Ashurst

Investing in hydrogen

A global guide

Outpacing change

contents

Introduction

With the continued investor focus on the emerging hydrogen market, our "Investing in Hydrogen" guide helps clients navigate the evolving hydrogen strategies and regulations, the available incentives and major projects taking place in countries that are focused on this market.

The purpose of this guide is to enable better decision-making with regard to investability in hydrogen around the world. It provides our clients with a complete picture when considering their investment opportunities by covering the same questions for each country on policy, regulation, market developments and opportunities to allow comparison. The information in this guide is also available as an interactive map on **our website**.

Overview

The Ashurst "Investing in Hydrogen" guide brings together legal know-how and market insights of the global hydrogen industry. This overview chapter summarises key trends.

National hydrogen strategies

Most countries featured in this guide have by now adopted a national hydrogen strategy or policy, which reflects an international commitment to further advancing hydrogen as an energy source and essential element of the energy transition. Exceptions are Nigeria, Saudi Arabia, Sweden and Uzbekistan who do not yet have formalised hydrogen strategies in place. Overall, the country review shows broad policy support for a hydrogen industry across all regions, with hydrogen being increasingly integrated into long-term economic, energy, and climate planning efforts. While hydrogen strategies are still a fairly new policy instrument (the earliest dedicated hydrogen strategy appears to have been adopted by Japan as recently as 2017), some countries, such as Germany, have already updated their initial policies to account for new geopolitical realities. As the hydrogen industry develops, we expect hydrogen strategies to evolve as well.

Key goals

Across the jurisdictions covered, national hydrogen strategies formulate a variety of goals and commitments. Details vary by country, but there are several common themes: green hydrogen is seen as key contributor to achieving national or international decarbonization targets, especially in sectors where CO2 emissions are otherwise hard to abate. Most countries are also committed to scaling up national hydrogen production capacities, some by also announcing more or less binding production or consumption targets. More generally, countries aim to establish a full hydrogen industry along the entire value chain and to develop supporting regulatory frameworks.

Sectoral integration

An emerging hydrogen industry and the availability of especially green hydrogen in sufficient amounts and at affordable prices will have a transformative impact across various sectors. Country reports identify in particular the following sectors as those most likely to be affected: Heavy industry and manufacturing (steel, chemicals, refining etc.), transport & mobility (heavy road transport, shipping, aviation), power generation and energy storage.

Green hydrogen

Green hydrogen – produced by electrolysis using renewable energy – is a central pillar in many national strategies. In fact, the main goal of some strategies is specifically the promotion of the use of green hydrogen. However, not all countries focus exclusively on green hydrogen and many also support other forms of low-carbon hydrogen. This in particular applies to "blue" hydrogen, which is produced from natural gas with supporting carbon capture and storage to reduce CO2 emissions. This ties into another emerging global trend with CCUS becoming increasingly accepted as a means to reduce CO2 emissions. Some jurisdictions are also agnostic regarding the hydrogen source and generally support the use of all colours of hydrogen during the ramp-up of the hydrogen industry. As green hydrogen becomes more ubiquitous, it will be interesting to see whether policy support for other sources of hydrogen will diminish.

Certification schemes for green hydrogen

The development and implementation of certification schemes for green hydrogen is a key goal in many jurisdictions, but the implementation status and the details of existing schemes currently still varies considerably. EU Member States are implementing the EU's Renewable Energy Directives and related delegated acts which define under which conditions hydrogen, hydrogen-based fuels and other energy carriers can be considered renewable fuels of non-biological origin (RFNBO), thus eventually creating an EU-wide standard for green hydrogen. The European Commission has by now also recognised several voluntary certification schemes for RFNBOs and national authorities are beginning to accredit respective certification bodies. Outside of the EU, countries are developing individual green hydrogen standards, such as the Brazilian Hydrogen Certification System, India's Green Hydrogen Standard or South Korea's Clean Hydrogen Certification System. A key challenge to establishing an international green hydrogen market will be aligning the various certification schemes to ensure green hydrogen, similar to oil and gas today, will eventually be an internationally tradeable commodity.

Regulatory drivers for the use of green hydrogen

Many countries have established production or consumption targets for green hydrogen, but those targets are typically non-binding in nature. This may change soon. In the EU, for example, the Renewable Energy Directive requires Member States to ensure that by 2030 42% of the hydrogen used in the industry is an RFNBO and 60% by 2035. Generally, however, the approach in most countries is to incentivise and support the production and use of green hydrogen through financial, regulatory, and market-based mechanisms, rather than to mandate its use. Denmark, for example, allows hydrogen projects to be qualified as "regulatory test zones", exempting the project from specific regulations for a certain period of time. Other countries are providing tax credits (Finland) or developers enjoy fast-track approvals and reduced regulatory burdens (Egypt).

Government funding

Government funding continues to be a key element in supporting the market ramp-up of green hydrogen, with most countries providing some form of government subsidies for hydrogen projects, often through national or regional grants, R&D funding, tax incentives, and support for specific pilot projects. In the EU, this includes funding under the Important Projects of Common European Interest or the EU's Hydrogen Bank auctions. Where no hydrogen specific funding is available, projects may often participate in generally existing funding schemes. With government budgets being limited, it is likely that the hydrogen sector will eventually also have to move to a more market driven economy.

Evolving regulatory frameworks

An important aspect to highlight is the still evolving nature of hydrogen regulation. In most countries, hydrogen is still primarily governed by existing energy and environmental regulations, which may not always be the best fit. Bespoke hydrogen legislation is rare but beginning to emerge as the hydrogen sector matures and the need for more tailored regulations becomes more apparent. For example, France has developed a specific legal framework for hydrogen through the "Hydrogen Ordinance" and the "Hydrogen Decree", which set out regulatory requirements for production, storage, transportation, and supply and have been incorporated into the French Energy Code. In South Korea, the "Hydrogen Act" also provides a dedicated legal framework for the hydrogen sector, including a graded clean hydrogen certification system and specific safety management provisions. Especially in the EU more dedicated hydrogen regulation can be expected as EU Member States will begin to implement the EU's Hydrogen and Gas Decarbonisation Package.

International cooperation

One final aspect that became apparent in the updated country chapters is the importance of international cooperation, which is becoming a cornerstone of the emerging global hydrogen economy. Countries are entering into a range of bilateral and multilateral agreements to foster investment, harmonise standards, and facilitate cross-border trade in hydrogen and its derivatives. For example, the Netherlands has been particularly active, signing several Memoranda of Understanding and Declarations of Intent with countries such as Denmark and Norway to establish regional hydrogen networks, including cross-border transport infrastructure and underground storage solutions. In May 2024, the Belgian Hydrogen Council, NLHydrogen (Netherlands), and the German National Hydrogen Council signed an MoU to strengthen cooperation in the hydrogen sector, focusing on joint initiatives to advance the hydrogen economy in North-West Europe. Belgium has also entered into an MoU with Hydrom Oman to enhance cooperation in green hydrogen development and to produce green hydrogen and ammonia for export to Europe and Asia. Canada and Germany have established the Canada-Germany Hydrogen Alliance, committing to policy harmonisation, the development of secure hydrogen supply chains, and the creation of a transatlantic supply corridor for clean hydrogen. Similarly, Australia has entered into a range of bilateral agreements, such as the Australia-Germany Hydrogen Accord, the Australia-Japan Memorandum of Cooperation, and MoUs with the Republic of Korea, the Netherlands, and the United Kingdom, all aimed at advancing hydrogen research, trade, and investment. The growing number of international cooperations is a clear indicator that hydrogen is becoming a global commodity with trade partners working towards creating harmonised standards.

Outlook

The latest Ashurst "Investing in Hydrogen" guide continues to show strong government policy support across most jurisdictions for the development of a comprehensive hydrogen value chain, backed by significant amounts of government funding and regulatory measures intended to support the scaling of production capacities and offtake demand. At the same time, the hydrogen sector is showing uneven momentum due to technical, economic and infrastructure challenges that are currently still hampering an unhindered development of the hydrogen industry. Especially green hydrogen continues to be expensive and is not yet available in sufficient amounts and it may not be the universal solution for all green energy demands. We nevertheless expect the hydrogen economy to eventually emerge as a key element in global decarbonisation efforts, with specific applications in various industries.

Argentina

Ashurst collaborated with **Beccar Varela** in the preparation of this content. We are grateful for their input.

Policy and regulation

1. Is there a government hydrogen strategy or policy?

Yes, the National Strategy for the Development of the Hydrogen Economy, a public policy tool that lays down lines of action and goals for 2050 to generate certainty around the development path of low-emission hydrogen.

The first actions, aimed at promoting public-private dialogue, began in 2021 and resulted, in February 2023, in the constitution of the Hydrogen Intersectoral Roundtable. This space worked on the coordination between the private sector and different areas of government, national and provincial, to develop the National Hydrogen Strategy (NHS).

In May 2023, the National Executive Power submitted to the National Congress the bill for the "Promotion of Low Carbon Hydrogen and Other Greenhouse Gases". The purpose of this legislative initiative is to promote low-emission hydrogen production projects, organize the governance of the sector and promote productive and technological development along the entire value chain.

Finally, the Secretariat of Strategic Affairs, in coordination with the Ministry of Environment and Sustainable Development, is conducting a Strategic Environmental Assessment to provide a sustainability framework for the NHS, plan the territorial deployment of this new activity and ensure the objectives of a just transition.

These actions promoted by national public policy are in addition to the strategic planning efforts made by provincial governments, the private sector and the academic sector.

2. What are the key goals and commitments included in the strategy/policy?

The vision guiding the NHS has three axes. First, it recognizes the importance of promoting technological and productive development throughout the value chain, including the production of critical capital goods and the provision of technological services.

Secondly, taking into account the different resources and capacities available in the Argentine territory, it contemplates the production of low-emission hydrogen by means of different technologies, either from renewable sources (green), from nuclear energy (pink), or from fossil fuels with carbon capture (blue).

Third, it establishes two pillars for the deployment of the hydrogen economy: the domestic market, fundamental to generate initial conditions, evaluate prototypes and develop national technology; and export markets, oriented to highly competitive large-scale production, taking advantage of the quality of natural resources and built capacities.

Some of the goals and commitments included in the NHS are:

- To promote competitiveness in the hydrogen production poles to create and promote the domestic and export markets.
- To promote the development of local suppliers of capital goods, inputs and equipment, and knowledge-based services, especially those associated with the demands of the production poles.
- To promote pilot-scale demonstration projects that allow estimating real costs of low-emission hydrogen production with different technologies, in different locations and considering logistics.
- To improve the efficiency of critical technologies for the production of low-emission hydrogen, such as electrolysis and Carbon Capture, Utilization and Storage (CCUS) technologies, based on technology transfer and innovation.
- To increase the generation of renewable energies at competitive costs.

3. Which industry sectors are most likely to be affected by hydrogen deployment?

In Argentina, low-emission hydrogen involves several value chains: those associated with energy generation; the production and storage of hydrogen itself and its by-products and derivatives; and chains related to the uses of hydrogen and its applications. Each of these chains in turn is made up of specific segments that require a wide range of technological and industrial skills. These include: (i) the provision of critical inputs and materials; (ii) the production of capital goods, as well as their parts and pieces; (iii) the construction of infrastructure for transportation and storage; (iv) the provision of knowledge-intensive services, from engineering services to research and development activities; (v) the adaptation of goods and services for the use of low-emission hydrogen; (vi) the production of hydrogen-derived products such as synthetic fuels; and (vii) the production of industrial goods using low-emission hydrogen to access new markets, such as steel or low-emission fertilizers.

4. Who are the main regulators for the hydrogen market?

Given the premature nature of the clean hydrogen market in Argentina, there is no clear-cut answer to this question. There are no specific regulators of hydrogen production and exportation in Argentina. Notwithstanding the foregoing, the bill for the "Promotion of Low Carbon Hydrogen and Other Greenhouse Gases", which aims to regulate the market, sets forth that the main regulator shall be the Secretary of Energy of the Ministry of Economy which shall be empowered to issue the necessary derivative, complementary, clarifying, and operational regulations for the proper compliance of the bill. So, it is expected that if the bill is passed, the Secretary of Energy will be the enforcement authority.

5. Does the government hydrogen strategy or policy support the development of both low-carbon (blue) hydrogen and renewable (green) hydrogen?

Yes. Argentina has great potential for the generation of green, pink and blue hydrogen. The first due to the optimal conditions to generate renewable energies such as solar, wind and hydroelectric, being the country recognized globally as one of the potential suppliers of hydrogen. Argentina also has potential to produce pink hydrogen due to its nuclear capabilities. Argentina has been recognized as one of the leading countries in the region in terms of nuclear technology and nuclear energy.

In the case of blue hydrogen, Argentina has the second largest unconventional gas reservoir in the world. In particular, Argentina has the possibility of leveraging the production of blue hydrogen from its vast gas resources, converting the current production of grey hydrogen to the production of blue hydrogen, with carbon dioxide capture and storage and emissions measurement.

6. If the government hydrogen strategy or policy supports the development of low-carbon hydrogen, to what extent is carbon capture and storage being taken forward?

In Argentina, the contribution of scientific and technological research to increasing the efficiency of technological assets is essential to improve the competitiveness of local low-emission hydrogen production. Over the next few years, the government expects that due to the NHS a number of technological sectors will become very dynamic, mainly electrolysers and CCUS technologies. Strengthening the country's research and development, together with industrial capabilities in the field of electrolysers, mainly alkaline, is a strategic aspect for Argentina to position itself in the technological race linked to hydrogen. These technological developments will make it possible to offer local technology to projects in the country.

7. Are there targets for the production of hydrogen?

Neither the bill for the "Promotion of Low Carbon Hydrogen and Other Greenhouse Gases" nor the NHS set forth any hard targets for the production of hydrogen.

8. Are there any incentive mechanisms/business models in place to support the production of hydrogen?

The NHS foresees the need for a framework of incentives to promote the production of hydrogen and that it is essential to have an active policy of seeking investments and promoting the opportunities offered by the country in order to establish Argentina in the world markets as a safe and reliable supplier of hydrogen, ammonia and low-emission synthetic fuels.

Currently, there are no incentive mechanisms or business models in place to support the production of hydrogen. In fact, the bill for the "Promotion of Low Carbon Hydrogen and Other Greenhouse Gases" is still being debated in Congress, so there are still many issues to be closed. In order to encourage investments, the bill includes measures such as accelerated amortization of income tax, early VAT refund and the establishment of a tax stability regime. The following are some of the measures included in the bill:

- Accelerated amortization in Income Tax and accreditation and/or early refund of Value Added Tax
- Accelerated amortization in Income Tax
- Extension of the term to compute losses
- Deduction of the Financial Burden of Financial Liabilities
- Exemptions for importation of goods
- Benefits for suppliers
- Specific and exclusive allocation of the imported goods
- Fiscal Stability for THIRTY (30) years
- Access to the Free Exchange Market

In fact, the bill for the "Promotion of Low Carbon Hydrogen and Other Greenhouse Gases" includes a whole chapter regarding the encouragement of investment through different incentive mechanisms.

9. Are there any standards in place for the classification and/or certification of low-carbon or renewable hydrogen?

One of the main goals of the NHS is to develop low-emission hydrogen certification and build capacity for agile and transparent certification with international acceptance, as well as to strengthen certification capabilities and increase the total number of supplier companies certified according to international quality and industrial safety standards. In Argentina, the National Institute of Industrial Technology (NIIT) is working on the development of a roadmap for the certification of origin of green and low-emission hydrogen. Progress is being made within the framework of an Interinstitutional Project on Strategic Issues (PITES), coordinated by Y-TEC (an entity owned by YPF S.A., the largest oil & gas company in Argentina and CONICET, the National Scientific Investigation entity).

It is expected that Argentina will implement before 2030 a certification of origin scheme based on emissions criteria without technological preference. This system will be supported by existing public capacities and will have clear mechanisms for determining emissions, adaptable to technological change and aligned with the requirements of the adopting markets.

10. Does the regulatory framework clearly define the regulatory requirements relating to the production, storage, transportation or supply of hydrogen?

No, although the NHS emphasises the need for regulation and the development of public policies in this regard.

11. Are there any foreign investment restrictions related to energy and infrastructure sectors?

No, foreign investment is actually encouraged throughout the NHS document (the expected amount of investments compatible with expected production is around US$90 billion). In this sense, the bill for the "Promotion of Low Carbon Hydrogen and Other Greenhouse Gases" foresees the adoption of effective promotion tools to encourage investments.

12. What international treaties are in place that may offer protection to international investors in hydrogen projects in the jurisdiction?

Argentina has signed 50 bilateral investment treaties (BITs) that are currently in force, in addition to other treaties that may contain protections for foreign investors. These can be viewed through the following link: **https://www.argentina.gob.ar/produccion/acuerdos-internacionales/conoce**

Market developments and opportunities

13. Are there any government grants or other government funding available to hydrogen projects (including for research and development)?

Currently, there are no government fundings available to hydrogen projects, although the bill for the "Promotion of Low Carbon Hydrogen and Other Greenhouse Gases" entrusts the Executive Committee of the National Fund for Productive Development (**FONDEP**) to carry out the necessary actions for the purpose of constituting a Specific Allocation Fund aimed at financing projects of manufacturers of equipment of the low emission hydrogen value chain, as well as suppliers of goods and/or services of high technological content for the same sector. The Specific Allocation Fund is expected to be able to:

- Provide funds and grant facilities through loans, acquisition of public or private trust securities, to the extent that these were issued for the exclusive purpose of obtaining financing for projects in any of the phases of the low emission hydrogen value chain and in research, innovation or pilot projects that promote the generation of local value, the development of national technology, qualified employment and the improvement of the competitiveness of the national hydrogen industry in the domestic or international market.
- Make capital contributions in companies that carry out the projects and subscribe any other financing instrument determined by the authority of application.
- Discount percentage points of the interest rate of credits and securities granted or in which financial entities or other actors intervene in the role of financing providers.
- Provide a mandatory minimum contribution on its total available resources to be destined to investments in science and technology, innovation and development, in public and private entities belonging to the National System of Science, Technology and Innovation defined by the Law of Science, Technology and Innovation No. 25,467; for the promotion of the development of the hydrogen industry in the national territory and the training of technicians and professionals in the matter.

14. Are there any notable pilot/demonstration projects in place or planned for the production or offtake of clean hydrogen?

The NHS aims to promote pilot-scale demonstration projects that allow estimating real costs of low-emission hydrogen production with different technologies, in different locations and considering logistics. Two pilot plants, pioneers in the region, are currently operating in the country:

- **Hychico Pilot Plant**, in the Province of Chubut, has been producing high purity green hydrogen since 2008, with a 2.3 km pipeline system and a geological storage facility. The production is experimentally applied to mixtures with natural gas and a 1.4 MW generator, it is also suitable for use in fuel cells.
- **Pico Truncado Experimental Plant**, in the Province of Santa Cruz, is a Green Hydrogen Experimental Plant and a human resources training centre for the development and testing of technology in a real environment. Nearby, the Energy Scientific and Technological Pole for Southern Patagonia will be built, promoted by the National Ministry of Science, Technology and Innovation, the Institute of Science, Technology and Innovation of the Province of Santa Cruz and the Innovation and Development Agency.

15. Are there any commercial-scale clean hydrogen production projects in development or already operating?

At the end of November 2024, the German Society for International Cooperation (**GIZ**) and the multinational company RP Global signed an agreement with the Government of Santa Cruz to launch *Gaucho: Wind to Hydrogen and Green Ammonia* (*Proyecto Gaucho*). The project includes the construction of a wind farm with a capacity of 8,777 MW, whose electricity will power electrolyzers capable of producing 0.62 million tons of green hydrogen per year (Mt/year) and 3.51 Mt/year of green ammonia. Furthermore, some initiatives were recently announced. In this sense, Fortescue Future Industries announced that it has entered into a Framework Agreement with the Province of Rio Negro to commence prospecting and feasibility work for green hydrogen projects in such Province. Pursuant to public announcements, Fortescue aims to invest US$8.4 billion in the country for the production of green hydrogen, creating more than 15,000 direct jobs in Argentina.

16. Have there been any hydrogen-related disputes in your jurisdiction?

No.

Last updated June 2025

Australia

Policy and regulation

1. Is there a government hydrogen strategy or policy?

1.1 National and State Hydrogen Strategy

Yes, on 13 September 2024 **Australia's 2024 National Hydrogen Strategy** was published.

Each Australian State and Territory, except for the ACT, have also released their own hydrogen strategies and policies, including the:

- **Five-year Energy Roadmap** development announced in April 2025 after the end of the **Queensland Hydrogen Industry Strategy 2019-2024** and set to be delivered by the end of 2025 **Queensland Energy and Jobs Plan** update published in November 2023, **Hydrogen Industry Workforce Development Roadmap 2022-2032** published in July 2022 and **Queensland Hydrogen Investor Toolkit** published in April 2024;
- **Western Australia's Renewable Hydrogen Strategy (2024 Update)** published on 25 October 2024, **Mission Update** published in December 2022; Renewable Hydrogen Roadmap published on 17 November 2020 and **Western Australia Renewable Hydrogen Investment Prospectus** published in November 2023;
- South Australia's Hydrogen Action Plan and **Hydrogen Export Prospectus**, published in September 2019 and October 2020, respectively;
- Northern Territory Renewable Hydrogen Strategy, published in July 2020, **NT Renewable Hydrogen Master Plan** published in October 2021, and **NT Hydrogen Supply Chain Map** published in April 2024;
- Victorian Renewable Hydrogen Industry Development Plan, published on 25 February 2021 and **Gas Substitution Roadmap** update published in November 2024;
- **Tasmanian Renewable Hydrogen Action Plan**, published in March 2020, and **Tasmanian Green Hydrogen International and Export Strategy** released in May 2022;
- New South Wales Hydrogen Strategy, published in October 2021 and **New South Wales Hydrogen Investment Prospectus** published in March 2022; and
- **ACT 2020-2025 Sustainable Energy Policy Discussion Paper** (which is not a specific hydrogen strategy but discusses the consumption of hydrogen as part of the Territory's general renewable energy strategy and the development of a natural gas transition plan) published in 2019 and **ACT Zero Emissions Vehicles Strategy 2022-30**, published in 2022.

1.2 Hydrogen Headstart

The Australian Government is investing $2 billion in the Hydrogen Headstart program, and the 2024-2025 Federal budget revealed a further $2 billion to be invested for an additional round of Hydrogen Headstart, providing revenue support for large-scale projects through competitive hydrogen production contracts. This funding is intended to bridge the commercial gap between the cost of hydrogen production from renewables and its current market price for early projects. The shortlisted applicants shows a healthy pipeline of hydrogen projects which represent a total electrolyser capacity of 3.5 GW. The projects are across various end uses predominantly in hard to abate sectors such as ammonia, alongside sustainable aviation fuel, e-fuels, mineral processing, and mobility.

The Murchison Green Hydrogen Project in Western Australia is the first project to be awarded funding under the Hydrogen Headstart program, it is a 1500 MW project that will receive around $184 million over a 10-year period for their project as developed by Copenhagen Infrastructure Partners. Registration for Round 2 of the Hydrogen Headstart program is now open.

1.3 Future Made in Australia and Hydrogen Production Tax Incentive

On 11 April 2024 the **Australian Government announced its '*Future Made in Australia Act*'** which proposes taxpayer-funded incentives to advance the manufacturing and clean energy industries in the highlighted areas of hydrogen, green metals and advanced clean energy manufacturing and assembly. The 2025-26 Federal budget builds on the Government's existing $22.7 billion Future Made in Australia agenda, including allocating $1.5 billion to support priority areas such as green metals and clean energy technology manufacturing capabilities.

The 2024-25 Budget included the Federal Government announcing a Hydrogen Production Tax Incentive (HPTI) to incentivise and support renewable hydrogen as part of the ***Future Made in Australia (Production Tax Credits and Other Measures) Bill 2024*** **(Future Made in Australia Bill PTCOM 2024)** that passed both Houses of Parliament on 11 February 2025. On 28 November 2024, the Australian Parliament passed the ***Future Made in Australia (Guarantee of Origin) Bill 2024*** **(Future Made in Australia Bill GO 2024)**.

