●	●						●			●		154
Teijin Aramid		●			●	●	●				●			155
TKI Gas												●		155
TNO												●		156
TNO Holst Center												●		156
To70 B.V.												●		157
Torrgas Projects B.V.		●	●						●			●		157
Toyota Material Handling Nederland B.V.							●							158
Tradinco Instrumenten-Apparaten B.V.					●		●	●	●	●	●	●		158
TSG Group			●						●			●		159
TSG Netherlands		●				●	●	●	●		●			159
TU Delft	●	●		●	●	●	●	●	●	●	●	●		160
TU Eindhoven	●	●				●			●		●	●		160
TU Twente (HyUT)	●	●		●		●	●	●	●	●	●	●	●	161
Twynstragudde	●	●	●	●			●	●	●	●	●	●	●	161
Van Leeuwen Buizen Groep				●	●						●			162
Van Wees UD and Crossply Technology BV						●	●	●	●					162
Varo Energies Netherlands B.V.		●							●					163
VDL Energy Systems B.V.	●				●	●	●		●	●	●			163
VDL Hydrogen Systems			●						●		●			164
Veco B.V.		●					●		●					164
Vecom Group B.V.		●		●	●	●	●	●	●		●			165
Vega		●		●	●	●		●	●	●	●			165
Veolia		●	●				●		●					166
VoltH2		●					●	●	●					166
Vonk			●											167
Royal Vopak				●	●	●	●	●	●		●			167
Voyex B.V.						●	●	●	●	●	●			168
VSParticle		●												168
VTTI				●		●					●			169
Water Alliance													●	169
WE | doubleyouenergy b.v.		●	●			●	●	●	●	●	●			170
Wigersma & Sikkema B.V.					●						●			170
Witteveen+Bos	●	●	●	●			●		●	●		●		171
Wolfard &Wessels			●	●				●	●					171
World Class Maintenance		●	●		●				●		●	●	●	172
WSP Nederland B.V.	●		●	●	●	●		●	●	●	●			172
XINTC B.V.		●	●				●	●	●					173
Zepp Solutions						●	●	●	●		●	●		173
Zeton B.V.		●							●			●		174
Novar Nederland BV	●	●				●	●		●		●			174

8.7 List of current clean hydrogen projects on the Gulf Coast

Project name	Location	Date online	Status	Capacity (kt H_2/yr)
Ascension Clean Energy (ACE) complex (LA), phase 2	Louisiana		Feasibility study	864
Ten08/Ohmium clean ammonia project in Texas	Texas		Concept	442
Ascension Clean Energy (ACE) complex (LA), phase 1	Louisiana	2029	Feasibility study	432
Acme - Port of Victoria	Texas	2027	Concept	379
HIF Matagorda	Texas	2029	Feasibility study	270
Sustainable Fuels Group - CIP Carbon reduced Ammonia plant St Rose (LA)	Louisiana	2027	Feasibility study	263
Project Labrador	Texas	2032	Feasibility study	256
CF Industries, JERA and Mitsui Blue Point Ammonia Complex (LA)	Louisiana	2029	FID/Construction	252
Eneos project (MVCE)	Texas	2031	Concept	244
Enbridge Ingleside Energy Center Low carbon ammonia (Project YaRen)	Texas	2029	Feasibility study	234
Horizons Clean Hydrogen Hub	Texas	2030	Feasibility study	208
Linde hydrogen plant for Woodside fertilizer blue ammonia Beaumont (Texas)	Texas	2027	FID/Construction	198
Avina Nueces Clean Ammonia	Texas	2028	Feasibility study	190
Gron Fuel Renewable Energy Complex (Fidelis)	Louisiana		Feasibility study	173
Cormorant Clean Energy Project (8Rivers)	Texas	2027	Feasibility study	158
DG Fuels	Louisiana	2028	Feasibility study	142
APCI Port Arthur	Texas	2013	Operational	118
Formerly Hydrogen City - Now Data City	Texas		Unclear/ Restructured	???

Source: Source: IEA Hydrogen Projects Database (September 2025), with additional analysis and adjustments by Acretio



9. Links to useful resources

Policy and governmental sources

- Hydrogen Program of the DoE (Department of Energy)
- U.S. National Clean Hydrogen Strategy and Roadmap
- Regional Clean Hydrogen Hubs initiative
- Wind Energy Technologies Office Projects Map (at the Office of Energy Efficiency & Renewable Energy)
- Louisiana Department of Conservation and Energy
- Texas General Land Office
- The Center for Houston's Future
- The HyVelocity Hub
- Texas Hydrogen Alliance