1.4 The National Energy Transformation Partnership (NETP)

On 12 August 2022, the Energy Ministers at Commonwealth, State and Territory levels agreed to establish a new National Energy Transformation Partnership (NETP), which reports to the Energy and Climate Change Ministerial Council. The National Energy Transformation Partnership is a framework for the Australian Government and State and Territory governments to collaborate on reforms to help transform Australia's energy system to achieve net zero by 2050. Through the partnership, each jurisdiction works collaboratively whilst continuing to pursue its own energy policies. Priority work agreed under the NETP includes the establishment and expansion of the **Capacity Investment Scheme (CIS)**, agreeing State-based support for the **Rewiring the Nation** program, and the development of a **First Nations Clean Energy Strategy**. The Australian Government has made a $157.9 million commitment to facilitating the priority works of the NETP.

Since 2022 the **Capacity Investment Scheme**, **Rewiring the Nation** program and **First Nations Clean Energy Strategy** have seen the following developments:

Capacity Investment Scheme

The CIS has a target to generate 32 GW of new capacity nationally, comprised of 23 GW renewable generation and 9 GW dispatchable capacity (4-hour equivalent). CIS auctions are held every six to twelve months until 2027. So far, 4 rounds of auctions have been announced:

- **Tender 1 – NEM Generation** was awarded to 19 projects representing a total of 6.4 GW of generation capacity.
- **Tender 2 – WEM Dispatchable** was awarded to four projects that represented a total 654 MW of dispatchable energy.
- **Tender 3 – NEM Dispatchable Capacity** aims to deliver 4 GW of four-hour equivalent dispatchable capacity. Bids closed on 18 December 2024. Successful bids are anticipated to be announced in September 2025.
- **Tender 4 – NEM Generation** aims to deliver 6 GW of generation capacity. Bids closed on 18 February 2025.

This leaves approximately 15 GW of the total 32 GW to be tendered in the next two years.

Rewiring the Nation Program

This program invests in new transmission lines that will deliver renewable energies to cities, towns and regional communities, financed by Clean Energy Finance Corporation. The CEFC has so far announced that it will provide:

$100 million for the NSW Scheme Financial Vehicle to support energy projects in NSW under NSW's Electricity infrastructure Roadmap;

$490 million finance to EnergyCo for expenditure on land acquisition and biodiversity offsets for the Central West Orana Renewable Energy Zone; and

$1.92 billion-finance to Transgrid for the delivery of two major energy infrastructure projects: HumeLink and the NSW element of the Victoria-NSW Interconnector.

First Nations Clean Energy Strategy

This strategy looks to guide investment, influence policy, and support First Nations people in self-determining how they participate in Australia's clean energy transition, it is a five year national framework developed in collaboration with First Nations peoples and organisations.

1.5 National Policy Amendments Affecting Hydrogen

On 28 October 2022, Energy Ministers agreed to amendments to the National Gas Law and National Energy Retail Law (NERL) to bring hydrogen, biomethane and other renewable gases under the national gas regulatory framework. The reforms aim to provide regulatory certainty to support investment in innovative projects that will reduce emissions in Australian gas networks. This consistency will support Australia's approach to developing a competitive and cost-efficient hydrogen market. The reforms also ensure existing regulatory provisions and consumer protections under the NERL work as intended when hydrogen and renewable gases are incorporated into the gas network.

2. What are the key goals and commitments included in the strategy/policy?

The key goals of Australia's National Hydrogen Strategy are that by 2030:

2.1 Export: Australia is one of the top three exporters of hydrogen to Asian markets

How? Australia has committed to co-funded projects with various nations that range from technological collaborations, supply chain testing and standards development. Australia and many Australian States have also entered into a variety of hydrogen-related Memorandums of Understanding (MoU) in global markets, including the:

- **Comprehensive Strategic Partnership** between Australia and Korea to support research on hydrogen supply chains between Korean and Australian companies;
- **MoU between NSW and Tokyo,** which will open doors for bilateral investment opportunities and further trade ties, focusing on hydrogen;

- **Memorandum of Cooperation between the Australian Hydrogen Council and the Japan External Trade Organisation** to foster collaboration to advance hydrogen priorities and advance trade ties between Australia and Japan;
- **MoU between Australia and the Netherlands** to support the Port of Rotterdam's work with State governments in **Tasmania**, **Queensland**, **Western Australia** and **South Australia** towards the establishment of a large-scale hydrogen network between the two countries;
- **Australia-Germany Hydrogen Accord** to advance the global renewable hydrogen industry, including committing to the **Hydrogen Innovation and Technology Incubator**, facilitating industry-to-industry cooperation on demonstration projects in Australian Hydrogen Hubs and facilitating trade of Australian hydrogen and its derivatives produced from renewable energy sources, including through H2Global; and
- **Terms of reference for the India-Australia Green Hydrogen Taskforce** to report to the India-Australia Ministerial Energy Dialogue on trade, commercial and research opportunities between the two countries through the manufacture and deployment of green hydrogen.
- **MoU between Australia and the UAE** to provide a framework for investment cooperation in green and renewable energy, including supporting the development of green hydrogen projects;
- **Climate and energy partnership** between Australia and the UK to cooperate on renewable energy technologies and investments such as hydrogen, as well as creating common standards;
- **India-Australia Renewable Energy Partnership** to guide climate and energy cooperation, with green hydrogen projects already underway continuing under this partnership; and
- **Green Economy Partnership Arrangement** between Australia and Korea to create more opportunities for the renewable energy sector, focusing on renewable hydrogen.

2.2 Safety: Australia has an excellent hydrogen-related safety track record

How? The Australian Government is a member of the U.S. Centre for Hydrogen Safety. This gives all Australian governments access to some of the world's foremost expertise in hydrogen safety. Standards Australia and CSIRO have also developed **HyStandards** to identify the relevant hydrogen standards in a range of hydrogen facility scenarios, including electrolyser hydrogen production, gaseous hydrogen transport by road, hydrogen transport by pipeline, blended hydrogen transport by pipeline and hydrogen refuelling. Additionally, Standards Australia has also formed its own ME-093 Hydrogen Technologies committee, dedicated to developing international standards and representing Australia's national interests in hydrogen technologies to ISO and IEC, as detailed in the **ME-0903 Hydrogen Technologies Strategic Work Plan**.

2.3 Economy: Hydrogen is providing economic benefits and jobs in Australia

How? The Australian Government has set a goal for hydrogen production of under $2 per kilogram ('H2 under $2') to make hydrogen competitive with conventional fuels. The ***Future Made in Australia Bill (Production Tax Credits and Other Measures) Act 2025* (Cth)** allows a refundable tax offset amount of $2 per kilogram of Australian eligible renewable hydrogen produced between 1 July 2027 and 30 June 2040. Some Australian States, including NSW, WA and NT, have set similar goals as part of their hydrogen strategies. NSW, for example, has set a goal of hydrogen priced at under $2.8 per kilogram by 2030. Other States, including VIC, QLD, SA, TAS and ACT, have not made any such goals but have rather set out key focus areas for developing the hydrogen industry in their respective States.

QLD has also released its **Energy and Jobs Plan** (2024) which includes a goal to finish constructing the Queensland SuperGrid which includes key Hydrogen Hubs at Gladstone and Townsville, and will create around 100,000 jobs by 2040, including across key sectors like renewable hydrogen. Construction of the SuperGrid is supported by the ***Energy (Renewable Transformation and Jobs) Act 2024* (Qld)** which enshrines the commitments in legislation, creating the frameworks needed to progress the SuperGrid and assist in the renewable energy transition. The Energy and Jobs Plan is backed by the boosted $4.5 billion Queensland **Renewable Energy and Hydrogen Jobs Fund** which aims to unlock opportunities in and grow the future of the renewable hydrogen industry in Queensland. However, since the publication of the Energy and Jobs Plan the incumbent Government was voted out. In February new Government announced that they will suspend funding to one of the Gladstone hydrogen projects (the Central Queensland Hydrogen Project) casting doubts on its commitments to the green hydrogen sector.

South Australia has a **Hydrogen Jobs Plan** too, which commits more than half a billion dollars to build the **200 MW Whyalla hydrogen power plant** which, once operational, will be a new source of flexible power, providing additional grid stability around the State by utilising excess renewable energy generated from large-scale wind and solar farms to provide a consistent output of supply. The Hydrogen Jobs Plan project objectives include to: (1) help unlock pipelines of renewable energy developments and business opportunities; (2) prove large-scale hydrogen production and generation technology; and (3) activate other hydrogen projects in development, including export-focused projects, all while maximising the employment opportunities for South Australians in the delivery of these significant projects. However, the current state of South Australia's Hydrogen Plan is now uncertain following the government's announcement that the standalone body in charge of delivering the project has been dissolved.

In Victoria, public consultation on the proposed **Victorian Energy Jobs Plan** closed on 8 April 2024 and is set to be published in early 2025. The plan, as it is proposed, will support Victoria in developing the workforce required to deliver 95% renewable electricity generation by 2035. The Victorian Government has designed the consultation paper to present an update on current developments of the plan and provide key stakeholders, rightsholders and unions with an opportunity to give feedback and input on key questions and issues.

2.4 Certification: Australia has a robust, internationally accepted, provenance certification scheme in place

How? The Department of Climate Change, Energy, the Environment and Water has developed, in partnership with the Clean Energy Regulator, an internationally aligned, voluntary and product-based emissions accounting framework called the **Guarantee of Origin Scheme**. The Guarantee of Origin Scheme will show where a product has come from, how it was made, and the emissions throughout its lifecycle. It is intended to assist in unlocking economic opportunities for the Australian industry to meet growing domestic and international demand for verified green hydrogen. Passed on 28 November 2024, the ***Future Made in Australia Act GO 2024* (Cth)** promotes competition and offers protection to consumers including a public registry of certificates detailing the product's production, delivery and consumption.

Australia is also signatory to the **COP28 Declaration of Intent on Mutual Recognition of Certification Schemes for Renewable and Low-carbon Hydrogen and Hydrogen Derivatives**.

3. Which industry sectors are most likely to be affected by hydrogen deployment?

The industry sectors which are most likely to be affected by hydrogen development include:

- the energy sector (including electricity grid support, electricity generation and gas networks);
- chemical production (including ammonia and methanol production);
- mining and other off-grid large electricity consumers;
- heavy and light transport industries;
- green iron and steel manufacturing;
- industrial heat; and
- the marine and agricultural industry.

4. Who are the main regulators for the hydrogen market?

The Energy and Climate Change Ministerial Council (**ECMC**) works closely with Energy Consumers Australia and has oversight of the energy market institutions responsible for regulating the hydrogen industry: the Australian Energy Regulator, the Australian Energy Market Commission and the Australian Energy Market Operator. Various Commonwealth Departments and authorities in each State regulate planning and environmental approvals, workplace health and safety, the supply of power and utilities and dangerous goods regulation and standards. Both the Commonwealth and NSW have published regulatory guides which set out the key regulators for various example projects including hydrogen production and export (see **here** (Commonwealth) and **here** (NSW)). The Clean Energy Regulator is the regulator of the Guarantee of Origin scheme. The ECMC's Hydrogen Working Group and Legal Frameworks Review Sub-working Group also provide strategic oversight and suggest areas for future national policy investigation and review, for example by co-developing the **National Hydrogen Codes of Best Practice**, released in 2024.

Australia-based companies that intend to export hydrogen should also be aware that the importing country may impose additional requirements above and beyond what is required in Australia. For example, the European Union (EU) is in the process of implementing a **Carbon Border Adjustment Mechanism** that will impose an additional charge on hydrogen that is not produced in compliance with EU emission standards.

5. Does the government hydrogen strategy or policy support the development of both low-carbon (blue) hydrogen and renewable (green) hydrogen?

The **National Hydrogen Strategy** supports the development of both blue and green hydrogen and includes both types in its definition of renewable hydrogen. However, the **Hydrogen Headstart program** ruled out funding for blue hydrogen, shifting its focus to green hydrogen production only.

6. If the government hydrogen strategy or policy supports the development of low-carbon hydrogen, to what extent is carbon capture and storage being taken forward?

The **National Hydrogen Strategy** recognises that Australia is well situated to take advantage of carbon capture and storage (**CCS**) and carbon capture use and storage (**CCUS**) technologies to produce low-emissions hydrogen from coal and natural gas. However, Australia does not currently have a national CCS strategy, or any policy specifically aimed at encouraging or facilitating the development of a CCS industry in Australia. Historically, the Federal Government has established the $50 million **CCUS Development Fund** and the $250 million **CCUS Hubs and Technologies Program**. Both funds are now closed, with the Hubs and Technologies Program being replaced in the 2022-23 Federal Budget with $141.1 million for the '**Carbon Capture Technologies for Net Zero and Negative Emissions**' program, which was removed from the 2023-24 Federal Budget. While the 2024-25 Federal Budget did not commit funding to support carbon capture nationally, it committed $5 million to establish a commercial carbon capture and storage network in Victoria's Gippsland Basin (CarbonNet).

The Australian Government has developed a method to credit abatement from new CCS projects under its **Emissions Reduction Fund** (a fund established to purchase abatement of carbon emissions, in the form of Australian carbon credit units).

The Victorian and Australian Governments are developing a multi-user CCS hub network in Gippsland, Victoria through their joint **'CarbonNet project'.** CarbonNet plans to build a 100km CO2 pipeline from the Latrobe Valley to the Gippsland Basin, enabling new decarbonised industries to contribute to Victoria's 2035 interim emissions reduction target and a net zero emissions outcome by 2045. The **NT Hub** (Northern Territory) and **South West Hub** (Western Australia) CCUS projects are also in their research phase.

Notably, due to legislative constraints, the Australian Government-owned green bank, the Clean Energy Finance Corporation (**CEFC**), expects to be prohibited from investing in blue hydrogen projects due to the fact that they include a CCS component. In 2022, the CEFC became the first Industry Supporter of the **Australian Carbon Industry Code of Conduct**, which is identified as an important risk management and due diligence tool in assisting the participation and procurement in the hydrogen market. Since July 2021, the Australian Renewable Energy Agency's (**ARENA**) funding scope includes CCS projects, aiming to reduce the mean cost of carbon dioxide compression, hub transport and storage in Australia to below $20 per CO2 tonne.

7. Are there targets for the production of hydrogen?

There are currently no targets for the production of hydrogen as part of the **National Hydrogen Strategy**. The Australian Government considered in its National Hydrogen Strategy that mandatory national targets would not be appropriate at this time but should be reconsidered periodically as the market develops. The NSW State Government has in the **NSW Hydrogen Strategy** set a target for the production of 110,000 tonnes of renewable hydrogen production per year by 2030, but other States have not set such targets.

8. Are there any incentive mechanisms/business models in place to support the production of hydrogen?

The **National Hydrogen Strategy** and State and Territory strategies include a number of financial incentive mechanisms to support the production of hydrogen (these are detailed below in the discussion of government funding available for hydrogen projects (13)). The National Hydrogen Strategy and many State and Territory government strategies do not include any business models to support the production of hydrogen. There are various investor tools available, such as the **Queensland Hydrogen Investor Toolkit** and **South Australia's Hydrogen Export Prospectus**, to assist potential proponents reach financial decisions in respect of hydrogen projects in Australia. The **Hydrogen Economic Fairways Tool also** helps policymakers and investors make decisions about the location of new infrastructure and the development of hydrogen hubs.

9. Are there any standards in place for the classification and/or certification of low-carbon or renewable hydrogen?

As noted above, the Australian Government has developed an internationally aligned **Hydrogen Guarantee of Origin Scheme** (the **GO Scheme**). The GO Scheme is intended to assist in unlocking economic opportunities for the Australian industry to meet growing domestic and international demand for verified renewable electricity and low emissions products. The GO Scheme is designed to be a voluntary, product-based emissions accounting framework that measures and tracks emissions and associated information across value chains. The GO Scheme has been developed with internationally aligned emissions accounting methodologies in close collaboration with international energy partners and forums to ensure consistency in meeting the needs of importers of Australia's clean energy. It is intended that the GO Scheme will expand to international trading partners in the future.

At COP28 in 2023, Australia signed the **Declaration of Intent on Mutual Recognition of Certification Schemes for Renewable and Low-carbon Hydrogen and Hydrogen Derivatives** under which the participants seek to work towards mutual recognition of their respective certification schemes.

As part of the **National Hydrogen Regulatory Review**, the Australian Government along with State and Territory governments are currently reviewing legal frameworks and standards relevant to the development and safety of the hydrogen industry to determine if existing regulatory frameworks are sufficient and if any amendments are required.

10. Does the regulatory framework clearly define the regulatory requirements relating to the production, storage, transportation or supply of hydrogen?

10.1 National Regulations

The Australian federal regulatory framework does not currently clearly define regulatory requirements relating to the production, storage, transportation and/or supply of hydrogen. However, any hydrogen production facility should consider broad regulatory issues such as environmental impact, storage of dangerous goods and water sourcing requirements. The Federal Government has published **lists of legislation and relevant regulators for six hypothetical hydrogen projects**. As a result of a recent review of Australia's legal frameworks to assure hydrogen safety, industry development and national consistency, the Australian Government, States and Territories are developing a range of **National Hydrogen Codes of Best Practice**. **The first two codes being developed are hydrogen production and refuelling. Industry Consultation closed in December 2024 and further consultation is expected to take place on the drafts.** The NETP aims to provide certainty in the storage and transmission of hydrogen nationally.

10.2 State Regulations

- (**New South Wales**) Most of the legislation relevant to the Hydrogen Strategy is in the ***Electricity Supply Act 1995* (NSW)** as amended by the ***Energy Legislation Amendment Act 2021 No 34* (NSW)** under Schedule 1 'Amendment of Electricity Supply Act 1995 No 94 (NSW)', which introduced significant exemptions from government fees for green hydrogen producers. NSW has also introduced the ***Gas Supply (Safety and Network Management) Regulation 2022* (NSW)** which includes requirements in regard to the safe injection of hydrogen-natural gas blends within the gas distribution network. The regulations commenced on 1 September 2022. The NSW Government published its **Hydrogen Guideline - Guide to the NSW planning system** in March 2023 and its Hydrogen Regulatory Guide in December 2023. The ***Energy Legislation Amendment (Clean Energy Future) Bill 2024* (NSW)** received assent on 24 June 2024 which amends the ***Electricity Supply Act 1995* (NSW)**, the ***Electricity Infrastructure Investment Act 2020 No 44* (NSW)**, the ***Energy and Utilities Administration Act 1987* (NSW)**. The purpose of this amendment was to update the existing Acts regarding energy supply to support and streamline NSW's transition to a renewable energy system, including provisions providing concessions for producers of green hydrogen.
- (**South Australia**) The ***Hydrogen and Renewable Energy Regulations 2024* (SA)**, which implemented Australia's first "one window to government" licencing and regulatory system for large-scale hydrogen and renewable energy projects, came into operation on 11 July 2024. Under the ***Hydrogen and Renewable Energy Act 2023* (SA)**, fit for purpose licensing arrangements will be established for projects across all land types, enabling **regulation of the whole project life cycle**. Consultation on the regulations concluded on 15 April 2024, and the **South Australian Hydrogen and Renewable Energy Regulations 2024 Consultation Report** was published in October 2024. SA has also declared hydrogen to be a regulated substance under the ***Petroleum and Geothermal Energy Act 2000* (SA)**. It received assent on 23 November 2023 and the ***Statutes Amendment (National Energy Laws) (Other Gases) Act 2023* (SA)** came into operation on 7 March 2024.
- (**Queensland**) In May 2020, the Queensland Government released the **Queensland Hydrogen Investor Toolkit** which provides an overview of the information on regulatory approvals in Queensland. In October 2023, the ***Gas Supply and Other Legislation (Hydrogen Industry Development) Amendment Bill 2023* (Qld)** passed in Queensland Parliament, which amends the ***Gas Supply Act 2003* (Qld)** and ***Petroleum and Gas (Production and Safety) Act 2004* (Qld)**. The ***Gas Supply and Other Legislation (Hydrogen Industry Development) Amendment Act 2023* (Qld)** commenced on 4 April 2024. It applied the existing safety frameworks for pipelines in Queensland to hydrogen and other renewable gases, including the requirement to develop safety management systems and comply with safety requirements. In February 2024, the Queensland Government released a consultation paper '**An effective regulatory framework for Queensland's hydrogen industry**' and consultation closed on 1 March 2024.
- (**Western Australia**) WA introduced the ***Petroleum Legislation Amendment Bill 2023* (WA)** on 29 November 2023 which proposed to amend the ***Petroleum and Geothermal Energy Resources Act 1967* (WA)**, the ***Petroleum Pipelines Act 1969* (WA)** and the ***Petroleum (Submerged Lands) Act 1982* (WA)** to provide a framework for permanent geological storage and transport of greenhouse gases and provide for the exploration and production of naturally occurring hydrogen as a regulated substance. It received assent on 14 May 2024 and Part 1 of the **Petroleum Legislation Amendment Act 2024 (WA)** commenced on that date, while the substantive provisions of the Act will commence on a date yet to be fixed by proclamation.

11. Are there any foreign investment restrictions related to energy and infrastructure sectors?

The energy and infrastructure sectors in Australia are subject to Australia's foreign investment regulatory regime, which involves assessment and approval by the Foreign Investment Review Board (**FIRB**). Amendments to the ***Security of Critical Infrastructure Act 2018* (Cth)**, effective from 2 and 14 December 2021, expanded the scope of 'critical infrastructure assets' to the energy sector. Critical infrastructure assets are subject to greater scrutiny from FIRB. Critical infrastructure assets relating to the energy sector include critical electricity, gas, energy market operator and liquid fuel assets. Proposed foreign investment into 'critical infrastructure assets' will likely require mandatory FIRB approval. Significant criminal and civil penalties can apply for non-compliance with the ***Foreign Acquisitions and Takeovers Act 1975* (Cth)**, such as taking an action notified to FIRB prior to receiving FIRB approval.

12. What international treaties are in place that may offer protection to international investors in hydrogen projects in the jurisdiction?

The **United Nations Conference on Trade and Development** (**UNCTAD**) website states that Australia is a signatory to 16 bilateral investment treaties (**BITs**) (15 in force) and 25 other treaties in force which may contain protections for investors in Australia. These can be accessed from **UNCTAD's Investment Policy Hub**.

Australia was a party to the **Energy Charter Treaty** (**ECT**), a multilateral investment treaty which specifically addresses energy trade, transit and investment between its contracting parties, however, Australia withdrew from the treaty in December 2021.

Market developments and opportunities

13. Are there any government grants or other government funding available to hydrogen projects (including for research and development)?

See above for further details on the **Hydrogen Headstart program** and the ***Future Made in Australia Act***.

As part of its **National Hydrogen Strategy**, the Australian Government committed $464 million over 5 years from 2021-22 to develop hydrogen hubs in regional Australia of which an estimated $30 million is available for **Hydrogen Hub Development and Design Grants**. Applications for this grant program closed on 22 November 2021. Federal government funding was also available through the Australian Renewable Energy Agency (**ARENA**) **Renewable Hydrogen Development Funding** program which closed on 20 January 2021. The **2025-26 Portfolio Budget Statement** for Climate Change and Energy delivers a $2 billion investment towards the CEFC for private sector investment in renewable power, storage, and low emissions technologies including solar, wind, and green hydrogen..

On 11 April 2024, ARENA **announced its award of $59.1 million in funding across 21 projects** to support the research, development and commercialisation activities covering renewable hydrogen and low emissions iron and steel. A further list of ARENA-funded hydrogen projects is available **here**. The CEFC **Advancing Hydrogen Fund** is aiming to invest up to $300 million in eligible projects to support the development of the hydrogen industry. A further $22.8 million has been committed to support the Australian Energy Regulator to assist in the integration of renewable energy into the National Energy Market.

On 20 March 2025, ARENA announced that the first recipient of its Hydrogen Headstart Program, Copenhagen Infrastructure Partners', would receive $814 million in funding towards their 1,500 MW Murchison Green Hydrogen Project in Western Australia.

Australian State and Territory governments, including NSW, VIC, WA, QLD, SA and TAS, have created similar funds including grant programs. Victoria, for example, has created the **Hume Hydrogen Highway** grant which will support the development of refuelling stations along the Hume Highway. The NSW Government is establishing a $250 million **Renewable Manufacturing Fund** to expand local supply chains for renewable energy content. The **Queensland Hydrogen Industry Development Fund** ($15 million) and **Queensland Renewable Energy and Hydrogen Jobs Fund** ($2 billion) further support the Hydrogen Strategy and provide funding to successful projects which so far have included **HyP Gladstone**, **SunHQ Hydrogen Hub** and **Kogan Creek Renewable Hydrogen Demonstration**. Tasmania previously launched the $50 million **Tasmanian Renewable Hydrogen Industry Development Funding Program** (in May 2020), which has now closed. From the first round of the Program, the Government provided $2.6 million to support three feasibility studies investigating large-scale renewable hydrogen projects in Tasmania, which have now concluded.

14. Are there any notable pilot/demonstration projects in place or planned for the production or offtake of clean hydrogen?

There are a number of different pilot projects being deployed in Australia to examine and test the feasibility of clean hydrogen production and use in different sectors. Notably:

- (**Federal**) the **CSIRO Hydrogen Industry Mission** focuses on leveraging CSIRO's hydrogen research capabilities in partnership with government, industry and the research community.
- (**New South Wales**) a joint venture between Hiringa Energy and Sundown Pastoral Co are working on the **Good Earth Green Hydrogen and Ammonia Project** which will use 36 MW of integrated solar energy to produce green hydrogen and ammonia.
- (**Queensland**) the **Central Queensland Hydrogen Project** (CQH2) commenced in 2020 as a concept study into a large-scale liquefied renewable hydrogen supply chain between Central Queensland and Japan, with the feasibility study was completed in June 2022. In May 2023, the project plans indicated a commercial operations date of renewable hydrogen targeted for 2029 ramping up in 200 tonnes per day increments as additional offtakes are secured, with full scale production capacity targeted at around 800 tonnes per day by the early 2030s. In October 2023, the Stanwell Corporation Limited (a Queensland Government-owned corporation and one of the main proponents of CQH2) announced that it had signed a 15-year, 380-MW Power Purchase Agreement with ACCIONA Energía to purchase 100 per cent of the output from its planned Aldoga Solar Farm, 20 kilometres north-west of Gladstone to the CHQ2 Project. The Aldoga Solar Farm will be located adjacent to the proposed hydrogen production facility and further information on this project is available **here**. Additionally, last year Pure Hydrogen signed a 5-year lease at Archerfield Airport to develop the first green hydrogen demonstration micro-hub to service commercial transport operators and the aviation industry, with development now underway.
- (**South Australia**) the Australian Gas Network is operating the **Hydrogen Park South Australia** produces renewable hydrogen for blending with natural gas for supply of around 4,000 homes and businesses in metropolitan Adelaide. Additionally, the Marubeni Corporation is building the Green Hydrogen and Battery Energy Storage System (Bolivar) which consists of a demonstrator scale hydrogen production and battery storage system. Additionally, the Hydrogen Utility is developing the **Hydrogen Utility (H2U) Eyre Peninsula Gateway Project** which, in its demonstrator stage, would integrate a 57 MW electrolysis plant and a 120 tone per day ammonia synthesis facility.
- (**Victoria**) a consortium (consisting of Kawasaki Heavy Industries, Electric Power Development Co., Iwatani Corporation, Marubeni Corporation, Sumitomo Corporation and the Australian Gas Network) completed the **Hydrogen Energy Supply Chain Pilot (HESC) Project** to produce hydrogen and export it to Japan in order to test the liquefied hydrogen supply chain from Australia to Japan. The first shipment of liquefied hydrogen took place on 21 January 2022, which successfully ended the pilot phase. Data gathered from the pilot phase is currently under review to determine whether to proceed to a commercialisation phase. An overview of the pilot is available **here**.
- (**Western Australia**) firstly, Horizon Power has delivered the **Denham Hydrogen Demonstration Plant** to test whether renewable hydrogen can be used to produce baseload power in a remote microgrid in the coastal town of Denham. To date, the project has produced more than 4,500 kg of hydrogen. Secondly, The Hazer Group has delivered the **Hazer Process Commercial Demonstration Hydrogen Plant** which converts biogas from sewage treatment into hydrogen and graphite. Thirdly, Curtin University was awarded $5 million in funding from ARENA for its **Kotai Hydrogen Project,** developed in partnership with Velox Energy Materials, which is a research project investigating the feasibility of using Sodium Borohydride (NaBH4) as a safe 'carrier' of hydrogen that can be deployed on demand (i.e. transporting hydrogen in an inert powder form which can then be added to water to generate hydrogen).

15. Are there any commercial-scale clean hydrogen production projects in development or already operating?

There are currently no existing commercial-scale clean hydrogen production projects in Australia, however there are a number of projects in the pipeline. The **AusH2 tool** by GeoScience and the **Hydrogen Map** by CSIRO track hydrogen projects under development, construction or operating in Australia. Notable projects include:

- (**New South Wales**) Orica is developing the **Hunter Valley Hydrogen Hub** which once completed is estimated to produce 4,700 tonnes of renewables-based hydrogen per annum. Additionally, BOC Limited are developing the **Illawarra Hydrogen Technology Hub**, the first phase of which is intended to produce 4 tonnes of hydrogen per day.
- (**Queensland**) a consortium led by the Stanwell Corporation is developing the **Central Queensland Hydrogen Project** which aims to initially produce 200 tonnes of hydrogen per day by 2029, scaling up to 800 tonnes per day by the early 2030s. However, the future of the project is uncertain after the Queensland Government announced it would cease contributing to the project.
- (**Western Australia**) Copenhagen Infrastructure Partners is developing the **Murchison Hydrogen Renewables Project** near Kalbarri and recently received $814 million in funding under the Hydrogen Headstart Program. At full scale, the project is anticipated to have 6 GW of capacity.

16. Have there been any hydrogen-related disputes in your jurisdiction?

On 18 October 2023, the High Court of Australia handed down its decision in ***Vanderstock & Anor v State of Victoria [2023] HCA 30***. It ruled that Victoria's charge on the use of Zero and Low Emission Vehicles (**ZLEVs**) (including hydrogen vehicles) was invalid because the charge imposes a duty of excise within the meaning of section 90 of the Constitution. Under that section, imposing duties of excise is a power vested exclusively in the Commonwealth Parliament. Looking ahead, States and Territories will be prohibited from implementing taxes similar to the ZLEV Charge, and in the context of rapidly developing Commonwealth and State policies on climate change, the Court's decision could result in a significant shift in the fiscal balance, with some taxing powers moving away from the States and Territories, and towards the Commonwealth. This is particularly relevant in circumstances where the Commonwealth is fulfilling its international responsibilities under the Paris Agreement. Read more **here**. More recently, Infinite Green Energy, a Perth-based green hydrogen developer entered into administration on 7 April 2025, ahead of its Supreme Court appearance over a winding up order. Sydney company Pure Hydrogen Corporation Limited (**Pure Hydrogen**) has also had a claim filed against it by Pure Haul Pty Ltd (**Pure Haul**) alleging repudiation of contract by Pure Hydrogen and claiming damages of $8.1 million, if this matter is not settled it will likely not be heard for at least 12 months.

Key resources used:

Australia's 2024 National Hydrogen Strategy

Australian Government's State of Hydrogen 2022 Report

Advisian Australian hydrogen market study, Sector analysis summary dated 24 May 2021

ARENA's Renewable Hydrogen Development Funding Round

ARENA – Hydrogen Energy

ARENA – Yuri Renewable Hydrogen to Ammonia Project

AEMC's 'Hydrogen: the new Australian manufacturing export industry and the implications for the National Electricity Market (NEM)'

COP28 Declaration of Intent regarding hydrogen and derivatives

CSIRO HyResource

CSIRO - Hydrogen Map

DCCEEW – Extending the national gas regulatory framework to hydrogen blends and renewable gases Joint media release: Delivering Australia's climate and energy transformation

DCCEEW - Hydrogen Headstart program CSIRO HyResource – Industry

DCCEEW – Guarantee of Origin Scheme

DCCEEW – National Hydrogen Regulatory Review

DCCEEW – Portfolio Budget Statements 2025-26 Climate Change, Energy, the Environment and Water Portfolio

GeoScience – H2 Tool

National Energy Transformation Partnership Australia | Green Hydrogen Organisation (gh2.org)

National Hydrogen Strategy Review 2023

Last updated May 2025

Belgium

Policy and regulation

1. Is there a government hydrogen strategy or policy?

On October 29, 2021, the Belgian federal government adopted its first hydrogen strategy. This document announced Belgium's ambitions for renewable molecules and the role it would like to play as an import and transit hub in Europe.

On October 12, 2022, the federal government validated an update of this strategy to reflect the state of progress of its implementation. Additional measures are announced therein taking into account recent developments in the sector.

The strategy of the federal government can be found **here**.

The new Belgian government, formed in early 2025, has pledged to support all forms of low-carbon hydrogen production. This includes allowing green hydrogen used in oil refining to count towards climate targets without correction factors and advocating for more flexible EU definitions of renewable fuels.

2. What are the key goals and commitments included in the strategy/policy?

The federal hydrogen strategy aims to prepare Belgium for the climate challenges, alongside the technological, political and economic challenges of the coming decades. This strategy is based on 4 pillars/objectives described below.

Pillars/objectives	Measures to achieve the pillars/objective
Positioning Belgium as an import and transit hub for renewable molecules in Europe	• Since 2021: Engage with key partners in order to open 3 main import routes (North Sea route, Southern route and the shipping route) for renewable molecules • 2022: Support the development of hydrogen import infrastructure to have the first imports of H2-molecules (or of H2-derivatives to be cracked into H2-molecules) by 2026 • 2023: Organise hydrogen master classes together with the Belgian Hydrogen Council to establish close relationships with key exporting partners • 2023-2024: Investigate how the development of both electricity and hydrogen networks can complement each other in the North Sea
Expanding Belgian leadership in hydrogen technologies	• 2021: Support research and pilot projects on hydrogen technologies with the two federal R&D funds (Energy Transition Fund and call Clean Hydrogen for Clean Industry) • By 2025: Develop a hydrogen test infrastructure • By 2026: Develop a limited electrolysis capacity of minimum 150 MW
Establishing a robust hydrogen market	• 2023: Set up a framework ensuring an optimal planning of energy transport networks • 2022-2023: Adapt the legal and regulatory framework for the transport of hydrogen per pipeline • 2023-2024: Investigate with the Belgian Regions and/or Europe how the federal government can help to put in place a system to unlock the demand for renewable H2-molecules and H2-derivatives • By 2025: Develop a European voluntary certification scheme and a register for H2-molecules and H2-derivatives • By 2025: Develop a market hub for H2-molecules and H2-derivatives linked to physical supply hubs in Belgium • By 2026: Develop 100 to 160 km of additional H2 pipelines (new and/or repurposed) to be operated under non-discriminatory third-party access conditions • By 2028: Interconnect the Belgian H2 transport network with Germany, France and the Netherlands
Investing in cooperation as a key success factor	• Implement a structural consultation on hydrogen within Belgium • Adopt a proactive and dynamic attitude within the working groups dedicated to hydrogen (Benelux, Pentalateral Energy Forum and European Union) • Represent Belgium in international organisations and forums on hydrogen • Continuous interactions with the sector, research institutes and citizens to keep this hydrogen strategy up to date with the evolution of the barriers and needs

3. Which industry sectors are most likely to be affected by hydrogen deployment?

The Belgian federal government strategy identifies four sectors that hydrogen will help to make climate neutral by 2050:

- the industry sector (chemical, steel, glass, etc);
- the transport sector;
- the heating of buildings; and
- the energy distribution sector.

4. Who are the main regulators for the hydrogen market?

The Commission for Electricity and Gas Regulation (the CREG) is entrusted as the independent regulatory authority responsible for overseeing hydrogen transport.

Fluxys Hydrogen has been appointed as the hydrogen transport network operator. It will be responsible for planning, developing and managing the non-discriminatory access to the hydrogen transport network in Belgium.

5. Does the government hydrogen strategy or policy support the development of both low-carbon (blue) hydrogen and renewable (green) hydrogen?

Yes, the federal government hydrogen strategy supports the development of both low-carbon hydrogen and renewable hydrogen.

The federal government hydrogen strategy aims to have only renewable hydrogen in the Belgian energy mix by 2050 or before if possible.

In order to achieve that objective, it is considered necessary to have a phased approach where fossil production with lowered GHG emissions can play a transitional role to kickstart the market.

According to the strategy, such a phased approach would be best suited to ensure both the lowest possible carbon emission and a level-playing field for hydrogen in the current economic context while giving priority only to the climate neutrality of the H2 production would slow down the pace of development of the sector, and thus the development speed of decarbonised solutions for the industry, the transport sector and the other H2 applications.

6. If the government hydrogen strategy or policy supports the development of low-carbon hydrogen, to what extent is carbon capture and storage being taken forward?

The Belgian federal government hydrogen strategy only supports the development of hydrogen production via steam methane reforming and auto-thermal reforming provided that the production installations are coupled with carbon capture and storage as well as pyrolysis plants.

Large-scale projects aiming to capture and store CO2 are currently in development in Belgium e.g. the Antwerp@C project.

7. Are there targets for the production of hydrogen?

The production of renewable hydrogen will remain limited in Belgium because of the limited local renewable energy potential. Nevertheless, Belgium has set itself the target of having at least 150 MW of electrolysis capacity into operation by 2026.

8. Are there any incentive mechanisms/business models in place to support the production of hydrogen?

The incentive mechanisms in place in Belgium to support the production of hydrogen consist mainly of subsidies granted to selected projects (see question 13 below).

The Belgian federal government also tries to incentivise investors to finance hydrogen projects in Belgium by establishing a legal framework providing sufficient legal certainty to companies active in the sector (see question 10 below).

9. Are there any standards in place for the classification and/or certification of low-carbon or renewable hydrogen?

The Renewable Energy Directive 2018/2001 (RED II) introduced guarantees of origin for renewable hydrogen. The Belgian federated entities (i.e the Regions of Belgium) have transposed that directive with the Flemish Decree of 26 April 2019 establishing a system of guarantees of origin for gas, heat and cooling, the Walloon Decree of 25 May 2022 amending various energy provisions in the context of the partial transposition of Directives 2019/944/EU of 5 June 2019 concerning common rules for the internal market in electricity and the Renewable Energy Directive 2018/2001/EU and the Brussels Ordinance of 6 May 2021 on the organisation of thermal energy networks and the accounting of thermal energy in the Brussels-Capital Region and their respective implementing governmental orders.

Except for guarantees of origin, there are no standards existing at Belgian level to distinguish between low-carbon and renewable hydrogen. In the future, the Belgium authorities intend to rely on the standards that are being developed at EU level.

The Belgian federal government is also supporting Hinicio, a strategy consultancy firm specialized in energy transition and sustainable mobility, in the development of a European voluntary certification scheme and a register for H2-molecules and H2-derivatives via the Energy Transition Fund. A pilot phase in Belgium is foreseen within this project. In a second phase, this work could also be extended to low-carbon molecules.

10. Does the regulatory framework clearly define the regulatory requirements relating to the production, storage, transportation or supply of hydrogen?

The regulatory requirements relating to the transport of hydrogen is governed by the Law of 11 July 2023. This law (i) guarantees non-discriminatory access to the hydrogen transport network for all interested parties, (ii) determines, among other things, the rules and procedures for preparing the network development plan and for setting regulated network tariffs, and (iii) designates the CREG as the regulator for hydrogen transport.

The regulatory requirements relating to the production, storage or supply of hydrogen are currently mainly governed by the Law of 12 April 1965 on the transport of gaseous and other products through pipelines and the various Royal Decrees implementing this law. Some regional environmental laws may also be applicable in case a hydrogen project requires an environmental/ building licence. These laws and implementing acts do not explicitly cover hydrogen.

11. Are there any foreign investment restrictions related to energy and infrastructure sectors?

In July 2023, Belgium introduced an ex ante federal foreign investment screening mechanism, primarily inspired by Regulation (EU) no 2019/452.

The federal screening regime applies to direct and indirect acquisitions by non-EU investors of:

- more than 25% of the voting rights in undertakings or entities established in Belgium whose activities touch upon, among others, critical infrastructure for energy, transport, water, health etc., technologies and raw materials that are of essential importance to public health, defence, public security etc. and the supply of critical inputs like energy; or
- more than 10% of the voting rights in undertakings or entities established in Belgium whose activities touch upon, among others, energy provided that the target's turnover exceeded EUR 100 Mio in the preceding book year.

It implies a mandatory and suspensory notification of the acquisition. The responsible entity will assess whether the acquisition may negatively impact on national security, public order or the strategic interests of the Belgian federated entities and may possibly impose remedies.

In January 2019, the Region of Flanders introduced an a posteriori regional screening mechanism regarding foreign (EU or non-EU) controlling investments in a Flemish or local governmental entity or any other entity controlled by the Flemish government, representing public strategic interests in Flanders.

No distinct foreign investment screening mechanisms are currently in force or foreseen in the Walloon or Brussels Region.

12. What international treaties are in place that may offer protection to international investors in hydrogen projects in the jurisdiction?

According to the United Nations Conference on Trade and Development (UNCTAD) Belgium is a signatory to 61 bilateral investment treaties (BITs) that are in force (**here**). Moreover, certain other treaties may contain other investment protection provisions.

Belgium is also a signatory to the Energy Charter Treaty (ECT), a multilateral investment treaty which specifically addresses energy trade, transit and investment between its contracting parties. However, it should be noted that the European Union and Euratom have decided to withdraw from the ECT (with effect from 28 June 2025). This withdrawal movement has been joined by several EU Member States. Belgium may follow in the future.

Belgium currently has no bilateral investment treaties in force with Member States of the European Union as the European Union has competence in this area on behalf of the Member States.

In May 2024, the Belgian Hydrogen Council, NLHydrogen (Netherlands), and the German National Hydrogen Council signed an MoU to strengthen cooperation in the hydrogen sector. This alliance focuses on joint initiatives to advance the hydrogen economy in North-West Europe, including collaboration among industry, government, research institutes, and civil society to promote innovation and sustainability.

In December 2024, the Belgian Hydrogen Council (BHC) and Hydrom Oman signed a Memorandum of Understanding (MoU) to enhance cooperation in green hydrogen development. This partnership includes joint research, industrial collaboration, and the establishment of regulatory frameworks to support hydrogen import and distribution. The agreement builds upon the Hyport Duqm project, a collaboration involving Belgium's DEME Group, aimed at producing green hydrogen and ammonia for export to Europe and Asia.

In March 2025, the Belgian Hydrogen Council, Flanders Investment & Trade, and GH2 India signed an MoU to connect their hydrogen ecosystems. This collaboration seeks to promote knowledge exchange and joint development of hydrogen technologies between Belgium and India. It could facilitate future green hydrogen exports from India to Europe via Belgian ports, aligning with Belgium's role as a hydrogen import hub.

Market developments and opportunities

13. Are there any government grants or other government funding available to hydrogen projects (including for research and development)?

Yes, the Belgian federal government has set up a number of programmes and funds to support research and development in the field of hydrogen. For instance:

- The Energy Transition Fund supports, among other things, research and development on the production, transport and storage of hydrogen and its derivatives. It has been active since 2017, remains in place until 2025 and subsidises various projects following an annual call for projects for a total amount of 20 to 30 million euros per year.
- The call for projects Clean Hydrogen for Clean Industry is organized within the framework of Belgium's national recovery and resilience plan. It focuses on the development of promising technologies for the production and use of hydrogen and its derivatives with a relatively high maturity level. In this way, the federal government aims to stimulate investments that will enable a faster scaling of commercial applications. A first call was launched in April 2022 for a total support of maximum 50 million euros. A second one was launched in 2023 for a total support of 10 million euros.
- The H2 Import Call focuses on the development and demonstration of technologies that enable the import of hydrogen (in any form whatsoever, H2-derivatives included) and its injection on a hydrogen transport network. This call was launched in early 2023, with an envelope of 10 million euros.

The Walloon government via, among others, its Walloon Kyoto Fund and its Walloon Recovery Plan and the Flemish government via, among others, its Ecology Premium have also made funding available to hydrogen projects.

Belgian companies active in the hydrogen sector can also ask for public funding at EU level to several public bodies like the EU Innovation Fund.

14. Are there any notable pilot/demonstration projects in place or planned for the production or offtake of clean hydrogen?

Yes, there are several pilot projects in Belgium to produce and collect clean hydrogen. For instance:

- The University of Liège, via one of its spin-off BeBlue, has launched a pilot project to produce green hydrogen from solar energy for ESA's spacecrafts.
- Scientists from the University of Leuven have launched a pilot project to produce green hydrogen from solar energy and moisture.
- A pilot project is underway at the University of Gent to produce green hydrogen from wind energy.

15. Are there any commercial-scale clean hydrogen production projects in development or already operating?

There are currently no existing commercial-scale clean hydrogen production projects in Belgium, but there are plenty of projects ongoing, at different stages of development, including:

In February 2025, Belgium inaugurated its largest green hydrogen project, Hyoffwind, located in Zeebrugge. It was developed by a consortium of different companies like Virya Energy, Fluxys, John Cockerill and BESIX.

Plug Power's project to build a 35-tonnes-per-day green hydrogen generation plant at the Port of Antwerp-Bruges;

Antwerp@C project in Antwerp which aims to store and reuse CO2 to produce blue hydrogen; and

The HaYrport project in Liège, being developed by Liege Airport and CMI, which aims to equip the airport with installations for production, distribution and the use of green hydrogen.

16. Have there been any hydrogen-related disputes in your jurisdiction?

There are no disputes that we are aware of.

Last updated June 2025

Brazil

Ashurst collaborated with **Cescon Barrieu Advogados** in the preparation of this content. We are grateful for their input.

Policy and regulation

1. Is there a government hydrogen strategy or policy?

Yes, the Brazilian Government has adopted the following hydrogen initiatives and policies:

- The National Energy Plan, published in December 2020 by the Ministry of Mines and Energy and the Energy Research Company (*Empresa de Pesquisa Energética*), a state-owned think-thank;
- The National Energy Policy Council Resolution, published in February 2021;
- The Basis for the Consolidation of the Brazilian Strategy for Hydrogen, published in February 2021 by Energy Research Company;
- The National Hydrogen Program ("**PNH2**"), published in June 2022 by the National Energy Policy Council;
- The **Low Carbon Emission Hydrogen Act** (Law No. 14,948/2024), published in August 2024 by the Federal Government ("**Low Carbon Emission Hydrogen Act**");
- The Low Carbon Hydrogen Development Program ("**PHBC**") (Law No. 14,990/2024), published in September 2024 by the Federal Government; and
- National Policy on Low-Carbon Hydrogen, executed by PNH2, as the national program that shall be responsible for establishing the guidelines for implementing the National Policy based on three aspects: (i) public policies, (ii) technology, and (iii) the sector stakeholders.

2. What are the key goals and commitments included in the strategy/policy?

The Low Carbon Emission Hydrogen Act aims to foster the development of the low-carbon emission hydrogen industry by establishing legal parameters and policies to stimulate both public and private sectors.

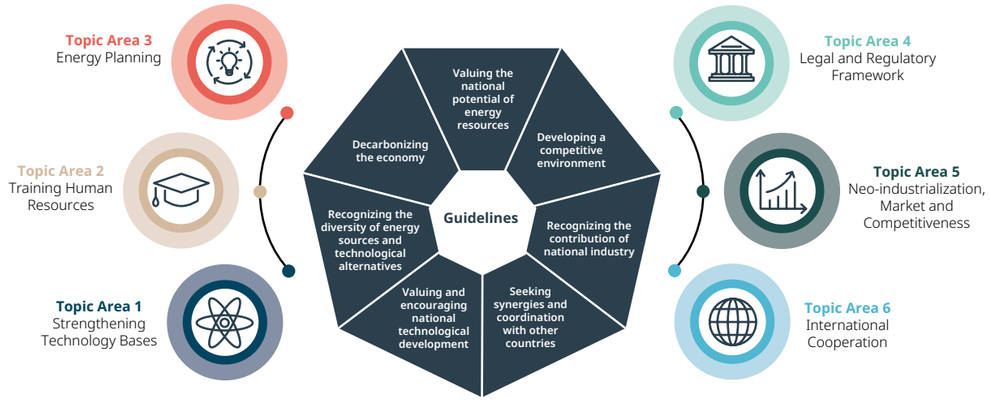
To achieve these goals, the Low Carbon Emission Hydrogen Act has implemented the following mechanisms:

- PHBC, as a funding source for the hydrogen energy transition;
- Low Carbon Hydrogen Certification System ("SBCH2");
- creation of a Special Incentive Regime for Low Carbon Hydrogen Production ("Rehidro"), which seeks to promote competition in connection with technological and industrial development and add value to national production chains;
- Technical and financial cooperation between the public and private sectors to develop research regarding new products, methods, processes, and technologies for producing low-carbon hydrogen; and
- Tax, financial, credit, and regulatory incentives.