Maps and data sources

- IEA Hydrogen production projects interactive map
- EIA Data
- EIA US Energy Atlas interactive map
- Texas CCUS Map at Baker Institute for Public Policy at Rice University
- National Pipeline Mapping System Public Viewer
- Texas Pipeline Map Public Viewer (Texas Railroad Commission GIS Viewer)
- US Hydrogen resource (wind/solar,etc) maps at the National Renewable Energy Laboratory (NREL)
- National Energy and Petrochemical map (at Fractracker Alliance)
- Texas General Land Office Maps & Data
- Louisiana Data Accees Tools
- SEIA (Solar Energy Industries Association) Project Location map

10. Emerging hydrogen triple helix

Academia

The University of Houston offers a few “micro-credentialing programs” in the Hydrogen space:

- The Hydrogen Economy Program
- The Hydrogen Pipelines: Facts, Opportunities and Solutions
- CCUS Executive Education Program

The University of Texas hosted a Hydrogen Day and maintains a webpage dedicated to Hydrogen resources and news.

The other large Gulf Coast universities have all either hydrogen-dedicated centers or strong Energy institutes.

University of Texas (UT) | Program: H2@UT

Texas A&M University | Program: Energy institute

Rice University | Program: Baker Institute for Public Policy

University of Houston | Program: Division of Energy and Innovation

Louisiana State University | Program: College of Engineering

University of Louisiana | Program: Energy Institute

Tulane University | Program: Energy Institute

Non-governmental organizations

Texas Hydrogen Alliance
Key industry stakeholders for advocacy, policy and education
Read more

Greater Houston Partnership
Public-Private Partnership | Read more

Houston Energy Transition initiative
Part of Greater Houston Partnership dedicated to Energy transition | Read more

Gulf Energy Catalyst
Catalyzing energy innovation and economic development across the Gulf Coast| Read more

Dallas-Fort Worth Clean Cities Coalition
Program of the North Central Texas Council of Governments (NCTCOG) and one of DoE's Clean Cities Coalition Network (focusing on clean transportation) | Read more

Central Texas Clean Cities Coalition
See DFW Clean Cities above | Read more

Texas Hydrogen Association
Small association supporting the growth of the H_2 sector in Texas | Read more

Clean Hydrogen Future Coalition
Diverse group of energy companies, utilities, NGOs, equipment suppliers, project developers etc. promoting clean H_2 in the US
Read more

Hydrogen Council
International companies involved in the entire hydrogen value chain | Read more

H2the Future
Part of Greater New Orleans Development Foundation
Read more

Selected deep draft ports

Recurring conferences

Hydrogen Technology Expo. North America
Houston, organized by Trans-global Events
Read more

Carbon Capture Technology Expo
Houston, organized by Trans-global Events
Read more

Hydrogen North America
Houston, organized by Reuters
Read more

World Hydrogen North America
Houston, organized by S&P Global
Read more

Hydrogen Americas Summit & Exhibition
Washington DC, organized by Sustainable Energy Council
Read more

GasTech / Hydrogen
Houston and rotating locations, organized by dmg events
Read more

Private institutions with abundance of information on hydrogen:

- Global Hydrogen Compass 2025
- RBN Energy (paywall)

Contact details of relevant agencies/other organizations in Texas and USA

Office of Clean Energy Demonstrations
U.S. Department of Energy
1000 Independence Ave SW
Washington, D.C. 20585
Email: OCED@hq.doe.gov
Media Inquiries: OCEDNewsroom@hq.doe.gov

Embassy of the Kingdom of the Netherlands in the United States
4200 Linnean Ave NW
Washington, DC 20008
www.netherlandsandyou.nl/web/united-states

Netherlands Business Support Office Texas
4201 Main Street, Suite 205
Houston, TX 77002
Email: office@nbso-texas.com
www.nbso-texas.com

Acretio LLC
1000 N Post Oak, Suite 220
Houston, TX 77055
Email: info@acretio.com
www.acretio.com

The Texas-Louisiana Gulf Coast and the Netherlands are uniquely positioned to shape a new transatlantic clean hydrogen corridor. Building on complementary strengths in energy infrastructure, ports, logistics, innovation, and industrial demand, this report highlights where opportunities for collaboration and business development are emerging.

It provides Dutch companies, policymakers, and knowledge institutions with practical insights into the rapidly developing hydrogen ecosystem along the Gulf Coast, including key market drivers, challenges, and potential entry points. The region's ecosystem brings together major energy players, ports, industrial clusters, research institutions, and public-sector partners.

The report also highlights the Dutch hydrogen landscape, including the Netherlands' national hydrogen strategy, emerging backbone infrastructure, port ecosystems, connections to Belgium and Germany, and the role of Dutch industry, research institutions, and innovative SMEs in developing hydrogen technologies and value chains.

As the clean hydrogen economy moves from ambition to implementation, strong transatlantic partnerships across government, industry, and academia will be essential. This publication is an invitation to explore, connect, and help build the next chapter of transatlantic energy cooperation.