The Low Carbon Emission Hydrogen Act has the following main objectives:

- preservation of national interest, consumer access and free market competition;
- to attract and encourage national and foreign investment in the production, transportation, and storage of low-carbon hydrogen and its by-products;
- promotion of sustainable development and to expand the labor market in the production/supply chains of low-carbon hydrogen and its by-products;
- promotion of energy applications of low carbon hydrogen and its by-products and enhance its role as a vector for energy transition in various sectors of the national economy and export;
- support for the energy transition to comply with the Paris Agreement;
- strengthening of the national supply chain of inputs and equipment for the production of low-carbon hydrogen;
- promotion of research and development related to the use of low-carbon hydrogen and its by-products for energy and industrial purposes;
- to stimulate public-private collaborations to develop low-carbon hydrogen projects; and
- development of domestic production of nitrogen fertilizers from low-carbon hydrogen to minimize dependence on foreign sources of fertilizers that can also lead to more domestic food security.

Brazilian strategy/policy is also based on the following guidelines and topic areas under the PNH2:



3. Which industry sectors will most likely be affected by hydrogen deployment?

Hydrogen has many applications and, in Brazil, it has the opportunity to be incorporated in the following industry sectors:

- Fertilizers: Low-carbon hydrogen can replace fossil fuels to produce fertilizers.
- Low carbon steel: Low-carbon hydrogen can be introduced into the steel production chain as an alternative to decarbonization.
- Fuel: Low-carbon hydrogen can be an alternative to fossil fuel burning. Potential benefits include naval, heavy transport, the chemical industry, and aviation.
- Batteries: Hydrogen is an excellent alternative to solve the periodicity of renewable energy sources, such as wind and solar power. Considering this, it can be used as a "battery" to store chemical energy.

Therefore, introducing hydrogen to the industry and throughout the supply chain can assist in reducing carbon emissions; that is, hydrogen can be at the vanguard of energy transition in various sectors of the national economy.

4. Who are the primary regulators for the hydrogen market?

The Low Carbon Emission Hydrogen Act establishes the National Oil, Gas, and Biofuel Agency ("**ANP**") as the regulatory entity responsible for authorizing and supervising hydrogen exploration and production activities. Considering its know-how in gas production and biofuels the commercialization process and regulations applicable to hydrogen will be similar.

5. Does the government hydrogen strategy or policy support the development of both low-carbon (blue) hydrogen and renewable (green) hydrogen?

Brazilian Strategy for Hydrogen and the PNH2 aim to invest in other hydrogen variants besides green hydrogen, considering the diversity of energy sources available in the country to produce hydrogen.

Although Brazil has one of the cleanest energy matrixes in the world (approximately 85% of the power is generated by renewable sources), the strategy encompasses various sources for obtaining renewable hydrogen and a wide range of applications in multiple sectors of the economy (transport, energy, steel, and mining, for example).

In this regard, the Brazilian national plan aims to establish and develop "low carbon hydrogen"—a phrase that is mainly used in all the national documents related to this matter.

The recent discovery of natural gas reserves in Brazil and South America is driving the option to adopt a regime for low-carbon hydrogen, produced both from renewable sources and natural gas.

6. If the government hydrogen strategy or policy supports the development of low-carbon hydrogen, how much progress is being made in carbon capture and storage?

In Brazil, carbon capture and storage (CCS) initiatives are still in their early stages and lack specific regulation. Nevertheless, Petrobras, the country's leading oil company, stands out for its efforts.

Since the 1970s, Petrobras has been developing Carbon Capture, Utilization, and Storage (CCUS) techniques in the pre-salt fields to enhance oil production. In 2022, the company reached a record of 10.6 million tons of CO_2 reinjected. With ambitious plans, Petrobras has set a target of reinjecting 80 million tons of carbon by 2025. Currently, CCUS technology is being used in 21 FPSO units (Floating Production, Storage and Offloading), and the company aims to expand this application to seven additional platforms by 2025.

The experience gained through CCUS provides Petrobras with solid expertise to advance in new technologies, such as Carbon Capture and Storage (CCS). In 2023, the company announced studies for the implementation, in partnership with other firms, of infrastructure to transport CO_2 from industrial capture sites to permanent storage in reservoirs located beneath the seabed.

Additionally, in 2025, Petrobras and Braskem signed a Memorandum of Understanding (MoU) to deepen studies on potential CCS project opportunities in the state of Bahia and develop a mutually beneficial business model within the low-carbon economy, marking a pioneering initiative in the region.

In that respect, Petrobras contributes to the advancement of a technology that holds the potential to enable large-scale decarbonization and reduce greenhouse gas emissions not only from its own operations but also from other sectors in the country, such as the cement industry and steel production.

Besides that, Brazil is focused on developing low-carbon emission hydrogen infrastructures. Brazil has know-how and infrastructure related to natural gas production and other types of renewable energy that will be utilized in the production of hydrogen, although both the availability and usage of such infrastructure is limited (most, if not all, the current infrastructure is not technically prepared to receive H2).

7. Are there targets for the production of hydrogen?

No targets are currently set. However, according to a study developed by the International Renewable Energy Agency ("IRENA") and McKinsey, Brazil could meet a domestic demand of 9 million tons of hydrogen and export up to 4 million tons to the United States and Europe by 2040.

8. Are any incentive mechanisms/business models in place to support hydrogen production?

As mentioned in previous items, the Federal Government has launched the Rehidro and PHBC programs, which are included in the Low Carbon Emission Hydrogen Act, to boost the industry.

- **Rehidro:** a five-year tax incentive program, available in January 2025, for legal entities qualified to produce low-carbon hydrogen. Qualification for the Rehidro is going to be regulated by the Federal Government but will require producers to: (i) use a minimum percentage of goods and services of Brazilian origin during the production process, when applicable; (ii) invest in research, development and innovation; and (iii) invest in sustainable development and energy transition projects in Brazil. Rehidro provides to qualified legal entities the right to purchase new machinery, devices, instruments and equipment In the domestic market or to import them, as well as to purchase construction materials and services without incurring PIS and COFINS taxes, as long as they are incorporated into infrastructure works intended for such fixed asset. Co-qualified legal entities that carry out (i) hydrogen packaging, storage, transportation, distribution or marketing activities; (ii) renewable electricity generation for hydrogen production; and (iii) biofuels for hydrogen production, may also benefit from Rehidro. The beneficiary of Rehidro is also authorized to issue incentivized debentures to finance the implementation or expansion of projects related to the production, packaging, storage, transportation, distribution or commercialization of low-carbon hydrogen.
- **PHBC:** the program aims to support initiatives in favor of energy transition and to apply incentives for decarbonization in hard-to-abate industrial sectors, such as fertilizers, steel, cement, chemical, and petrochemical industries. Referred goals will be achieved through the granting of tax credits related to the Social Contribution on Net Profit ("Contribuição Social sobre o Lucro Líquido – CSLL") for commercialization activities carried out between January 1, 2028, and December 31, 2032, by either the producer or the buyer of low-carbon hydrogen and its derivatives, produced within Brazilian territory. The tax credit will correspond to up to 100% of the difference between the estimated price of low-carbon hydrogen and the estimated price of substitute goods. Projects will be eligible for the tax credit if they meet at least one of the following criteria: (i) contribution to regional development; (ii) contribution to climate change mitigation and adaptation measures; (iii) promotion of technological development and dissemination; and (iv) contribution to the diversification of the Brazilian industrial base. The granting of the tax credit will be preceded by a competitive selection process aimed at selecting the projects eligible to calculate the tax credits. The evaluation criteria will include, at a minimum, the lowest credit value per unit of product.

In addition, the regulation and the market framework for hydrogen can be supported by numerous previous successful institutional experiences tested in Brazil concerning the power sector:

- **Demand incentives**. At a time when renewable energy sources in Brazil were not competitive, a series of policies were created to encourage demand for such sources, such as:
  - **Wheeling Fee Discounts**. Previously, energy generators from incentivized sources had discounts on fees for using transmission and distribution systems. Users who purchased energy from these sellers also benefited from such discounts. This system allowed for greater competitiveness for energy from incentivized sources. Still, the discounts are subsidized by other players and users of the sector, which, in addition to the sharp decrease in costs to implement renewable assets, led to the termination of this policy in 2021.
  - **Fuel Blending**. Brazilian law No. 8,723/1993 establishes a mandatory proportion of anhydrous ethanol to be blended with the gas commercialized in Brazil to create demand and incentivize the usage of biofuels over oil derivatives. Blending green hydrogen derivatives with natural gas or fuel could provide a similar alternative.
- **Specific financing—public banks**. Specific credit lines could be opened for hydrogen projects. Financing already exists for the purchase and sale of energy generation systems that contribute to reducing greenhouse gas emissions in general.
- **Reduction of tariffs for equipment imports (ex-tariff)**. The ex-tariff regime allows the temporary reduction of import tax rates for capital goods. For example, some specific photovoltaic equipment were included in the ex-tariff regime. Similar solutions could be adopted for equipment aimed at hydrogen production without national equivalents.

This "toolbox" (and others) available to Brazilian regulators in the energy sector can be taken as an example by players interested in contributing to the development of the hydrogen segment because it can be applicable to the hydrogen sector.

9. Are there any standards for classifying or certifying low-carbon or renewable hydrogen?

Yes - the Low Carbon Emission Hydrogen Act has created the Brazilian Hydrogen Certification System (SBCH2) with the purpose of reporting the intensity of emissions relating to the hydrogen production chain, guaranteeing its sustainability. Hydrogen certification will adopt the greenhouse gas (GHG) emissions intensity related to hydrogen produced within national territory as an attribute, based on a life cycle analysis.

Adherence to the certification system will be voluntary for those interested in reporting and disclosing such information. Volunteers wishing to issue the certificate for hydrogen or its derivatives produced in the national territory will be required to follow the governance rules established in the certification system, the regulation of which is still pending.

The regulatory authority shall provide mechanisms for interoperability and harmonization with international hydrogen certification standards and may establish rules for the recognition of certificates for hydrogen and its derivatives that are imported.

Furthermore, the Brazilian Energy Trading Chamber ("**CCEE**") developed the first Brazilian certification initiative for renewable hydrogen. The Certification Guide was updated in 2023, and in 2024, the CCEE requested the European Commission torecognize the Brazilian certification and assured that the governance and ecosystem involved in the certification process were aligned with European standards.

The main goal of the CCEE certification is to meet national and international requirements, acting as a verification tool in which users can verify the origin and trace the product's environmental attributes and facilitate the qualification of the hydrogen producer in the market, strengthening the safety and credibility of its product. Considering that, CCEE will:

- Analyze the origin of the electricity used to produce the hydrogen. This validation is essential to meet the requirements of origin criteria, attesting to the portion of renewable electricity used with a power purchase agreement ("**PPA**") or self-production arrangement and the portion that may have been consumed from the grid that cannot be verified as renewable.
- Periodically verify the electricity generated and used by the hydrogen producer. The hydrogen produced will be certified as hydrogen from a renewable source, proportional to the renewable energy used in the PPA for production in the period. Should the energy verified be insufficient, and the hydrogen producer generated energy outside the PPA framework, the proportional share of hydrogen will be certified as hydrogen from a partially renewable source.

CCEE is a member of the international work group that creates international guidelines and requirements for hydrogen certification. This initiative includes energy sector leaders from Australia, Canada, Spain, the United States, Holland, Israel, Italy, and the United Kingdom.

10. Does the regulatory framework clearly define the regulatory requirements relating to hydrogen production, storage, transportation, or supply?

The Low Carbon Emission Hydrogen Act appoints ANP as the agency responsible for regulating, authorizing, and inspecting the exploration and production of hydrogen in the national territory, as well as activities related to the loading, processing, treatment, import, export, storage, warehousing, packaging, transportation, transfer, resale, and marketing of hydrogen.

In addition, ANP is responsible for creating regulations related to such activities. The Low Carbon Emission Hydrogen Act establishes that the activities must be carried out by companies incorporated under Brazilian Law and that the rules to be created by ANP shall (i) observe the powers of the regulatory agencies to establish the rules, (ii) establish the possibilities and requirements for the prior consent by ANP for the transfer of the authorization by ownership; and (iii) establish the conditions in which the authorization may be waived particularly in relation to the volume produced and the use of hydrogen.

11. Are there any foreign investment restrictions related to the energy and infrastructure sectors?

One of the guidelines of the Brazilian strategy is engagement with international programs and initiatives. Several ongoing Brazilian initiatives and debates on green hydrogen production, such as GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit), the World Bank, and the European Union, rely on foreign cooperation and investments.

The Low Carbon Emission Hydrogen Act limits the authorizations for production, storage, transportation, or supply to companies incorporated under Brazilian Law, but does not restrict foreign investors' investment or share ownership.

Finally, Brazilian state legislation restricts foreign-controlled companies' ownership or lease of rural properties.

12. What international treaties are in place that may offer protection to global investors in hydrogen projects in the jurisdiction?

Brazil has signed bilateral agreements with Germany, the European Union and the United Kingdom to develop green hydrogen. Brazil and Chile also created the Brazil-Chile Working Group to perform explanatory technical work on potential bilateral hydrogen cooperation.

Market developments and opportunities

13. Are any government grants or other government funding available for hydrogen projects (including research and development)?

Brazilian regulators, such as the ANEEL and the ANP, monitor and direct mandatory investments in research and development in their industries. At the same time, the National Fund for Scientific and Technological Development ("**FNDCT**") finances innovation in Brazil.

ANEEL approved a strategic Invitation for Research, Development, and Innovation Projects (PDI) No. 23/2024 in March 2024 to receive expressions of interest in funding projects focusing on hydrogen in the electricity sector. The Invitation aims to promote projects that study the application of hydrogen, from production to application, in the electricity sector, with an emphasis on low-carbon sources. According to the report published on April 2nd, 2024, 95 energy companies or groups have expressed an interest in funding projects focused on hydrogen in the electricity sector.

The **Brazilian Development Bank (BNDES)** launched a program to promote pilot projects for the production of green hydrogen generated from renewable energies. The program combines two support instruments: the BNDES Finem—Environment line and the Climate Fund Program.

Besides that, BNDES and **CAF,** a multilateral development bank of Latin America and the Caribbean, has signed an agreement to open a credit line between CAF to BNDES in the amount of R$ 2.7 billion to finance projects in four priority areas, such as (i) new or refurbished industrial plants with high energy consumption, encouraging the production of green manufactured goods, such as steel, cellulose, cement and chemicals, with a focus on reducing carbon emissions and environmental improvements and (ii) Green Hydrogen production projects.

The Brazilian Federal Government has also launched the Brazilian Platform for Climate Investment and Ecological Transformation – BIP, with the aim of financing projects that promote the decarbonization of the economy with a focus on priority sectors such as low-carbon hydrogen. To be eligible for funding, projects must meet the following requirements: (i) compliance with the transition plans and national programs; (ii) material environmental impact as to reduce greenhouse gas emissions; (iii) the need to mobilize capital and support from the Platform; and (iv) socio-economic benefits, in the sense that other social benefits must be promoted, such as jobs creation.

The **State of São Paulo** also launched an initiative to promote decarbonization by offering BRL 500 million in credit. The credit is targeted at technologically innovative startups that are aligned with decarbonization and state and municipal programs aligned with energy transition.

14. Are there any notable pilot/demonstration projects in place or planned for the production or offtake of clean hydrogen?

Several pilot projects are being deployed in Brazil to develop electrolyzer production and to examine and test the feasibility of clean hydrogen production and the use of hydrogen in different sectors:

The state of Piauí, together with the corporate Green Energy Park and Solatio, launched the world's biggest green hydrogen project in the Export Processing Zone (Zona de Processamento de Exportação—ZPE) located in Parnaíba, on Piauí's coast. The project's installed capacity will be 20 GW, with the Green Energy Park and Solatio investing BRL 200 billion over the years.

The state of Rio Grande do Norte and the companies CPFL Energia and Mizu Cimentos signed the first green hydrogen trading agreement in Brazil. The project, which is scheduled to begin operations in 2037, is pursuing the installation of a pilot unit for the cement industry by 2030.

The **Export Processing Zone** located in Pecém, in the state of Ceará, approved the installation of Brasil Fortescue's largest green hydrogen generation project. The company intends to invest R$17.5 billion in the project, which will have a production capacity of 1.2 gigawatts (GW) per year and the potential for increases in later stages of the development. The operational date is expected to be August 2028.

The **Brazilian Federal Government** and **Climate Investment Funds (CIF)** signed an agreement to invest R$6 billion in green hydrogen production projects related to the decarbonization of the Brazilian industry as part of PNH2's initiatives. 70 projects were selected by way of a Public Invitation. These projects will be invited to participate in the next phase of the process, which will consist of presenting the projects in detail in order to better understand the project's data and how CIF-ID resources can be allocated to support its viability. The funds will cover the various stages and requirements of the projects, including the development of engineering designs, procurement of equipment, and provision of working capital.

Pecém Complex Initiatives: The **Pecem Complex (CIPP)** is a joint venture formed by the state government of **Ceará** and the **Port of Rotterdam**. CIPP has entered into a series of MoUs and other agreements related to viability analysis and the development of hydrogen projects aimed at the external market. Among the MoUs and agreements entered into by CIPP or the government of Ceará and partners for the development of such projects, we point out:

- **Transhydrogen Alliance (THA)**, a consortium among **Proton Ventures, Trammo DMCC, Varo Energy**, and **GES**, executed an MoU with CIPP for the execution of a feasibility study for a USD2 billion project that will produce 2.5 million tons of green ammonia per year, with 500,000 tons of green hydrogen as feedstock at the Pecém Complex. In February 2023, THA signed a MoU with **Casa dos Ventos** and **Comerc Energia Group** to construct a green hydrogen plant and export more than 2.0 million tons of green ammonia to Europe from 2026.
- **White Martins (Linde Group)** signed an MoU with CIPP to establish and develop the potential to produce local hydrogen to sell to the European market. White Martins is a company with technology and expertise in several key areas of green hydrogen production, distribution, and application supply chains, including electrolyzers, ammonia production, hydrogen liquefaction, technology for the use of hydrogen in mobility applications, and experience with the insertion of hydrogen in natural gas networks.
- **Qair Brasil**, a renewable power generation company, signed an MoU with the government of Ceará to develop a green hydrogen production plant using energy generated by the Dragão do Mar offshore wind complex. The expected CAPEX is USD 6.95 billion.
- **EDP**, a company that operates across the entire supply chain of the Brazilian electrical sector, has produced in the Pecém Complex the first green hydrogen molecule in December of 2023 and inaugurated, in January 2023, a green hydrogen production plant as part of the Pecém Hydrogen Research & Development project.

Porto do Açu Initiatives is a privately owned port and industrial complex in Rio de Janeiro that has signed an MoU with Fortescue to develop green industrial projects based on hydrogen. The MoU allows the company to conduct feasibility studies to install a green hydrogen plant with a capacity of 300 megawatts, with the potential to produce 250,000 tons of green ammonia per year at the Açu complex.

The **Brazilian Pact for Renewable Hydrogen**, founded by the Brazilian Association of Wind Energy and New Technologies (ABEEólica), the Brazilian Photovoltaic Solar Energy Association (ABSOLAR), the Brazilian Biogas Association (ABIOGÁS), and the German-Brazilian Chamber of Commerce and Industry in Rio de Janeiro (AHK Rio), aims to contribute to the development of the green hydrogen sector in Brazil, mainly through economic and regulatory aspects.

15. Are any commercial-scale clean hydrogen production projects in development or already operating?

White Martins has installed a low-carbon hydrogen production plant in Pernambuco State and received the "Green Hydrogen Certification" from TÜV Rheinlan, a German company specializing in inspection services related to quality, technical safety, and the protection of people and the environment worldwide. The plant has a production capacity of 156 tons of low-carbon hydrogen per year.

In addition, in 2025, White Martins announced the inauguration of a second low-carbon-emission hydrogen production plant in São Paulo, with a production capacity of 800 tons of hydrogen per year. Twenty percent of this is already committed to a long-term contract with glass manufacturer, Cebrace.

Furthermore, there are several projects under development, most still in their early stages. We highlight the following commercial-scale clean hydrogen projects that are currently under development:

- **Atlas Agro**, a fertilizer company, will invest more than USD 850 million to build a plant in Uberaba to produce nitrogen products from green hydrogen. The project is planned to be concluded in mid-2027.
- **Neuman & Esser**, a German company, has signed an MoU with the state government of **Minas Gerais** to invest more than BRL45 million in producing and manufacturing green hydrogen generation equipment. This will be Latin America's first green hydrogen generation equipment manufacturing plant.
- **Porto Central** signed an MoU with **Companhia Energética Integrada (CEI)** to construct photovoltaic and green hydrogen production plants. The goal is for the plants in this first phase to be operational by 2026, with an expected investment of BRL100 million.

16. Have there been any hydrogen-related disputes in your jurisdiction?

There have not been any hydrogen-related disputes in the Brazilian jurisdiction.

Last updated April 2025

Canada

Ashurst collaborated with **Blake Cassels & Graydon** in the preparation of this content. We are grateful for their input.

Policy and regulation

1. Is there a government hydrogen strategy or policy?

Yes, a federal Hydrogen Strategy was published in December 2020, and in May 2024, a Progress Report was released and highlights over 80 low-carbon hydrogen production projects in various stages of development, the introduction of the Clean Hydrogen Investment Tax Credit, and 13 operational low-carbon hydrogen production facilities across Canada. Specific provinces across the country have also published their own hydrogen strategies that include individualized targets and ambitions. For example, Alberta, Canada's current largest producer of hydrogen, published the Alberta Hydrogen Roadmap, and in April 2024, Alberta announced nearly $60 million in funding for 28 new projects. Alberta aims to position itself as a global supplier-of-choice in clean hydrogen exports by 2030.

2. What are the key goals and commitments included in the strategy/policy?

The Hydrogen Strategy's (the "**Strategy**") primary short-term goal is to establish a foundation for Canada's hydrogen economy by 2025 through the development of necessary infrastructure and technologies to support both existing and emerging hydrogen applications. By 2050, the long-term goal is to expand Canada's supply and distribution of hydrogen, aiming for hydrogen to constitute a significant portion of domestic end-use energy and to achieve net-zero emissions for Canada. The Strategy commits to creating jobs, establishing international partnerships with countries in Europe and Asia to advance clean hydrogen export opportunities, and develop hydrogen hubs in regions like Edmonton, Vancouver, and Southern Ontario to effectively match supply with demand.

3. Which industry sectors are most likely to be affected by hydrogen deployment?

The industry sectors that are most likely to be affected by the replacement of fossil fuels by clean hydrogen in Canada include:

- energy storage and power generation;
- transportation;
- residential and commercial heating; and
- refining and manufacturing.

The Strategy highlights opportunities to reduce emissions through actions such as retrofitting existing technology with carbon capture and storage, installing new clean hydrogen technology that does not produce carbon, and switching to hydrogen blends in heavy industry. The Strategy mentions that hydrogen has the potential to decarbonize sectors of the Canadian economy, including resource extraction, freight, and the production of other inputs, such as steel and cement.

4. Who are the main regulators for the hydrogen market?

The hydrogen market is regulated by various entities at the federal and provincial levels. In Canada, Natural Resources Canada (NRCan) oversees the Hydrogen Strategy, while Environment and Climate Change Canada (ECCC) regulates environmental impacts, and the Canadian Energy Regulator (CER) manages energy project frameworks. There are also provincial regulators that are responsible for regulating the hydrogen industry in each province. For example, in Alberta, the Alberta Energy Regulator (AER) and Alberta Innovates support hydrogen project development and innovation.

5. Does the government hydrogen strategy or policy support the development of both low-carbon (blue) hydrogen and renewable (green) hydrogen?

Yes, the Strategy highlights Canada's supports the development of both low-carbon (blue) hydrogen and renewable (green) hydrogen. The Strategy highlights Canada's opportunities to leverage blue hydrogen, particularly given the abundance of natural gas resources and existing infrastructure in several provinces. It emphasizes the importance of carbon capture, utilization, and storage (CCUS) to reduce emissions from blue hydrogen production. Additionally, the Strategy underscores Canada's strong position to produce green hydrogen using renewable energy sources such as wind, solar, and hydroelectric power.

6. If the government hydrogen strategy or policy supports the development of low-carbon hydrogen, to what extent is carbon capture and storage being taken forward?

The development of low-carbon hydrogen is a strategic priority for Canada. Canada has a target of net-zero emissions by 2050, and to achieve this goal, all hydrogen production must either be carbon neutral or offset. Currently the most cost-competitive of these strategies is to use fossil fuel-derived hydrogen coupled with carbon capture utilization and storage (CCUS) to produce carbon neutral hydrogen due in large part to Canada's ample low-cost natural gas.

The Strategy recognizes significant growth potential in CCUS and clean hydrogen production in Canada. The 2024 Progress Report highlights over 80 low-carbon hydrogen production projects in various stages of development and the introduction of the Clean Hydrogen Investment Tax Credit to incentivize clean fuel development. Moving forward, Canada is considering various strategies to use the country's natural advantages to achieve its hydrogen goals, including reducing industrial emissions and facilitating the production of low-carbon hydrogen. The Strategy also acknowledges that emissions from hydrogen production can be decreased using bioenergy with CCUS and identifies opportunities to reduce emissions in midstream oil and gas by retrofitting existing conversion technology with CCUS.

Provincial strategies are also moving CCUS forward. Alberta, as a leader in hydrogen production and CCUS technology, has mature natural gas-based hydrogen production processes throughout the province. These processes can achieve near-term clean hydrogen by retrofitting existing infrastructure and building new facilities with CCUS. Alberta announced nearly $60 million in funding for 28 projects in 2024, covering hydrogen production, storage, transmission, distribution, and usage. Over time, emissions can be further reduced using competitive, cost-effective technologies such as renewable energy-based hydrogen production and emerging natural gas decomposition. Numerous CCUS projects are currently underway or in development in Alberta, further supporting the province's hydrogen economy. Further detailed in Section 14 below, several CCUS projects are currently operating or developing in Alberta.

7. Are there targets for the production of hydrogen?

Canada's Hydrogen Strategy has suggested a vision for hydrogen to make up 6% of delivered energy by 2030 and 30% of delivered energy by 2050.

8. Are there any incentive mechanisms/business models in place to support the production of hydrogen?

There are several incentives in place to support hydrogen production in Canada. Canada's Strengthened Climate Plan, which includes carbon pricing, the Clean Fuel Standard, and a $1.5 billion Low-carbon and Zero-emissions Fuel Fund, implements foundational federal initiatives the federal government believes are required to achieve the Strategy's goals. Carbon pricing adds costs to the production of greenhouse gas emissions; the Clean Fuel Standard incentivizes the use of low-carbon hydrogen through tax credit eligibility; and the Low-carbon and Zero-emissions Fuel Fund supports projects that reduce greenhouse gas emissions. Each incentive aims to encourage hydrogen uptake and production over time.

In the 2023 budget, the federal government introduced three tax credits to drive the transition to a net-zero economy. The Clean Hydrogen Investment Tax Credit is particularly relevant for hydrogen production, offering refundable credits ranging from 15% to 40% based on hydrogen's carbon intensity. It can offset equipment expenses for hydrogen projects via the produced electrolysis or natural gas, provided emissions are reduced through CCUS when using natural gas.

Tax credit rates depend on emissions as follows:

1. Less than 0.75 kg carbon dioxide equivalent (CO_2e) per kg of hydrogen: 40% tax credit.
2. 0.75-2 kg CO_2e per kg: 25% tax credit.
3. 2-4 kg CO_2e per kg: 15% tax credit.

Eligibility for the full credit rate also hinges on labour requirements. Organizations must pay prevailing wages and ensure 10% of tradesperson hours are worked by registered apprentices in the Red Seal trades. Organizations that do not meet these labour requirements can still claim tax credits through the program but not at the highest rate available.

Furthermore, the Clean Technology Manufacturing Investment Tax Credit is a refundable tax credit, which will offset 30% of the expenses associated with acquiring new machinery and equipment used in the production or processing of clean technologies and the extraction, processing, or recycling of critical minerals.

Canada's Net Zero Accelerator initiative provides up to $8 billion over seven years to support projects to decarbonize large greenhouse gas emitters, fast-track the growth of clean technology, and expedite industrial transformation to achieve Canada's net-zero goals.

Individual provinces, including Alberta, British Columbia, and Quebec, have also implemented their own incentives to encourage hydrogen adoption.

9. Are there any standards in place for the classification and/or certification of low-carbon or renewable hydrogen?

Canada's Clean Fuel Regulations (CFR) mandate that suppliers of liquid fossil fuels like gasoline and diesel progressively lower the carbon intensity of the fuels they provide in Canada. The CFR aims to boost the development and use of cleaner fuels, technologies, and processes. The objective of the regulation is to achieve about a 30% reduction in the carbon intensity of gasoline and diesel compared to 2005 levels by the year 2030, contributing to a cleaner and more sustainable energy future. CFR replaces the current federal Renewable Fuels Regulations.

These measures include the allocation of $1.5 billion to establish the Clean Fuels Fund, aimed at promoting the production and use of low-carbon fuels like hydrogen and biofuels. These investments not only support the growth of clean hydrogen but also aligns with the objectives outlined in the Strategy. In 2024, the Clean Fuels Fund was extended to March 31, 2030.

10. Does the regulatory framework clearly define the regulatory requirements relating to the production, storage, transportation, or supply of hydrogen?

Canada does not currently have a clear, harmonized regulatory framework setting out regulatory requirements related to hydrogen. Certain federal legislation such as the Canadian Environmental Protection Act, 1999 and the Canada Water Act will apply to the hydrogen industry across the country.

Much of the regulation of hydrogen is done at a provincial level. For example, in October 2022, the British Columbia Government introduced amendments to the Oil and Gas Activities Act and the Petroleum and Natural Gas Act to enable further hydrogen development in the province. Alberta has clear regulatory requirements related to the production, storage, transportation and supply of hydrogen through the Responsible Energy Development Act, applicable portions of the Pipeline Act and the Oil and Gas Conservation Act. It is also the first jurisdiction in Canada with regulation for large scale CCUS projects, with the Carbon Sequestration Tenure Regulation.

Further, in July 2023, Ontario's Ministry of Energy unveiled its strategy, titled "Powering Ontario's Growth: Ontario's Plan for a Clean Energy Future", outlining how the province intends to meet rising electricity demand. This plan focuses on constructing clean energy infrastructure, including generation, storage, and transmission, in response to projections that Ontario may need to nearly double its current generating capacity from 42,000 to 88,000 megawatts (MW) by 2050. The primary drivers behind this demand surge are economic expansion, the electrification of various sectors, and population growth. The plan also highlights key ongoing and upcoming initiatives aimed at achieving these goals.

In 2025, the Alberta Government tabled Bill 52 (Bill). The Bill would allow hydrogen to be used as power in residential homes by allowing hydrogen to be mixed with natural gas. If passed, the Bill would amend the Gas Distribution Act and the Gas Utilities Act.

While early hydrogen projects can be expected to operate within existing regulatory regimes, it can be expected that there will be development of a comprehensive and long-term policy and regulatory framework that includes hydrogen in the near future.

11. Are there any foreign investment restrictions related to energy and infrastructure sectors?

Foreign investment in Canada is generally regulated by the federal government under the Investment Canada Act (the "ICA"). The ICA applies when a non-Canadian establishes a new business in Canada or proposes to acquire control (directly or indirectly) of an existing Canadian business. For relevant transactions, a notification or an application for review must be filed with the Department of Industry and/or the Department of Canadian Heritage, as per the ICA.

12. What international treaties are in place that may offer protection to international investors in hydrogen projects in the jurisdiction?

Canada is a signatory to 37 bilateral investment treaties (BITs) that are in force, and in addition certain other treaties may contain protections for investors in Canada. These can be accessed from the Government of Canada Treaty Series online **database** maintained by the Treaty Law Division of the Department of Foreign Affairs and International Trade, and the United Nations Conference on Trade and Development's **Investment Policy Hub**.

In 2021, the Government of Canada signed a Memorandum of Understanding with the Government of the Netherlands on cooperation in the field of hydrogen energy. The intention is that this will lead the way for increased cooperation between the two countries, cementing the role that hydrogen plays in building a cleaner net-zero future. Priority areas of cooperation set out in the Memorandum of Understanding are: 1) cooperation on setting up export-import corridors for clean hydrogen between Canada and the Netherlands; and 2) creating an aligned agenda for promoting investments in hydrogen infrastructure, the hydrogen supply chain, and facilitating collaboration between private parties in both countries.

In August 2022, the Government of Canada signed a joint declaration of intent with the Government of the Federal Republic of Germany to establish a Canada-Germany Hydrogen Alliance (the "Alliance"). The Alliance will commit the two countries to: enable investment in hydrogen projects through policy harmonization; support the development of secure hydrogen supply chains; establish

a transatlantic Canada-Germany supply corridor; and export clean Canadian hydrogen by 2025. As part of this initiative, Canada committed up to $300 million in 2024 to support clean hydrogen trade with Germany. This will help Canadian companies access German markets for their clean hydrogen and ensure Germany has access to competitively clean energy products produced by the Canadian industry.

In May 2023, the Government of Canada signed a Memorandum of Understanding with South Korea on cooperation in critical mineral supply chains, the clean energy transition and energy security, which features hydrogen, its derivatives, and enabling technologies as one of the key areas of cooperation.

Market developments and opportunities

13. Are there any government grants or other government funding available to hydrogen projects (including for research and development)?

There have been a number of different funding initiatives regarding various different areas of hydrogen development in Canada.

In June 2021, the federal government launched the Clean Fuels Fund which aims to invest $1.5 billion to grow the production of clean fuels in Canada, such as hydrogen. Funding is provided through conditionally repayable contribution agreements of up to 30 percent of the total eligible project costs, to a maximum of $150 million, per production project and up to $5 million for feasibility studies.

In the 2022 federal budget, the federal government introduced the Canada Growth Fund (CGF), a $15 billion investment fund established under Canada Development Investment Corporation (CDEV) in December 2022. The CGF's main goal is to make strategic investments that stimulate significant private sector contributions to Canadian businesses and projects. This initiative aims to accelerate and expand Canada's transition to a net-zero economy.

In the 2023 federal budget, additional information was included with respect to the Clean Technology Investment Tax Credit, initially introduced in the 2022 Fall Economic Statement. This tax credit is relevant to hydrogen due to its coverage of industrial zero-emission vehicles and associated charging or refuelling equipment, including heavy-duty hydrogen trucks. Starting on March 28, 2023 until December 31, 2034, the Clean Technology Investment Tax Credit is set at 30% of eligible property costs. However, it gradually reduces to 15% in 2034 and expires in 2035.

In 2024, the federal Minister of Energy and Natural Resources announced a $9.14 million investment for six projects to support innovation in Canada's clean hydrogen sector. Of this funding, $2.74 million was allocated through the Energy Innovation Program and $6.4 million was allocated to Clean Fuels Fund project to advance knowledge of blending hydrogen into our existing utility networks.

Also, see Section 7 for discussion of Canada's Net Zero Accelerator initiative.

Additionally, there are various provincial-level funding incentives for hydrogen projects. The Government of Alberta announced on August 1, 2023, that they are allocating $50 million to boost technology development crucial for advancing its Hydrogen Roadmap and Natural Gas Strategy. Emissions Reduction Alberta (ERA) will provide $25 million for advanced innovations via the Accelerating Hydrogen Challenge. Alberta Innovates will contribute $20-25 million for early-stage innovations through the Hydrogen Centre of Excellence Competition 2, with additional support from Natural Resources Canada (NRCan).

14. Are there any notable pilot/demonstration projects in place or planned for the production or offtake of clean hydrogen?

There are a number of different pilot projects being developed in Canada regarding the production or offtake of clean hydrogen, including those that are outlined below.

FortisBC Energy has partnered with Suncor Energy and Australia-based Hazer Group to test the production of "turquoise hydrogen," an almost zero-emission method for capturing and converting methane from burning gas. This would be the first project of its kind in Canada, following similar projects in Germany and France. If developed commercially, the plant could eventually produce up to 2,500 tonnes of zero-emission hydrogen fuel a year. As of 2025, the $11.25 million pilot project received $8 million from the CleanBC Industry Fund and is expected to take one to two years to select a site and make a final investment decision.

The **Edmonton Region Hydrogen HUB** was launched in 2021 by an alliance of government, Indigenous, academic and economic development leaders to kickstart the Edmonton Region's low-carbon hydrogen economy. The Hydrogen HUB will serve as a blueprint of how to accelerate a strong hydrogen economy that can be replicated in other regions across the country with low-cost, low-carbon hydrogen. With help from the Transition Accelerator, a Canadian organization working towards a net-zero future, over 25 potential projects are planned relating to the supply, delivery and use of low-carbon hydrogen. These projects include the use of hydrogen for municipal and commercial vehicle fleets and home and industrial heat and power. In 2025, the project shifted into an activation phase with new leadership and a focus on grounding the project within economic development opportunities in Edmonton.

The **Alberta Zero Emissions Truck Electrification Collaboration** is a pilot project to test the ability of hydrogen to fuel the province's heavy freight transportation sector. The project is led by the Alberta Motor Transport Association and features the development of two long-range fuel cell trucks for operation between Edmonton and Calgary. The project intends to test and demonstrate a 700-kilometre plus range fuel cell truck performance in Alberta conditions. If successful, this project will pave the way towards broader decarbonization in the transportation sector across Canada. Since 2024, the project has ramped up its next phase of development with a focus on data collection and performance assessment.

In 2022, ATCO began delivering a blend of natural gas containing five percent hydrogen to approximately 2,100 customers in Fort Saskatchewan in a first-of-its-kind project for Alberta. **The Fort Saskatchewan Blending Project** is intended to be used as a stepping-stone into the Canadian hydrogen market, and if successful, will validate the pursuit of larger-scale hydrogen- blending activities across the country. In 2025, the customers in the project zone are expected to see an increase from 5 to 20 per cent hydrogen blended into their natural gas stream.

British Columbia is investing $4 million in the **BC Hydrogen Ports Project** (BCH2 Ports Project), which aims to bring clean hydrogen technology to the challenging commercial transportation sector. This project, a collaboration between public and private sectors, is pioneering made-in-B.C. technology to help the province achieve its decarbonization objectives. It represents a significant effort to utilize hydrogen and fuel cells in shipping and transportation, marking a significant step toward cleaner transportation in the region.

The **Markham Virtual Hydrogen Hybrid Demonstration Project** was launched in 2023 with the aim to showcase hydrogen electrolyser's ability to vary its power input in response to an external control signal. The project now focuses on a full year of operation, addressing dispatch deviations in a wind energy facility across all seasons. It is expected to offer technical insights into long-term hydrogen blending in the natural gas system, especially in Alberta and Ontario, aligning with the Federal Government's 2050 decarbonization goals.

In early 2025, the federal Minister of Innovation, Science and Industry, announced a $49 million investment in HTEC, a privately held clean hydrogen technology company from Vancouver, British Columbia, through the Strategic Innovation Fund. This funding will support the company's $472 million project to build and operate a facility that will capture and liquefy 15 tonnes per day of industrial by-product hydrogen in North Vancouver, turning waste into a valuable, clean fuel.

15. Are there any commercial-scale clean hydrogen production projects in development or already operating?

There are currently no existing commercial-scale clean hydrogen production projects in Canada, however, there are a number of projects in varying stages of development. These include:

- Varennes Carbon Recycling, the 88MW water electrolysis plant being developed in Quebec, which is expected to produce 11,000 metric tons of green hydrogen annually. This will be one of the world's first and biggest production facilities for green hydrogen and is expected to be active by 2026;
- Suncor and ATCO's collaboration on a clean hydrogen production facility in Alberta, which is expected to be operational as early as 2028;
- Japanese ITOCHU Corporation's partnership with Petronas for the creation of a natural gas-based ammonia facility with CCUS in Alberta to export ammonia as a hydrogen carrier to Asian markets;
- the development of Ekona Power's novel system for low-cost, clean hydrogen production for industrial processes. The project will demonstrate a direct carbon fuel cell, which converts solid carbon by-product from the hydrogen production process to electrical power, enhancing the economics of hydrogen production in Alberta. Commissioning and operational testing for the project are to begin in 2025, with the first commercial deployments slated for 2026;;
- Aeolis Wind Power and Evolugen's Thunder Mountain Wind Project, which is set to produce renewable hydrogen in British Columbia. The project is currently in the development stage, with construction not scheduled to commence until 2028;
- Artura Power's low carbon energy project, Niagara Hydrogen Centre, being developed in Ontario and is expected to be operational in 2026;
- University of British Columbia's pilot plant using its patented pyrolysis technology for low-cost, low-emission hydrogen production;
- Hydrogen in Motion's project located in British Columbia, which will generate clean hydrogen with low-pressure solid-state storage, distribution and transport;
- Enbridge Gas Inc. in Ontario to conduct a System-Wide Hydrogen Blending Study to determine blended hydrogen gas' feasibility and maximum limits in the Ontario utility's existing network;
- Trans Quebec & Maritimes Pipeline Inc.'s study to assess the technical feasibility in blending up to 10-percent hydrogen segments of their existing natural gas transmission system located in Quebec; and
- Aryton Energy's feasibility study to asses the feasibility of safe, efficient and cost-effective storage and transportation of hydrogen in conventional tanks, trucks and pipelines at ambient temperature and pressure.

16. Have there been any hydrogen-related disputes in your jurisdiction?

There are no notable hydrogen-related disputes in Canada to date.

Last updated May 2025

Chile

Ashurst collaborated with **HD Legal** in the preparation of this content. We are grateful for their input.

Policy and regulation

1. Is there a government hydrogen strategy or policy?

Yes. Chile has a **National Green Hydrogen Strategy** published in **November 2020**, which outlines the country's vision to become a global leader in green hydrogen production. This strategy builds on Chile's exceptional solar and wind energy resources and was developed through a participatory process involving technical roundtables, citizen workshops, and a high-level advisory council.

In **2023**, the government launched the **Green Hydrogen Action Plan 2023–2030**, which focuses on:

- Governance: strengthening coordination among institutions through regional hydrogen councils and interministerial committees.
- Incentives: tax benefits, subsidies, and grants for R&D and commercial-scale projects.
- Environmental management: establishing sustainability standards and ensuring community involvement.
- Regulatory framework: developing clear guidelines across the hydrogen value chain.
- Infrastructure: planning ports, logistics hubs, and energy transmission systems to support the industry.
- Certification: advancing standards to validate hydrogen's green origin for export markets.

This strategy has been supported by successive governments across political lines, showing a broad national commitment.

2. What are the key goals and commitments included in the strategy/policy?

The **Green Hydrogen Action Plan 2023–2030** sets out Chile's strategic goals, including:

- **Electrolysis capacity**: Developing large-scale green hydrogen production based on renewable electricity.
- **Export targets**: Aiming to export hydrogen and derivatives worth approximately USD 2.5 billion.
- **Technological innovation**: Supporting R&D, pilot projects, and technology transfer.
- **Local supply chains**: Encouraging local manufacturing of critical components like electrolyzers.
- **Environmental safeguards**: Implementing environmental management systems and certification frameworks.
- **Financial mechanisms**: Offering public support through CORFO to de-risk private investment.
- **International cooperation**: Building partnerships to access markets and technologies.

3. Which industry sectors are most likely to be affected by hydrogen deployment?

Hydrogen deployment in Chile is already influencing several key sectors:

- **Energy**: Companies like Colbún and Guacolda are exploring hydrogen and ammonia co-firing to reduce emissions while maintaining energy security.
- **Transport**: The *Haru Oni* pilot project in Magallanes produces synthetic e-fuels (using wind power, green hydrogen, and captured CO_2) to decarbonize vehicle fleets.
- **Gas supply**: Plans are underway to blend green hydrogen into the natural gas network, aiming to reduce fossil fuel dependency in households.
- **Mining**: Initiatives such as **HYDRA** are testing hydrogen fuel cell-powered trucks in copper mining, a sector critical to Chile's economy and emissions profile.

These examples illustrate the cross-sectoral relevance of hydrogen, particularly in high-emission and energy-intensive industries.

4. Who are the main regulators for the hydrogen market?

Hydrogen regulation in Chile is coordinated across several institutions:

- **Ministry of Energy**: Leads the strategy and oversees policy implementation.
- **CORFO**: Provides economic instruments (subsidies, guarantees, grants) to promote investment and innovation.
- **Ministry of Environment**: Establishes environmental standards and supervises compliance.
- **National Energy Commission (CNE)**: Defines technical standards and integrates hydrogen into energy planning.
- **Environmental Assessment Service (SEA)**: Evaluates projects under the Environmental Impact Assessment System (SEIA).

Additional permitting authorities include:

- **MINVU**: Regulates land use via DDU 470.
- **SERNAGEOMIN**: Oversees safety in hydrogen-related mining activities.
- **SAG** and **Servicio Nacional Forestal**: Evaluate impacts on biodiversity and forests.
- **Parliament**: Approves enabling legislation on energy, environment, and investment.

All agencies are mandated to act in coordination under Law No. 19,880. While collaboration can be uneven, bipartisan support for hydrogen development fosters gradual institutional alignment.

5. Does the government hydrogen strategy or policy support the development of both low-carbon (blue) hydrogen and renewable (green) hydrogen?

Chile's strategy prioritizes **green hydrogen**, capitalizing on its competitive advantage in renewable energy. This focus aligns with national decarbonization goals and avoids reliance on imported fossil fuels.

Blue hydrogen, derived from natural gas with carbon capture and storage (CCS), is not prioritized due to Chile's limited natural gas reserves and infrastructure.

However, the government recognizes the potential of **transitional low-carbon solutions**. These may benefit indirectly from green hydrogen support schemes, especially in contexts where interim technologies can accelerate deployment and market readiness.

6. If the government hydrogen strategy or policy supports the development of low-carbon hydrogen, to what extent is carbon capture and storage being taken forward?

Chile is actively exploring **carbon capture and storage (CCS)** and **carbon capture, utilization and storage (CCUS)** through both public and private initiatives:

- **Emission Compensation System**: Developed by the Ministry of Environment, it allows companies to offset CO_2 emissions through accredited reduction or absorption projects.
- **Blue Carbon Projects**: Initiatives like Anglo American's algae regeneration in Bahía Inglesa demonstrate marine-based CO_2 absorption with potential for carbon credit generation.
- **Academic R&D**: Institutions such as UCSC are leading CCUS research, focusing on industrial capture and reuse technologies.
- **Global Carbon Market Project**: Supports policy tools like carbon taxes and emission trading schemes to integrate Chile into international carbon markets.
- **Climate Change Framework Law**: Sets the target of carbon neutrality by **2050** and supports emission reduction and adaptation policies.
- **Complementary efforts**: Include rural electrification, rail electrification, energy efficiency, and recycling mandates (e.g., under the REP Law).

Although CCS is not central to the hydrogen strategy, it forms part of the broader framework for achieving national decarbonization.

7. Are there targets for the production of hydrogen?

Yes. The **Green Hydrogen Action Plan 2023–2030** includes ambitious production targets:

- **Electrolysis scale-up**: Aims to develop significant capacity to produce green hydrogen cost-effectively.
- **Exports**: Projects exports of hydrogen and derivatives (e.g., ammonia, methanol) exceeding USD 2.5 billion.
- **Local value chains**: Seeks to establish component manufacturing (e.g., electrolyzers) to support domestic supply and job creation.
- **Certification and sustainability**: Includes implementing international-quality standards and environmental safeguards.

These goals aim to position Chile as a leading global exporter of green hydrogen and derivatives, while fostering domestic industrial development.

8. Are there any incentive mechanisms/business models in place to support the production of hydrogen?

Yes. Chile has developed multiple instruments to promote hydrogen production:

- **Emission Trading System (ETS)**: Under development as part of broader climate policy.
- **Tax incentives and subsidies**: Applied to R&D, pilot plants, and early-stage commercial production.
- **CORFO programs**:
  - **Subsidies** for end-users of green hydrogen, particularly in the Biobío region.
  - **Financial facilities** to reduce investment risks and mobilize private capital.
  - **Calls for investment** with co-financing of up to **USD 50 million** for large-scale projects.

These mechanisms are part of a broader strategy to de-risk investment and catalyze technological deployment at scale.

9. Are there any standards in place for the classification and/or certification of low-carbon or renewable hydrogen?

Chile is in the process of developing a regulatory and certification framework aligned with international best practices:

- **Ministry of Energy**: Includes hydrogen and its derivatives under the scope of the **Energy Efficiency Law No. 21.305**, effective since 2021.
- **MINVU (DDU 470)**: Issued in 2022, it clarifies the land-use classification applicable to hydrogen-related infrastructure.
- **SERNAGEOMIN Guide**: Provides technical recommendations for hydrogen use in mining operations, covering production, storage, and safety.

Although standards are still evolving, these developments demonstrate institutional readiness to support certification and regulatory clarity across the hydrogen value chain.

10. Does the regulatory framework clearly define the regulatory requirements relating to the production, storage, transportation or supply of hydrogen?

At present, Chile does not have a unified or specific regulatory framework covering the full hydrogen lifecycle (from production to export).

Instead, hydrogen projects must comply with general regulatory requirements, including:

- **Environmental impact assessment** (via SEIA).
- **Safety and risk controls** (especially in mining and energy infrastructure).
- **Sector-specific permits** from relevant authorities (e.g., MINVU, SAG, SEA, SERNAGEOMIN).

Efforts are ongoing to develop dedicated hydrogen regulations. In the meantime, project developers must navigate the current framework through cross-sectoral legal and administrative coordination.

11. Are there any foreign investment restrictions related to energy and infrastructure sectors?

No. Chile maintains an open and stable investment environment, particularly favorable to foreign investors in energy and infrastructure.

Key features include:

- **No significant restrictions** on foreign ownership in energy or hydrogen-related assets.
- **Legal certainty**: Chile provides constitutional and statutory guarantees for private property and investment protection.
- **International reputation**: Chile ranks among the most investment-friendly countries in Latin America, with a long-standing policy of economic openness.
- **Special incentives**: Limited to certain sectors (e.g., IT, remote zones), but not required for most hydrogen-related investment.

This regulatory openness reinforces Chile's position as an attractive destination for global hydrogen developers.

12. What international treaties are in place that may offer protection to international investors in hydrogen projects in the jurisdiction?

Chile has over 60 international treaties in force that provide investment protection, encompassing agreements with a wide range of countries from the Americas, Europe, and Asia. These treaties typically offer protections such as fair and equitable treatment, safeguards against expropriation, and the ability to freely transfer funds across borders. Collectively, these treaties create a conducive legal environment for international investors investing in the hydrogen sector, offering various legal protections and incentives to foster their investments.

13. Are there any government grants or other government funding available to hydrogen projects (including for research and development)?

Yes, the Chilean Government offers several grants and funding opportunities aimed at supporting hydrogen projects, including research and development initiatives.

One example is CORFO's Green Hydrogen Subsidy Scheme, which targets users of green hydrogen and its derivatives in the Biobío region. Under this scheme, up to 60% of the total cost of each project may be funded, with a cap of $5 million per project. The objective is to stimulate demand for green hydrogen, enhance regional industrial linkages, and foster technology transfer and innovation within the green hydrogen sector.

Additionally, CORFO has launched a financing initiative providing up to $50 million for both national and foreign companies, designed to support and enhance green hydrogen projects within Chile. This initiative aims to bridge existing gaps within the industry and solidify the emerging green hydrogen sector as a cornerstone of the national economy.

These funding opportunities are part of Chile's broader strategy to position itself as a global leader in the production of green hydrogen.

14. Are there any notable pilot/demonstration projects in place or planned for the production or offtake of clean hydrogen?

Yes, there are several pilot and demonstration projects underway or planned for the production or offtake of clean hydrogen in Chile. Below is a brief overview of the most relevant H2V pilot projects:

i. **Haru Oni Hydrogen Plant**:
   - **Location**: Magallanes Region
   - **Details**: This flagship project is the world's first integrated, industrial-scale plant for synthetic climate-neutral fuels. It produces eFuel from wind and water and involves collaboration between companies like HIF, Porsche, Enel, ExxonMobil, and ENAP.

ii. **Cerro Pabellón Microgrid:**
   - **Location**: Antofagasta Region
   - **Details**: Operated by Enel Green Power Chile Ltda and ENAP, this project uses solar power to produce 10 tons of hydrogen per year using a 50 kW PEM electrolyzer. It provides dispatchable renewable electricity to a microgrid serving a community of over 600 technicians.

iii. **Anglo American Hydrogenerator**:
   - **Location**: Metropolitan Region
   - **Details**: This project, operated by Anglo American, uses renewable electricity from solar plants and reuses water from the mining process in an electrolyzer with a production capacity of 2 kg of hydrogen per day.

iv. **H2GN**:
   - **Location**: Coquimbo Region
   - **Details**: This project, monitored by the University of La Serena, uses a photovoltaic power supply system and an electrolysis process to produce 65 kg of hydrogen per day for blending in natural gas pipelines.

v. **Mobile Green Hydrogen Plant**:
   - **Location**: Antofagasta Region
   - **Details**: Operated by Cicitem, this project uses photovoltaic panels to supply electrolyzers and measures the efficiency of hydrogen production under different conditions.

vi. **Forklifts**:
   - **Location**: Metropolitan Region
   - **Details**: A collaboration between Engie, Walmart, and Plug Power, this project involves replacing lead-acid batteries in 259 forklifts with hydrogen fuel cells.

vii. **Minera San Pedro/CNP Project**:
- **Location**: Metropolitan Region
- **Details**: This project uses renewable hydrogen in backup power generation equipment and a forklift for warehouse management.

viii. **UCSC**:
- **Location**: Biobío Region
- **Details**: This project at the University of Concepción involves a hydrogen plant for applied research in hydrogen production and use in electric vehicles.

ix. **Hvallesur**:
- **Location**: Ñuble and Biobío Regions
- **Details**: This project involves solar power supplying an electrolysis process to produce 416 tons of renewable hydrogen per year.

x. **Proyecto Piloto H2V GNA**:
- **Location**: Antofagasta Region
- **Details**: This project involves renewable solar power supplying an electrolysis process to produce 60 tons of renewable hydrogen per year.

xi. **HYDRA**:
- **Location**: Antofagasta Region
- **Details**: This project considers replacing the internal combustion engine of large capacity mining haul trucks with a hybrid system of hydrogen fuel cell and batteries.

xii. **H2-powered train**:
- **Location**: Antofagasta Region
- **Details**: This project involves a hydrogen-powered train operated by FCAB.

xiii. **Cabo Negro**:
- **Location**: Magallanes Region
- **Details**: This project involves a 1-2 MW electrolyzer and is expected to begin operation in 2025.

xiv. **Power-to-MEDME**:
- **Location**: Northern Chile
- **Details**: This project involves producing synthetic fuels, including methanol and DME, using renewable hydrogen.

These projects demonstrate Chile's active involvement in developing pilot-scale hydrogen projects, leveraging its renewable energy resources to produce clean hydrogen and explore various applications.

15. Are there any commercial-scale clean hydrogen production projects in development or already operating?

Yes, there are several commercial-scale clean hydrogen production projects in development or already operating in Chile. Below we list some notable examples:

1. **HyEx**:
- **By**: Engie and Enaex
- **Location**: Antofagasta Region
- **Details**: This industrial-scale project uses solar power and renewable electricity from the grid to produce ammonia. The pilot phase involves 26 MW of nominal electrolysis power to produce 18,000 tons of ammonia per year, while the industrial scale will have 2,000 MW of electrolysis to produce 700,000 tons of ammonia per year.

2. **H2 Magallanes**:
- **By**: Total Eren, with ENAP collaboration
- **Location**: San Gregorio, Magallanes Region
- **Details**: This project includes a plant with 10 GW of installed wind capacity and 8 GW of electrolysis capacity, projected to produce 800,000 tons of renewable hydrogen per year and 4.4 million tons of ammonia per year. It also includes a new port terminal and a desalination plant.

3. **Power to Ammonia**:
- **By**: AES Andes
- **Location**: Antofagasta Region
- **Details**: This project involves 800 MW of renewable power supply to produce 50,000 tons of hydrogen per year and 250,000 tons of ammonia per year. Desalinated water will be used, and the project is expected to begin operation in 2025.

4. **Antofagasta Mining Energy Renewable (AMER)**:
- **By**: Air Liquide
- **Location**: Antofagasta Region
- **Details**: This project involves an electrolyzer with 80 MW nominal capacity to produce 60,000 tons of e-methanol per year.

5. **Faraday**:
- **By**: Aker Clean Hydrogen and Mainstream Renewable Power
- **Location**: Antofagasta Region
- **Details**: This project involves 3,500 MW of wind and solar power supplying the electrolysis process with a nominal capacity of 2,000 MW to produce 250,000 tons of renewable hydrogen per year and 1.3 million tons of ammonia per year. The project includes a desalination plant and is expected to begin operation in 2027.

6. **HOASIS**:
- **By**: TCIGECOM
- **Location**: Antofagasta Region
- **Details**: This project involves 4,500 MW of solar power supplying the electrolysis process with a nominal power of 2,100 MW, allowing the production of 102,000 tons of renewable hydrogen per year and 250,000 tons of ammonia per year.

7. **HyPro Aconcagua**:
- **By**: Linde and ITM Power, with an offtake MoU with ENAP
- **Location**: Valparaíso Region
- **Details**: This project involves electrolysis with a nominal power of 24 MW to produce 3,600 tons of renewable hydrogen per year.

8. **Quintero Bay H2 hub**:
- **By**: GNL Quintero, Enagas, and Acciona Energía
- **Location**: Valparaíso Region
- **Details**: This project involves 10 MW of installed electrolysis capacity to produce 430 tons of renewable hydrogen per year.

9. **HNH Energy**:
- **By**: AustriaEnergy, Ökowind, and CIP
- Location: Magallanes Region
- **Details**: This project involves 1.7 GW of wind generation and an electrolysis capacity of 1,300 MW to produce 150,000 tons of renewable hydrogen per year and 850,000 tons of ammonia per year. The project includes a port terminal for export.

10. **Paracelus:**
- **By**: Humboldt Hidrógeno Verde and Mejillones Port Complex
- **Location**: Antofagasta Region
- **Details**: This project involves an off-grid PV plant supplying the electrolysis process. The nominal electrolysis power is 10 MW (pilot project), with a further scale-up to reach 2,000 MW to produce 110,000 tons of renewable hydrogen per year and 600,000 tons of ammonia per year by 2027.

These projects highlight Chile's commitment to becoming a leader in the green hydrogen industry, leveraging its abundant renewable energy resources to produce clean hydrogen at a commercial scale.

16. Have there been any hydrogen-related disputes in your jurisdiction?

There have been no material publicly reported hydrogen-related disputes to date in Chile.

Last updated June 2025

Denmark

Ashurst collaborated with **Bech-Bruun** in the preparation of this content. We are grateful for their input.

Policy and regulation

1. Is there a government hydrogen strategy or policy?

With the **Danish Climate Agreement for Energy and Industry of 22 June 2020**, a Danish parliamentary majority decided that Power-to-X (PtX) and carbon capture and storage are key elements in Denmark achieving its climate policy objectives.

Several broad-based political agreements aim for developing and promoting hydrogen and green fuels in Denmark. The political initiatives generally support the establishment of Power-to-X facilities and the production of green hydrogen. On 15 December 2021, the Danish Government published its proposal for promoting hydrogen and green fuels (PtX). Following negotiations, the government and all parties of the Danish Parliament but one reached a political agreement regarding promotion and development of hydrogen and green fuels in Denmark (the "_") on 15 March 2022. A sub-agreement from 23 May 2023 lays down that the state-owned companies Energinet and Evida shall own and operate the hydrogen infrastructure in Denmark. A follow-up agreement from 4 April 2024 lays down the economic framework conditions for hydrogen infrastructure.

In March 2023, Germany and Denmark signed a cooperation agreement regarding construction of a cross-border hydrogen pipeline by 2030. Following the agreement entered into by Germany and Denmark, The Danish Government has subsequently made an agreement with the Danish Parliament on the 6th of February 2025 in which the government of Denmark lent a sum of 7,4 mia. DKK in further support of the construction of the pipeline.

2. What are the key goals and commitments included in the strategy/policy?

The PtX Strategy from 15 March 2022 sets out an aim to build upwards of 4 - 6 GW of electrolysis capacity by 2030. Key initiatives in the PtX Strategy include the following:

- Funding (DKK 1.25 billion) through a tender for operational support of the production of hydrogen and other PtX products. Subsidies will be granted as a fixed-price supplement for a 10-year period.
- Dialogue between the government and the European Commission on allocating DKK 344 million of REACT-EU funds and the Just Transition Fund to establish an investment subsidy scheme for innovative green key technologies focusing on PtX and hydrogen, including green production and demonstration projects.
- An application-based scheme for construction of direct links between major electricity consumers (e.g., PtX plants) and electricity producers (wind farms/solar parks) if such direct links are socio-economically beneficial.
- Option for Energinet and the grid companies to use geographically differentiated consumption tariffs and local tariffs with respect to energy communities and industry communities producing and consuming electricity concurrently.
- An analysis of possibilities and consequences of introducing a derogation for projects involving PtX plants with direct connection to offshore wind farms with respect to a distance limitation of 15 km under the open-door scheme for offshore RE installations. However, the open-door scheme for offshore RE installations **have been cancelled**, which may affect this initiative.
- Framework for construction of hydrogen infrastructure that can eventually be linked to a common European hydrogen infrastructure. This includes giving Energinet and Evida the possibility of owning and operating hydrogen infrastructure. A sub-agreement from 23 May 2023 supports this initiative.
- A PtX task force will be assigned to identify and handle regulatory barriers blocking the establishment of a new Danish utility sector using PtX solutions. The task force will also be assigned to strengthen the framework conditions for hydrogen and PtX products. Further, a secretariat within the Danish Energy Agency is set up as a point of contact for project developers and authorities requesting guidance with authorisation procedures etc.

3. Which industry sectors are most likely to be affected by hydrogen deployment?

According to the government's proposal for promoting hydrogen and green fuels (PtX), PtX fuels may play an important role in sectors where direct electrification is not possible or prohibitively expensive. It is assessed that the following sectors have significant potential for PtX fuels:

- Aviation
- Shipping
- The industrial sector's internal heavy road transport and high-temperature processes
- Parts of heavy road transport

4. Who are the main regulators for the hydrogen market?

The Ministry of Climate, Energy and Utilities is responsible for the overall strategy and policy for the development and regulation of the energy sector.

The Danish Energy Agency administers energy and supply in Denmark, including new hydrogen technologies. A secretariat within the Danish Energy Agency is set up as a point of contact for project developers and authorities requesting guidance with authorisation procedures etc. regarding PtX.

Further, a PtX task force has been established under the PtX secretariat. The PtX task force contributes to coordination across governmental authorities, ensuring ongoing dialog with the PtX sector and identification and handling of regulatory and legislative barriers.

Some market players have asked for a one-stop-shop for PtX projects, but according to the PtX secretariat, the Danish authorities do not see this as an option for the time being.

5. Does the government hydrogen strategy or policy support the development of both low-carbon (blue) hydrogen and renewable (green) hydrogen?

The Danish PtX strategy focuses exclusively on producing green hydrogen.

6. If the government hydrogen strategy or policy supports the development of low-carbon hydrogen, to what extent is carbon capture and storage being taken forward?

Separate strategies have been adopted for PtX and carbon capture and storage (CCS). The PtX Strategy focuses exclusively on the production of green hydrogen.

Denmark has decided to establish a basis for safe and sustainable storage of CO2 in Denmark and import/export of CO2 to/from Denmark. A political agreement regarding CCS from June 2021 lays down the first initiatives promoting CCS in Denmark. Since then, further political agreements have been made and new regulation introduced. The initiatives concern, amongst others, framework conditions for CO2 storage in Denmark, construction and operation of CO2 transportation pipelines, funding for CCS/CCUS through subsidy tenders, a licensing regime for CO2 storage and state participation in CO2 storage licences.

Funding of approximately 5 billion EUR has been set aside for CCUS (cf. Danish Ministry of Climate, Energy and Utilities). The first subsidy tender for a full-scale CCS project in Denmark was held in 2023 and won by Ørsted. Two more subsidy tenders with a pool of DKK 28,7 DKK billion in total are scheduled for march 2025.

Denmark aims to become a European hub for CO_2 storage and has signed agreements with Belgium, Flanders, Netherlands, France, Norway and Sweden allowing for transportation of CO2 across national borders for geological storage.

7. Are there targets for the production of hydrogen?

The PtX Strategy from 15 March 2022 sets out that Denmark is aiming to build upwards 4-6 GW of electrolysis capacity by 2030.

8. Are there any incentive mechanisms/business models in place to support the production of hydrogen?

The PtX Strategy aims to create framework conditions that are appropriate for ensuring that the production and use of hydrogen and PtX products may eventually perform on market terms. Legislation in this regard was passed on the 19th of December 2024.

Innovative energy and supply projects may apply to the Danish Energy Agency for a so-called regulatory test zone status if regulatory barriers prevent the implementation of the respective projects. If the Danish Energy Agency grants a project regulatory test zone status, the project may be exempted from specific regulation for a defined period of time. Two PtX projects, Brande Brint and GreenLab Skive, were the first projects to obtain regulatory test zone status in 2021.

Substantial funds have been allocated for promoting PtX technologies and enabling the production of green hydrogen to reach an industrial scale. See question 13.

9. Are there any standards in place for the classification and/or certification of low-carbon or renewable hydrogen?

The European Commission has issued two delegated regulations that lay down detailed rules on the EU definition of renewable hydrogen:

- Delegated regulation (EU) 2023/1185 establishing a minimum threshold for greenhouse gas emissions savings of recycled carbon fuels and by specifying a methodology for assessing greenhouse gas emissions savings from renewable liquid and gaseous transport fuels of non-biological origin and from recycled carbon fuels.

The delegated regulations were formally adopted in June 2023. Guarantees of origin can be issued for green hydrogen in Denmark.

10. Does the regulatory framework clearly define the regulatory requirements relating to the production, storage, transportation or supply of hydrogen?

In 2021, the Danish Energy Agency and Energinet (Danish TSO for electricity and gas) conducted a market dialogue with relevant actors within the hydrogen industry. In the market dialogue, the actors highlighted the need for a clear regulatory framework to realise the potential of hydrogen projects.

Since 1 January 2023, transmission, distribution and storage of hydrogen are regulated by the Danish Gas Supply Act with the recognition that future updates of the legal framework may be necessary due to upcoming EU rules regarding hydrogen infrastructure.

On 1 May 2023, new rules for direct electricity supply lines came into force making it possible to apply for approval to construct a direct electricity connection between production and consumption facilities. It is expected that PtX plants can save part of the tariff payment for the electricity that is delivered directly from the producer to the consumer and thus does not burden the collective grid.

The market is awaiting decisions from the state-owned companies Energinet and Evida on investments in hydrogen infrastructure. A broad-based political agreement from 23 May 2023 lays down that Energinet and Evida shall own and operate the hydrogen infrastructure in Denmark. A political agreement from 4 April 2024 lays down the economic framework conditions for the hydrogen infrastructure, including that the Danish State, under certain conditions, is willing to take on part of the risk in connection with Energinet's potential investments in a hydrogen backbone etc. Following the latest political agreement from April 2024, Energinet is conducting studies and is aiming for an investment decision in first quarter 2025.

On the 19th of December 2024, Government and Parliament passed a new ruleset governing CCS in the supply chains, with the purpose of eliminating certain market barriers.The Danish Energy Agency has prepared an overview of planning and administrative permits to be obtained for PtX plants. The overview is available on the agency's website (in Danish).

11. Are there any foreign investment restrictions related to energy and infrastructure sectors?

On 1 July 2021, the Danish Investment Screening Act (FDI Act) entered into force. The FDI Act introduces a mandatory sector-specific foreign investment control and a voluntary cross-sector foreign investment control.

Under the mandatory sector-specific foreign investment control, foreign investors must apply for authorisation from the Danish Business Authority if their investment or special financial agreement falls within particularly sensitive sectors and activities and meets other detailed conditions.

One of the particularly sensitive sectors is "critical infrastructure". The specific assessment of what constitutes critical infrastructure is based on socially important sectors and underlying socially important functions. According to the Danish Executive order no. 1491 of 25 June 2021, socially important functions in the energy sector comprise:

- Production, storage capacity, transport and delivery of electricity.
- Production, transport and storage of heating and cooling.
- Production, storage capacity, transport and delivery of gas.
- Production, storage and transport of crude oil as well as oil products for transport and the petrochemical industry.

12. What international treaties are in place that may offer protection to international investors in hydrogen projects in the jurisdiction?

According to the website of the United Nations Conference on Trade and Development (UNCTAD), Denmark is a signatory to a number of bilateral investment treaties (BITs).

Denmark signed the **Energy Charter Treaty** (ECT) in 1994. The ECT grants foreign investors fundamental rights with regard to their investments and offers investor-state dispute settlement. In April 2023, the Danish Government announced that it will be seeking withdrawal from the ECT due to the ECT creating unnecessary uncertainty about the green transition. The Danish Parliament is expected to formally consent to Denmark's withdrawal from the ECT in 2024.

Market developments and opportunities

13. Are there any government grants or other government funding available to hydrogen projects (including for research and development)?

Substantial funds have been allocated for promoting PtX technologies and enabling the production of green hydrogen to reach an industrial scale:

- A subsidy pool of DKK 1.25 billion is allocated for a tender for operational aid for the production of hydrogen and other PtX products within a 10-year period. The tender was held from 19 April 2023 to 1 September 2023 and the subsidy pool was distributed on six winning projects.
- DKK 850 million is allocated for the Danish participation in the Important Project of Common European Interest (IPCEI) on hydrogen. Two projects on Danish soil have been selected to participate in the pan-European project and receive funding, one of them is Green Fuels for Denmark, see section 15 below.
- The Energy Technology Development and Demonstration Programme (EUDP) supports new technologies in the energy sector.
- In order to mature the technologies, PtX has been designated as one of the four green research missions to receive funding from the Danish research reserve, which is part of the Danish Finance Act. DKK 200 million has been allocated from the research reserve in 2021, DKK 295 million in 2022 and DKK 301.8 million in 2023.

14. Are there any notable pilot/demonstration projects in place or planned for the production or offtake of clean hydrogen?

Several different pilot projects are being deployed in Denmark to examine and test the feasibility of clean hydrogen production and use in different sectors, for instance:

Brande Hydrogen project: The project shall demonstrate that green hydrogen can be produced without using any power from the grid ("island mode"). The project has been granted an official regulatory energy test zone.

GreenHyScale: The project aims to accelerate the large-scale production of green hydrogen by building and operating the world's first 100 MW green pressurized alkaline electrolysis plant both onshore (GreenLab Industrial Park, Skive – Denmark) and offshore. The project is EU-funded.

Estech: The engineering and development company, Estech, has developed a pilot project combining carbon capture and production of green hydrogen. The project is funded by EUDP.

15. Are there any commercial-scale clean hydrogen production projects in development or already operating?

There is currently no existing commercial-scale green hydrogen production operating in Denmark. However, several projects are in the pipeline or are already being built, for instance:

- **H2 Energy Esbjerg**: H2 Energy Europe plans to invest in a hydrogen production plant of 1 GW in Esbjerg. The project received an environmental approval from the Danish Authorities on 10 January 2024.
- **Green fuels for Denmark**: In the project's first two phases, the project aims for producing renewable hydrogen for trucks and enough e-methanol to supply an ocean-going vessel or several ferries.
- **HySynergy 2.0**: Everfuel is together with partners planning to establish a large-scale production and storage facility of green hydrogen. The project has received Danish IPCEI funding.
- **Idomlund**: Ørsted and Skovgaard Energy are planning to build a plant which in its first phase will have an expected electrolysis capacity of 150 MW and can, depending on the planned offshore wind capacity and hydrogen infrastructure, be increased to more than 3 GW.

According to the Danish Energy Agency (draft precondition memorandum for climate change projections 2024), PtX projects corresponding to more than 9 GW electrolysis capacity in total in 2030 have been announced, however, final investment decisions have not been made for the majority of the announced projects.

16. Have there been any hydrogen-related disputes in your jurisdiction?

To our knowledge, no hydrogen related disputes of relevance have been brought before the Danish courts.

Last updated April 2025

Egypt

Ashurst collaborated with **Shalakany Law Office** in the preparation of this content. We are grateful for their input.

Policy and regulation

1. Is there a government hydrogen strategy or policy?

Yes, the Egyptian Prime Minister signed and approved the National Green Hydrogen Strategy on 22 November 2023 (the "**Strategy**").

Shortly thereafter, on 27 January 2024, Egypt enacted the Law on Incentives for Green Hydrogen and Derivatives Production Projects issued by virtue of Law No. 2 of 2024 (the "New Law"). The New Law provides a comprehensive framework of tax and non-tax incentives aiming at encouraging and attracting investment in green hydrogen projects, including their derivatives, as well as the expansion of existing projects.

2. What are the key goals and commitments included in the strategy/policy?

The Strategy aims to make Egypt one of the leading countries in the production of low-carbon hydrogen (i.e. green hydrogen) in the world.

The goals of the Strategy are as follows:

- Reaching a percentage of renewable energy in the electricity mix to more than 42% by 2035;
- Issuing approvals for the establishment of green hydrogen and green hydrogen derivatives projects, and granting them the necessary incentives to attract more investments in this field;
- Making Egypt one of the leading countries in the green hydrogen economy in the world by utilizing world-leading expertise and innovations in the production of hydrogen, its derivatives, and promising renewable energy sources;
- Gradually expanding the local use of green hydrogen, with increased production capacity of hydrogen and its derivatives, leading to the use of green hydrogen in all sectors, especially manufacturing and transportation;
- Exporting the excess green hydrogen;
- Unifying the efforts made by the State to encourage and stimulate investment in the field of green hydrogen and its derivatives, in line with the requirements of sustainable development and the plans of the State for economic and social development, and ensuring competitiveness at the regional and international levels; and
- Producing green hydrogen using 100% renewable energy.

3. Which industry sectors are most likely to be affected by hydrogen deployment?

According to the Strategy, the main sectors to be affected by green hydrogen deployment are the manufacturing and transportation sectors.

Further, the exemptions introduced by the New Law apply to green hydrogen and derivative production projects including production plants, desalinated water and renewable energy facilities primarily serving such plants, transport and storage infrastructure, and manufacturing of related equipment. We therefore anticipate that these types of projects will be the most impacted.

4. Who are the main regulators for the hydrogen market?

The main regulator/competent entity in Egypt with regard to green hydrogen is the Prime Minister. Also, Prime Ministerial Decree No. 3445 of 2023 established a committee named the National Council for Green Hydrogen and its Derivatives headed by the Prime Minister (the "Committee"). The Committee's members include the ministers of electricity and renewable energy, petroleum and mineral resources, finance, environment, and the Executive Director of the Sovereign Fund of Egypt.

Regarding the green hydrogen projects established in special economic zones (e.g., Suez Canal Special Economic Zone) or free zones (e.g., Alexandria free zone), they will be supervised by the board of directors of the relevant special economic zone or free zone.

The Committee has the following mandates:

- Following up on the implementation of the Strategy, and proposing updating it in light of international and national developments;
- Approving the policies, plans and mechanisms necessary to implement and update the Strategy;
- Coordination between ministries and relevant authorities, and proposing the necessary solutions to overcome obstacles to investment in the field of green hydrogen and its derivatives; and
- Reviewing the legislation, regulations and rules regulating the field of green hydrogen and its derivatives and proposing their update.

Moreover, the construction and operation of any hydrogen producing facilities outside special economic zones and free zones are subject to the supervision of the Industrial Development Authority.

Overall, in terms of electricity production from green hydrogen, the Egyptian Electric Utility and Consumer Protection Agency is the regulator of the production, transportation and distribution of electricity in Egypt and therefore, it could be involved in the production of electricity from hydrogen/green hydrogen.

Further to the above, the New Law designates the Prime Minister as the competent minister for the purposes of implementing its provisions.

5. Does the government hydrogen strategy or policy support the development of both low-carbon (blue) hydrogen and renewable (green) hydrogen?

In July 2022, the Egyptian Natural Gas Holding Company (EGAS) signed a Memorandum of Understanding (MoU) with Wintershall Dea to prepare commercial and technical feasibility studies of blue and turquoise hydrogen in Egypt.

Further to the above, on 15 August 2024, the Egyptian Government launched the "National Low-Carbon Hydrogen Strategy" ("**Low-Carbon Strategy**"), marking a significant step in the country's transition towards a low-carbon economy and its commitment to environmental sustainability.

The Low-Carbon Strategy aligns with Egypt's broader efforts to achieve the Sustainable Development Goals outlined in the "Egypt Vision 2030".

The Low-Carbon Strategy leverages Egypt's strategic geographic location and abundant natural resources, particularly solar and wind energy to support the production of low-carbon hydrogen (i.e. blue and green hydrogen). Also, a central objective of the strategy is to strengthen partnerships with international stakeholders and financial institutions to promote investment, research, and development in hydrogen technologies.

6. If the government hydrogen strategy or policy supports the development of low-carbon hydrogen, to what extent is carbon capture and storage being taken forward?

According to a statement by the Minister of Petroleum and Natural Resources, the Ministry and Italian energy firm "Eni" are implementing a pilot carbon capture project at Italian energy firm's Meleiha concessions in the Western Desert. The pilot project — which marks Egypt's first carbon capture initiative — is being implemented at a cost of USD 25 million and aims to store some 25-30k tons of carbon dioxide each year. If successful, similar schemes will be rolled out in other locations, the statement read.

On November 14, 2024, during the COP29 Climate Conference held in Azerbaijan, Dr. Rania Al-Mashat, Egypt's Minister of Planning, Economic Development, and International Cooperation, participated in several events and panel discussions. Dr. Al-Mashat while presenting the Low-Carbon Strategy, she explained that by 2050, Egypt's renewable energy production is expected to meet 10% of global hydrogen demand, creating over 100,000 jobs, many of which will be high-skilled positions. This initiative is set to play a significant role in the global transition to clean energy. Furthermore, this effort is projected to help reduce global carbon emissions by 46 million tons annually by 2040, highlighting Egypt's strong commitment to a sustainable future.

7. Are there targets for the production of hydrogen?

The Egyptian Government's target is to have 42% of electricity produced via renewable energy (including green hydrogen) by the year 2035.

Further, as part of the Low-Carbon Strategy, Egypt plans to produce 1.5 million tons annually of green hydrogen and its derivatives by 2030, which will require 19 gigawatts of installed renewable energy capacity. By 2040, production is expected to increase to 5.8 million tons per year.

Egypt is targeting a 5% to 8% share of the global commercial hydrogen market, equivalent to around 5.8.

Further to the above, the Low-Carbon Strategy is expected to generate significant economic returns, including an increase in Egypt's GDP by up to USD 18 billion by 2040, and the creation of over 100,000 new jobs by the same year. Additionally, it will contribute to strengthening Egypt's energy security by diversifying its energy sources, while also supporting the reduction of carbon dioxide emissions and advancing the transition to a green economy.

8. Are there any incentive mechanisms/business models in place to support the production of hydrogen?

The main instrument which provides incentives for the production of hydrogen is the New Law. The New Law's scope applies to the green hydrogen related projects that sign project agreements within five (5) years from the date of entry into force of the New Law (i.e., 28 January 2024), which are as follows:

1. Factories producing green hydrogen and its derivatives.
2. Desalinated water production stations that allocate at least 95% of their production to be used in the production of green hydrogen and its derivatives.
3. Electric energy/electricity production stations from renewable energy sources, which allocate no less than 95% of their production to feed green hydrogen and green hydrogen derivatives production plants and desalinated water production plants referred to above.
4. Projects whose activity is limited to transporting, storing or distributing green hydrogen and its derivatives produced within Egypt.
5. Projects whose activity is directly limited to the manufacture of production supplies or inputs necessary for factories producing green hydrogen and green hydrogen derivatives and for which a decision shall be issued by the Council of Ministers based on the proposal of the competent minister and after taking the opinion of the minister concerned with electricity and renewable energy affairs and the minister of finance.

The incentives granted by the New Law can be summarized as follows:

Tax incentives:

- A monetary investment incentive denominated as "the green hydrogen incentive", ranging from 33% to 55% of the tax amount paid upon declaring the income resulted from initiating activities in the project or its expansions. The said incentive shall be paid/reimbursed within a maximum period of 45 days from the end of the period for submitting the tax return, otherwise, a delay interest calculated on the basis of the credit and discount rates announced by the Central Bank of Egypt on the first of January preceding the incentive due date shall be due in favour of the project.
- An exemption from value-added tax on equipment, tools, machinery, devices, raw materials, supplies and transportation means needed for the initiation of the project (passenger cars are not included).
- A VAT rate of 0% is applicable to exports of green hydrogen projects and their related products.

Non-tax incentives (fast approvals and less bureaucracy):

1. Project companies engaging in green hydrogen production projects may obtain a single approval (i.e., golden license).
2. Project companies are permitted to import all required materials and equipment for the establishment, expansion and operation of the project without the requirement to register themselves in the importer's register. Similarly, they can export products without a licence or registration in the exporter's register.
3. During the first ten (10) years after the signing date of project agreements, the project company may employ foreign workers up to 30% of the total workforce.
4. Special customs ports may be established specifically for the import and export activities of the project.
5. 30% reduction in fees for seaport usage, sea transport and related services provided to ships in Egyptian seaports.
6. 25% reduction in the usufruct right fees of industrial lands allocated for establishing a green hydrogen and hydrogen derivatives production plant, along with a 20% reduction for fees of storage warehouse lands at the ports.
7. A grace period is granted for the payment of the usufruct right fees for industrial and storage lands, starting from the project's commercial operational date, without imposing interest or fines.
8. The terms of licences granted to green hydrogen production projects will match the duration of the usufruct right for the project's land.

In order to obtain the previously mentioned incentives, the New Law sets several conditions as follows:

- The project is required to begin its commercial operation within five (5) years from the date of concluding the project agreements.
- Financing for the project must predominantly originate from foreign sources, representing at least 70% of its total investment cost.
- The project must prioritize the use of domestically manufactured components whenever they are available in the local market, with a minimum requirement of 20% of the project's components.
- The project is obligated to facilitate the transfer and localization of modern and advanced technologies to Egypt, and commit to the development and implementation of training programs for Egyptian workers.
- The project company is required to devise a plan aimed at fostering the development of surrounding local areas. This plan must adhere to the guidelines for corporate social responsibility as outlined in Egyptian Investment Law No. 72 of 2017 (the "Investment Law").

9. Are there any standards in place for the classification and/or certification of low-carbon or renewable hydrogen?

No.

10. Does the regulatory framework clearly define the regulatory requirements relating to the production, storage, transportation or supply of hydrogen?

There have not been any laws or decrees regulating the production, storage, transportation or supply of hydrogen (other than the New Law and the Prime Ministerial Decree No. 3445 of 2023, which do not provide details directly regulating these matters).

The framework is determined according to the memoranda of understanding ("**MoUs**") and agreements concluded by the Egyptian Government with the energy companies and investors undertaking the establishment of hydrogen projects in Egypt.

However, and further to point 1 of the non-tax incentives under question 8 relating to the single approval/golden licence, the Cabinet of Ministers Decree No. 56 for the year 2022 considers projects relating to the production, storage, transmission and/or exportation of green hydrogen and green ammonia as national/strategic projects that can be subject to a single approval (i.e., golden licence), provided that the project fulfils at least two criteria of the below list:

- The project shall contribute to increasing exports by exporting at least 50% of its products abroad annually, within a maximum period of 3 years from the date of starting the activity.
- The project shall obtain its financing as foreign funds transferred from abroad through an Egyptian bank, in accordance with the conditions determined by the Board of Directors of the Central Bank of Egypt.
- The project shall aim at reducing imports, localize the industry and deepen the local component in its products. The percentage of the local component of raw materials and production requirements in its products should be a minimum of 50%, provided that said percentage is calculated by deducting the value of the imported components from the cost of the product.
- The project is established in one of the areas in need of development.
- The project must contribute to the transfer and localization of modern and advanced technology in Egypt, and support innovation, development and scientific research.
- The project shall aim at securing strategic goods for the country and limit its imports.
- The project should use national labor intensively.
- The project shall contribute to reducing the environmental impact, reducing heat and gas emissions, and improving the climate.

Companies establishing green hydrogen projects and fulfilling at least two (2) of the above criteria, shall submit an application in order to obtain a single approval from GAFI, which will either accept or reject the application after verifying whether at least two of said criteria are fulfilled.

In light of the above, the New Law grants green hydrogen production projects and their expansions—excluding passenger vehicles—an exemption from value-added tax (VAT) on equipment, tools, machinery, devices, raw materials, supplies, and transportation means that are necessary and essential for carrying out the licensed activities of green hydrogen and its derivatives production projects.

The New Law also grants green hydrogen production projects and their derivatives a 25% reduction in the value of land usufruct fees for industrial land allocated for establishing green hydrogen production facilities. Additionally, it provides a 20% reduction on the usufruct fees for land used for storage facilities at ports.

These reductions are granted without prejudice to the annual increases stipulated in usufruct contracts and licences and are subject to compliance with any other regulatory rules established by the relevant land-authority.

11. Are there any foreign investment restrictions related to energy and infrastructure sectors?

There are no foreign investment restrictions related to energy and infrastructure sectors. The Investment Law grants foreign investors protection such as financing the project from abroad without restrictions on foreign currency. The foreign investor shall also have the right to freely own, manage and use the project, gain profits and transfer such profits abroad. In addition, the foreign investor shall have the right to liquidate the project at any time. All cash transfer operations related to foreign investment are allowed to be undertaken without any delay. The State further allows the transfer of the local currency into foreign currency.

The above being said, the Egyptian bank undertaking the transfer may request, at its sole discretion, the documents it deems justifying the transfer of funds abroad. As such, the entity making the transfer will have to submit documents to its Egyptian bank justifying the transfer of the funds abroad.

12. What international treaties are in place that may offer protection to international investors in hydrogen projects in the jurisdiction?

Egypt has entered into numerous Bilateral Investment Treaties ("**BITs**"). The BITs to which Egypt is a signatory party are with, inter alia, Albania, Algeria, Argentina, Armenia, Australia, Austria, Belarus, Belgium and Luxembourg, Bosnia and Herzegovina, Bulgaria, Canada, China, Comoros, Croatia, Cyprus, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, India, Indonesia, Italy, Japan, Jordan, Kazakhstan, Latvia, Lebanon, Malaysia, Morocco, the Netherlands, Occupied Palestinian Territory, Oman, Poland, Portugal, Qatar, Republic of Korea, Romania, the Russian Federation, Singapore, Slovakia, Spain, Sri Lanka, Sweden, Switzerland, Syria, Thailand, Turkey, Turkmenistan, Ukraine, the United Arab Emirates, the United Kingdom, the United States and Vietnam.

Egypt has also entered into a number of Multilateral Investment Treaties and free trade agreements. These include the Unified Agreement for the Investment of Arab Capital in the Arab States and the COMESA Investment Treaty, which provide substantive investment protections and easy recourse to international arbitration. Egypt is also a signatory to the 1958 New York Convention on the Recognition and Enforcement of Arbitral Awards.

Market developments and opportunities

13. Are there any government grants or other government funding available to hydrogen projects (including for research and development)?

There are no grants or other government funding available to hydrogen products to date. That said, the government provides incentives to hydrogen projects including tax and non-tax incentives under the New Law. Please refer to our responses to questions (8) and (10) above.

14. Are there any notable pilot/demonstration projects in place or planned for the production or offtake of clean hydrogen?

The Egyptian Government has signed multiple MoUs and agreements with international investors to produce hydrogen, such as the following:

- On 8 July 2021, the government, represented by the Egyptian Electricity Holding Company (EEHC) and the Egyptian Natural Gas Holding Company (EGAS), signed an initial agreement with Italian energy company Eni to assess the technical and commercial feasibility of projects for the production of green hydrogen through the storage of CO2 in depleted natural gas fields.
- The first MoU was signed in August 2021 with Siemens Energy to build a plant with a capacity of 100 to 200 MW. Under the MoU, Siemens and the Egyptian Government will jointly promote investment, technology transfer and implementation of projects related to hydrogen production.
- The Sovereign Fund of Egypt concluded an agreement in March 2022 with a consortium of Norway's Scatec, Egyptian businessman Nassef Sawiris, ammonia producer Fertiglobe and Orascom Construction, in order to establish and operate a 100 MW green hydrogen plant in Ain El Sokhna. The project is set to start by 2024, making it Egypt's first operational green hydrogen plant.
- South Korean company Hyundai Rotem signed on 23 January 2022 in a consortium with Orascom Construction and France's Colas Rail an MoU to build a green hydrogen-powered tram in Egypt's new administrative capital.
- During COP 27, held in Sharm El Sheikh, Egypt (through the Minister of Petroleum and the Minister of Electricity and Renewable Energy) and the European Commission signed an MoU on 16 November 2022 on a strategic partnership on renewable hydrogen.
- The Egyptian Government, represented by the New and Renewable Energy Authority, the Ministry of Electricity, the Egyptian Electricity Transmission Company, the Suez Canal Special Economic Zone and the Sovereign Fund of Egypt signed 7 MoUs for the production of green hydrogen, since August 2022.
- Elsewedy Electric in partnership with ReNew Power Private Limited signed a Framework Agreement with the Egyptian Government represented by the Infrastructure and Utilities Sub Fund of the Sovereign Fund of Egypt, the New and Renewable Energy Authority, the Egyptian Electricity Transmission Company and the General Authority for Suez Canal Economic Zone to jointly develop, finance, construct, operate and maintain a green hydrogen project with related ancillary facilities. Initially, a pilot electrolysis plant is expected to produce 20,000 tons of green hydrogen annually. While for the next phase, the annual output of the plant will be raised by up to 200,000 tons of green hydrogen, bringing the total production to 220,000 tons. The pilot phase project is expected to be commissioned in 2026.
- Infinity Power and its consortium partners, Masdar and Hassan Allam Utilities, announced that they have signed a framework agreement with leading Egyptian state-backed organizations for the development of a 2 GW green hydrogen programme in the Suez Canal Economic Zone (the "SCZONE"). The consortium signed two MoUs in April 2022 with Egyptian entities, related to the development of two green hydrogen production plants in the country, one in the SCZONE and the other in the Mediterranean. The consortium is targeting an electrolyzer capacity of 4 GW by 2030, and an output of up to 480,000 tonnes of green hydrogen per year.
- On 20 February 2024, Egypt signed seven new MoUs, the value of which is up to USD 12 billion for pilot facilities, and an additional USD 29 billion for the first phase of large-scale production of those MoUs, amounting to an investment of up to USD 40 billion to be invested over the next 10 years, according to Egypt's Minister of Planning. Details of such MoUs include:
  - Smartenergy: A Swiss renewables investor planning to develop 1 GW of electrolysis capacity to produce 830 000 tonnes of green ammonia, destined for two primary uses: producing fertilizers and as green fuel for the maritime sector.
  - Pash Global: A London-headquartered renewables investor focusing on projects in Africa and Latin America signed an MoU to develop a large-scale green hydrogen and ammonia project in the Suez Canal Economic Zone.
  - Gama Construction: A Cairo-based construction firm, part of a consortium with French investor Meridiam.
  - SK Ecoplant Co.: A subsidiary of a Korean industrial conglomerate, in a consortium with the China State Construction Engineering Corporation (CSCEC), the world's largest builder, are set to team up on a USD 1.9 billion renewable energy project in Egypt, their first joint project since the two companies agreed to cooperate on the eco-friendly business.
  - Gila Al Tawakol Electric: A Cairo-based electrical equipment supplier.
  - Amm Power: A Canadian-based green ammonia producer.
  - United Energy Group: A Hong Kong-headquartered oil and gas exploration firm.
- Germany awarded a tender to Fertiglobe, a UAE-based company, to supply at least 259,000 metric tons of green ammonia produced in Egypt between 2027 and 2033. This contract, valued at EUR397 million, is part of Germany's H2Global initiative to import green hydrogen derivatives for industrial decarbonization.
- In August 2024, Magnom Properties, a subsidiary of Saudi Arabia's Rawabi Holding, announced plans to construct a USD 1 billion, 50-store office tower in Egypt's new administrative capital. Named the Forbes International Tower, it is set to be powered by clean hydrogen and solar energy, aiming for net-zero carbon emissions upon its completion in 2030.
- In October 2024, Egypt Green Hydrogen (EGH), led by Norway's Scatec, received a EUR30 million (EUR33 million) grant from Germany's PtX Development Fund. This funding supports the development of an integrated green hydrogen and ammonia project in Egypt, with a total capital expenditure of approximately EUR500 million. EGH has also secured a 20-year ammonia offtake agreement with Fertiglobe (as mentioned above), which will supply the renewable ammonia to Germany's Hydrogen Intermediary Network Company (Hint.co).
- In December 2024, a consortium led by BP, including Abu Dhabi-based Msdar and Egypt's Infinity Power, announced plans to focus on domestic demand for their green hydrogen project in Egypt. This shift comes after challenges in securing international buyers due to competitive global markets. The project aims to supply local industries, such as fertilizer and sustainable aviation fuel producers.
- The Emirati Company, AMEA Power, agreed with the Egyptian Government to produce green ammonia by facility in Sokhna with an annual production capacity of 390,000 tons, set to start commercial operations by the end of 2025.

15. Are there any commercial-scale clean hydrogen production projects in development or already operating?

There are no projects that have materialized on the ground yet, only MoUs and agreements that have been concluded between the government and investors.

16. Have there been any hydrogen-related disputes in your jurisdiction?

We are not aware of any hydrogen-related disputes in Egypt.

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Finland

Ashurst collaborated with **Dittmar & Indrenius** in the preparation of this content. We are grateful for their input.

Policy and regulation

1. Is there a government hydrogen strategy or policy?

In June 2022, the Finnish Government announced a new national energy and climate strategy aimed at carbon neutrality by 2035. The new energy and climate strategy includes a section on hydrogen and this forms Finland's hydrogen strategy. Based on the national hydrogen strategy, the Finnish Government adopted a resolution defining the national hydrogen objectives and describes the measures to promote them on hydrogen in February 2023.

2. What are the key goals and commitments included in the strategy/policy?

As a part of the goal to achieve carbon neutrality by 2035, Finland is preparing comprehensively for the deployment of hydrogen solutions throughout the value chain when hydrogen solutions reach commercial viability. Finland's goal is to become the European leader in the hydrogen economy in the entire value chain. Finland has the capability to produce at least ten per cent of the EU's emissions-free hydrogen in 2030.

The objectives of the Finnish Government's resolution on hydrogen are to manufacture clean hydrogen and electrofuels for the needs of the Finnish industry, transport and energy system, to renew industry and grow exports with high value added, and to secure investments in Finland. The objective is to grow a new industry in Finland based on hydrogen and hydrogen-based products, which will support the renewal of the manufacturing industry and turn the technology companies in the sector into internationally leading suppliers.

The Finnish gas transmission system operator Gasgrid Finland Oy announced in June 2022 that it will develop a national hydrogen transmission infrastructure to enable a regional hydrogen market in the future. A concrete hydrogen infrastructure route plan was announced in November 2024. The European Commission granted in February 2025, EUR 51 million to Gasgrid and its partners to support hydrogen transport infrastructure projects in the Baltic Sea area.

3. Which industry sectors are most likely to be affected by hydrogen deployment?

The industrial sectors likely to be affected by hydrogen deployment are:

- the power sector
- road freight
- shipping and aviation.

Currently, the biggest users of hydrogen in Finland are oil refineries, biofuel production companies and the chemical industry. In these sectors, where hydrogen is already being used, a shift to low-carbon hydrogen is expected.

4. Who are the main regulators for the hydrogen market?

There is currently no sector-specific legislation in place and therefore no sector-specific regulators either.

5. Does the government hydrogen strategy or policy support the development of both low-carbon (blue) hydrogen and renewable (green) hydrogen?

The hydrogen strategy as well as the Finnish Government's resolution on hydrogen support both low-carbon hydrogen and renewable hydrogen.

6. If the government hydrogen strategy or policy supports the development of low-carbon hydrogen, to what extent is carbon capture and storage being taken forward?

The Government has allocated EUR 150 million in its Sustainable Growth Programme towards investment, among other things, hydrogen projects and carbon capture and recovery projects for the year 2025, the Government has allocated EUR 400 million for industrial investments in its clean transition aid scheme. The Ministry of Economic Affairs and Employment may grant energy aid for investment projects or studies conducted in Finland that aim to promote: renewable energy production;energy savings or more efficient energy production or use; recovery of waste heat; or decarbonisation of energy systems. Energy aid also promotes investment and research projects related to renewable energy and renewable hydrogen. Additionally, energy projects are supported through the RRF support programme. In October 2024, EUR 72 million were granted by the Ministry of Economic Affairs and Employment through the RRF to seven new energy technology projects and five energy infrastructure and electrification projects.

Business Finland acts as the granting authority for all projects related to hydrogen production and storage, as well as carbon capture and utilization. In spring 2023, Business Finland launched a new program (The Hydrogen & Batteries – Dual Helix of Decarbonization) for the hydrogen and battery industry to fund, among other things, future hydrogen investment projects. During the years 2022-2024, the Ministry of Economic Affairs and Employment granted RRF energy support to a total of 77 projects, amounting to approximately EUR 469 million. By March 2025, there have been nearly 2,000 individual beneficiaries receiving RRF funding in Finland, with a total of almost EUR 1.8 billion granted to these beneficiaries.

The hydrogen strategy also includes plans to accelerate the development and introduction of CCUS.

In addition, according to the Government Programme, "A Strong and Committed Finland", published in June 2023, the Government will explore and introduce policy instruments to ensure that carbon dioxide emissions to atmosphere from large industrial sources are eliminated by the mid-2030s. The Government will introduce a reverse auction of negative emissions or a similar mechanism to encourage the capture of carbon dioxide.

7. Are there targets for the production of hydrogen?

Finland aims for a 10% share of the EU's production of clean hydrogen and at least the same share of further use of hydrogen. Finland's non-binding target is to have at least 200 MW of electrolyser hydrogen production capacity by 2025 (in 2021, the capacity was 9 MW) and at least 1000 MW by 2030 according to the hydrogen strategy.

8. Are there any incentive mechanisms/business models in place to support the production of hydrogen?

The Government has allocated EUR 150 million in its Sustainable Growth Programme towards investment, among other things, in hydrogen projects and carbon capture and recovery projects. For the year 2025, The Government has allocated EUR 400 million for industrial investments in its clean transition aid scheme.

The primary target group for these investments is large companies in the energy technology and energy-intensive industries and their supplier networks, as well as SMEs that commercialise innovations. There are no restrictions on the size of company that can benefit from these investments and no specific regions or industries are targeted however, investments will not be allocated to projects for the production of hydrogen from natural gas. The funding from the Sustainable Growth Programme is therefore intended to foster innovation in the field of electrolyser hydrogen however, the Government acknowledges the difficulties relating to commercialisation of such technologies in the hydrogen strategy.

In its hydrogen strategy, the Government announced that it will investigate the feasibility of introducing carbon contracts-for-differences (CCfDs) as an incentive mechanism to accelerate transformation to low-carbon industry.

Hydrogen distribution stations for traffic use can already obtain investment aid and hydrogen fuel is now included in the renewable fuel distribution obligation system.

The Finnish Government's resolution on hydrogen states that a supportive regulatory framework, a favourable business environment and economic incentives must be promoted to encourage investment.

The clean transition aid scheme, which came into force on January 9, 2025, supports industrial investments aimed at reducing carbon emissions in production processes, improving energy efficiency, and advancing climate-neutral industries. In January 2025, a decree issued by the Finnish Government came into force, enabling companies in Finland to receive government grants for investment projects aimed at reducing greenhouse gas emissions and energy consumption in industrial production processes. Additionally, grants are available for investment projects in certain strategic sectors essential for the transition to a climate-neutral economy. To qualify for support under the grant programme, the eligible costs of an investment project must be at least EUR 30 million. Only new investment projects are eligible for the subsidy. The application period for investment aid ended in March 2025.

In March 2025, the Finnish Parliament approved the Government's proposal concerning the tax credit for green industrial investments with eligible investment costs of at least EUR 50 million. The tax credit may be granted for investments related to the production and storage of renewable energy, decarbonization of production processes and energy efficiency, as well as the production of equipment, components, and raw materials that are strategic for the transition to a climate-neutral economy. The tax credit can be up to 20 % of eligible investment costs, with a maximum limit of EUR 150 million per group. The tax credit will apply to the company's income tax starting from the tax year that begins in the calendar year 2028, continuing for the subsequent nineteen tax years. However, the investment credit may be reduced at the earliest in the tax year during which the investment is completed.

9. Are there any standards in place for the classification and/or certification of low-carbon or renewable hydrogen?

The European Commission has issued two delegated acts outlining rules on the EU definition of renewable hydrogen. The Delegated Regulation (EU) 2023/1184 defines under which conditions hydrogen, hydrogen-based fuels or other energy carriers can be considered as renewable fuels of non-biological origin (RFNBOs). The Delegated Regulation (EU) 2023/1185 provides a methodology for calculating life-cycle greenhouse gas emissions for RFNBOs. The EU hydrogen and gas decarbonisation package, consisting of Directive (EU) 2024/1788 and Regulation (EU) 2024/1789, was adopted in May 2024. The package aligns with the stipulations set forth in the EU's Renewable Energy Directive II/III (RED II/III) and complements it, notably by offering the much-anticipated definition of low-carbon hydrogen.

There are no national standards in place for the classification of low-carbon or renewable hydrogen. However, The Ministry of Economic Affairs and Employment has sent a draft government proposal for consultation, aiming to implement the regulatory changes required for the enforcement of the sustainability criteria under the RED III Directive. The proposed legislative amendment mandates that facilities producing electricity, heating, or cooling with a capacity exceeding 7.5 MW, must prove that the biomass they use meets sustainability criteria. The proposal also includes more detailed regulations on demonstrating the compliance of RFNBOs through a national system.

The European Commission published in September 2024 a 4-week call for feedback on the draft delegated act which clarifies the methodology for evaluating the emission savings of low-carbon hydrogen and fuels. The initiative is still under consideration and awaiting Commission approval.

10. Does the regulatory framework clearly define the regulatory requirements relating to the production, storage, transportation or supply of hydrogen?

National regulation concerning the production, storage, transportation, and supply of hydrogen is currently being prepared in Finland.

In February 2025, the Ministry of Economic Affairs and Employment established a working group to prepare the national implementation of Directive (EU) 2024/1788 of the European Parliament and of the Council on common rules for the internal markets for renewable gas, natural gas and hydrogen. The directive establishes common rules regarding the transmission, delivery, and storage of hydrogen using the hydrogen system, as well as rules concerning the general operation of the hydrogen market.

Starting from March 24, 2025, the Ministry of Economic Affairs and Employment is requesting opinions on legislative proposal for amendments required to implement the EU Energy Efficiency Directive into Finnish law. The Energy Efficiency Act would regulate, among other things, the application of the energy efficiency first principle in public procurements and significant investments made by companies. Companies with an average annual energy consumption exceeding 23.6 GWh would be mandated to implement a certified energy management system. Additionally, companies whose energy consumption surpasses 2.7 GWh annually would be required to conduct an energy audit every four years.

According to the Finnish Government's resolution on hydrogen the promotion of renewable and low-carbon hydrogen production and the launch of investment require a supportive regulatory framework. In particular, safety regulatory reform is an important part of the development and deployment of hydrogen technologies.

11. Are there any foreign investment restrictions related to energy and infrastructure sectors?

There is no sector-specific legislation in place in Finland relating to foreign investments in energy and infrastructure sectors. However, there is legislation in place that provides that a foreign corporate acquisition will be subject to monitoring if, as a result of the proposed corporate acquisition, a foreign owner will control a certain proportion of votes or will have actual influence in a company active in the defence and security sector or a business undertaking considered critical for vital functions of society.

In this instance, a notification must be made to the Ministry of Economic Affairs and Employment, which confirms the proposed acquisition in the first instance but may refer it to the Council of State of Finland, which in turn may refuse to confirm the acquisition if it is deemed necessary due to a critical national interest.

12. What international treaties are in place that may offer protection to international investors in hydrogen projects in the jurisdiction?

The United Nations Conference on Trade and Development (UNCTAD) website states that Finland is a signatory to 55 bilateral investment treaties (BITs) that are in force, and in addition certain other treaties may contain protections for investors in Finland. These can be accessed from the Ministry of Foreign Affairs' website, and UNCTAD's Investment Policy Hub.

Market developments and opportunities

13. Are there any government grants or other government funding available to hydrogen projects (including for research and development)?

The Government has allocated EUR 150 million in its Sustainable Growth Programme towards investment, among other things, in hydrogen projects and carbon capture and recovery projects. For the year 2025, The Government has allocated EUR 400 million for industrial investments in its clean transition aid scheme. By March 2025, there have been nearly 2,000 individual beneficiaries receiving RRF funding in Finland, with a total of almost EUR 1.8 billion granted to these beneficiaries.

Business Finland acts as the granting authority for all projects related to hydrogen production and storage, as well as carbon capture and utilization. In spring 2023, Business Finland launched a new programme (The Hydrogen & Batteries – Dual Helix of Decarbonization) for the hydrogen and battery industry to fund, among other things, future hydrogen investment projects. The programme will run for six years, ending in 2028.

14. Are there any notable pilot/demonstration projects in place or planned for the production or offtake of clean hydrogen?

There are a number of different pilot projects being deployed in Finland to examine and test the feasibility of clean hydrogen production and its use in different sectors, such as:

- **SSAB's** industrial-scale research project, which aims to produce fossil-free steel using hydrogen reduction and clean electricity;
- **Q Power** and **Wärtsilä** aim to produce synthetic natural gas from hydrogen and carbon dioxide;
- **Flexens**, which aims to produce and utilise clean hydrogen for ferry transport. Currently, the project is being postponed until at least 2026 due to Flexens' financial difficulties;
- **Gasgrid Finland's** hydrogen transmission infrastructure demonstration project, which is the first hydrogen transmission project extending beyond an industrial site;
- **Raahen Monivoima** is preparing a project combining the storage of wind and solar energy, a green hydrogen production plant, and a hydrogen storage facility;
- **Solar Foods**, which produces protein by utilising carbon dioxide and renewable electricity. Solar Foods has constructed an industrial-scale demonstration plant which uses hydrogen technology. The plant started its operations in April 2024. ABB aims to develop and demonstrate megawatt-scale fuel cell solutions to enable zero-emission maritime transport (as part of the CLIC Innovation and Gasgrid Finland's BalticSeaH2-project);
- **Helen** aims to produce green hydrogen with a PEM electrolyser (as part of the CLIC Innovation and Gasgrid Finland's BalticSeaH2-project). The first pilot plant is planned to be operational in 2024 and will mainly serve heavy-duty transport;
- **Blastr Clean Steel** and **Primetals Technologies** are planning an ultra-low CO_2 steel plant in Inkoo. The MIDREX H2TM Plant is powered by up to 100 % green hydrogen;
- **Plug Power** announced in 2023, a 1GW project to produce green hydrogen in Kristinestad; and
- **Flexens** is planning a 350 MW green ammonia and hydrogen production facility in Kokkola.

15. Are there any commercial-scale clean hydrogen production projects in development or already operating?

Finland's first green hydrogen plant began operations in February 2025, operated by P2X Solutions (see more information below). There are a number of projects in the pipeline at different stages of development, including the following projects:

- **P2X Solutions** launched the operation of Finland's first green hydrogen production plant in Harjavalta in February 2025.The Harjavalta plant's green hydrogen production capacity is 20 MW. The facility's complex also includes a methanation plant, which will launch its operations at a later stage. P2X Solutions is also planning hydrogen plants in other locations, such as Joensuu and Oulu. Business Finland provided an investment grant of EUR 60 million to P2X Solutions' renewable hydrogen and synthetic methanol production plant in Joensuu in February 2025. The company plans to progressively expand hydrogen production, targeting a capacity of 40 MW for the Joensuu facility and up to 100 MW for the Oulu facility.
- **Ren-Gas** has signed a reservation agreement with the City of Pori for a site in the Kirrinsanta industrial area. Ren-Gas is developing a 300 MW e-methane project in the area, which is the largest single hydrogen investment in Finland. Other than that, Ren-Gas has entered into several co-operation agreements since the start of 2022 with different parties regarding feasibility studies of Power-to-Gas plants/facilities which would have electrolysis capacity ranging between 20-60 MW each. In 2023, at least one of these projects progressed to obtaining investment support and planning a construction project. In April 2024, the Ren-Gas Lahti plant was given a EUR 45 million subsidy grant through the European Hydrogen Bank's first competitive bidding process.

- **CLIC Innovation** and **Gasgrid Finland's** BalticSeaH2-project, which aims to build the first significant, cross-border hydrogen valley in Europe. The goal is to create an integrated hydrogen economy around the Baltic Sea to enable self-sufficiency of energy and minimise carbon emissions from different industries. The project includes 40 partners from nine Baltic Sea area countries. The project has started in the beginning of June 2023 and lasts five years.
- **Neste Corporation, Gasgrid Finland, Helen** and **Vantaan Energia** have in collaboration started preliminary studies on the development of an industrial hydrogen valley. The industrial hydrogen valley would combine infrastructure, storage and transmission of renewable hydrogen, serving both producers and consumers of hydrogen.
- **Helen** announced in April 2024 plans to build a green hydrogen plant in Helsinki, with operations expected to commence in 2026. The 3H2 – Helsinki Hydrogen Hub pilot plant project is set to have a capacity of around 3 MW. The produced hydrogen will mainly be distributed through a hydrogen filling station to be built in connection with the plant, which is mainly intended for heavy transport.
- **Vetyalfa** has initiated a significant green hydrogen refinery project in Utajärvi, Northern Ostrobothnia. The project could result in a refinery producing up to 150,000 tons of hydrogen annually, along with various synthetic fuels. The plant's electrolyser capacity would be up to 1000 MW, with another contemplated option being one-fifth of this capacity.
- **ABO** Energy group is planning an industrial scale green hydrogen production facility in Nivala. Preliminary estimates suggest that the planned plant would have an electrolysis capacity of 200 MW. In April 2025 ABO Energy group was granted a planning reservation to build a 600-MW green hydrogen plant in Oulu.

16. Have there been any hydrogen-related disputes in your jurisdiction?

There have been no directly hydrogen-related disputes that are publicly available.

Last updated May 2025

France

Policy and regulation

1. Is there a government hydrogen strategy or policy?

Generally, France has made the decarbonisation of the economy one of the priorities of the France 2030 investment plan. This ambition is part of a European and international dynamic with the *Accord de Paris* and the Fit for 55 legislative package, the objective of which is to reduce the emissions of the Member States of the European Union by 55% in 2030 compared to their 1990 level.

The major change in the Green hydrogen French Market, was announced recently, 19 December 2024 : France has launched its first call for tenders. Interested companies had until 14 March 2025, to submit their proposals. This first phase will support a capacity of 200 MW. Ultimately, it is planned to support a cumulative capacity of 1 GW of electrolysis by mobilising approximately EUR 4 billion. A maximum of twelve candidates will be selected, after an examination of their technical and financial capabilities, to participate in a competitive dialogue phase. At the end of this phase, the candidates will develop their offer according to a specification that will be detailed based on the exchanges conducted during the competitive dialogue. The ADEME (the French Environment and Energy Management Agency) will be the ministry's operator for conducting this procedure. Applications closed on 14 March 2025. The procedure concerns the allocation of public support for a maximum duration of 15 years for the construction and operation of renewable hydrogen or low-carbon hydrogen production units. Eligible installations are those with a submitted power capacity greater than 5 MW and less than or equal to 100 MW.

Moreover, the French state, through ADEME, approved on 5 December 2024, the granting of aid amounting to 8.1 million euros to the "Grand-ParHY" project led by the company Hyliko SAS, as part of the "Hydrogen Territorial Ecosystems" call for projects. This project aims at acquiring 34 hydrogen trucks and leasing them to 10 partner transport companies.

Initially, the French Minister in charge of energy transition issued a hydrogen deployment plan for the energy transition in June 2018. This plan was based on three main axes: the creation of a decarbonised industry, the development of renewable energies storage capacities and the development of zero-emission solutions for road, rail and waterway transport.

This initiative was followed by the issuance of the National Strategy for the development of low-carbon hydrogen in France by the government on 8 September 2020 (the "**Hydrogen National Strategy**") as part of the stimulus plan aiming to accelerate ecologic, industrial and social transition in France. Since it launch, the government has supported over 150 hydrogen-related projects. Some of the major projects include setting up hydrogen production plants in Fos-sur-Mer, the Vallée de la Chimie, and around the Havre-Estuaire de la Seine. Moreover, The Important Project of Common European Interest (IPCEI) for hydrogen has helped to implement around 20 key projects, such as gigafactories for electrolysers, fuel cells and hydrogen tanks.

Three years after its launch and as part of the French Climate-Energy Strategy for 2024-2035, the French Government has worked on a revised version of the Hydrogen National Strategy to adapt it to changes in the sector since its adoption in 2020. Although it was initially planned for June 2023, such revised Hydrogen National Strategy was subject to public consultation from 15 December 2023 to 19 January 2024.

The government presented the **updated Hydrogen National Strategy** at the Interministerial Committee on 10 April 2025. The main figures involved in this announcement were Agnès Pannier-Runacher, Minister of Ecological Transition, Marc Ferracci, Minister of Industry and Energy, Philippe Tabarot, Minister of Transport, and Bruno Bonnell, Secretary General for Investment in charge of France 2030 (the huge French investment plan that the French President announced on 12 October 2021 to develop hydrogen).The revised Hydrogen Strategy has been enacted on 16 April 2025, a revised strategy which has been awaited for a long time by the industries. This update confirms a reduction in the targeted capacity for low-carbon hydrogen production .The new objective is set at up to 4.5 gigawatts installed in France by 2030, and 8 GW by 2035, compared to the previous targets of 6.5 GW and 10 GW. Additionally, the government intends to launch a new call for projects to accelerate the deployment of hydrogen-powered utility vehicles.

This initiative aims to advance fuel cell and tank technologies, with a specific focus on supporting the purchase of light utility vehicles starting in 2025. Overall, the purpose of this strategy is to continue to industrialise the previously supported projects and strengthening the integration of the ecosystem around French industries.

Furthermore, the hydrogen is at the heart of the massive investment plan France 2030 announced by the French President on 12 October 2021, one of the aims of which is for France to become the leader in green hydrogen. France 2030 increases the financial support for hydrogen up to EUR 9 billion.

In order to promote the development of hydrogen, on 19 September 2024 CRE presented its recommendations on the broad regulatory guidelines for the hydrogen and carbon capture, storage and transport sectors. In its recommendations, the CRE firstly recommends local development of production as close as possible to consumers, with priority given to a few industrial hubs.

The "Hydrogen Territorial Ecosystems" call for projects of France 2030 aims to finance the production and distribution of hydrogen and the deployment of vehicles. Since 2018, 35 ecosystems have been supported throughout France with more than 320 million euros in public support. (**see question 8, 1**)

2. What are the key goals and commitments included in the strategy/policy?

In April 2025, the French Government published a strategy setting several objectives on hydrogen. There are three priorities, namely industry decarbonisation to meet carbon neutrality by 2050, development of hydrogen-powered heavy mobility and support to high-level research and development of training offers.

In this context, three major objectives have been set by the French Government:

- Raising the number of electrolysers to significantly contribute to economy decarbonisation (development of 4.5 GW low-carbon hydrogen production capacities based on electrolyse, by 2030, and 8.5 GW, by 2035).
- Corresponding priority: decarbonising industry by creating a French electrolysis industry.
- Development of clean mobilities specifically for heavy mobilities, i.e. utility vehicles, trucks, trains, river shuttles, ships, planes (the objective is to save 6 million tonnes of CO2 by 2030).
- Corresponding priority: developing heavy-duty mobility with low-carbon hydrogen.
- Creation of an industrial sector generating jobs and guaranteeing technological expertise.
- Corresponding priority: support research, innovation and skills development to foster the uses of tomorrow.

The draft revised Hydrogen National Strategy adds a number of priorities to the original ones, among which:

- In addition to support for electrolysis production, supporting the deployment of new hydrogen production methods as part of the objective of installing a low-carbon electrolytic hydrogen production capacity of 4.5 GW by 2030 (and 8 GW by 2035): the government will allocate funding to explore the potential of hydrogen naturally present in the subsoil. A first research permit has been granted in the *Pyrénées-Atlantiques* region on 23 November 2023.
- The "Important Projects of Common European Interest" (IPCEI) programme, focusing on hydrogen production, will also enable the rollout of six pioneering projects for large-scale hydrogen production for industrial applications (such as chemicals, ammonia, and refining) within French territory. The selected projects will help establish the initial hydrogen production units in French industrial zones like Fos-Sur-Mer, the Havre-Estuaire de la Seine, and Lyon's "*Vallée de la Chimie*", which are anticipated to be significant hydrogen consumption centers in the future.
- Promoting competitive low-carbon hydrogen production in France, in particular through a EUR 4 billion in the form of Carbon Contracts for Difference ("CCfD") to ensure, in addition to the existing support mechanisms, the competitiveness of low-carbon hydrogen as compared to fossil hydrogen over the next decade.
- Supporting the French hydrogen industry in its international commercial development and promoting the emergence of a global market for hydrogen and its derivatives. In this respect, the French Government has asked relevant authorities to analyse the appropriateness and methods of importing hydrogen. Their report should have been presented to the government in the first quarter of 2024.
- Making the deployment of hydrogen an opportunity to make the energy system more flexible, by improving electrolysers and developing storage capacity.
- Ensuring the necessary conditions for the development of the French hydrogen industry, including access to land, simplification of permitting and grid connection procedures or even the adaptation of the national regulatory framework to ensure complete, readable and stable regulation.
- Regarding projects related to hydrogen storage an *appel à Manifestation d'intérêt* has been launched by Soreng, a subsidiary of Engie. In November 2024, Storengy initiated a market survey to identify the needs of hydrogen traders, producers, and users along the French segment of the forthcoming European hydrogen backbone. This backbone aims to link the networks of the Iberian Peninsula with those of North-West Europe, traversing Portugal, Spain, France, and Germany.

3. Which industry sectors are most likely to be affected by hydrogen deployment?

The industry sectors where clean hydrogen may displace fossil fuels in France include:

- Steel and chemical industry: A significant portion of the sector's current consumption could thus be decarbonised in the long term by resorting to electrolysis.
- Transport: according to the French hydrogen strategy published in 2025 the priority sectors for the use of low-carbon hydrogen are industry and heavy and intensive mobility (particularly for aviation and maritime).
  - Air transport is subject to obligations for the incorporation of sustainable aviation fuels (SAF) defined at the European level (ReFuel EU regulation) until 2050.
  - The maritime sector, under the FuelEU Maritime regulation, will need to follow a path to reduce the carbon intensity used on board ships.
  - Road mobility: electric cars will be preferred. However, in certain specific cases requiring long daily autonomy, high availability, fast charging time, maintenance of payload, or higher energy needs (temperature changes, gradients), hydrogen, although more expensive at present, could become relevant.
- Refining industry: The sector could use low-carbon hydrogen as a substitute for the fossil hydrogen used today, if economic conditions encourage it. The TIRUERT ("*Taxe Incitative Relative à l'Utilisation des Energies Renouvelables dans le Transport*") currently promotes the use of renewable or low-carbon hydrogen in the refining process or as fuel, since the entry into force of decree no. 2025-226 of 10 March 2025. A Decree in in line with the French Government's desire to develop both green and blue hydrogen (see question 5).
- Heating.

Sectors where hydrogen is already being used in smaller quantities, such as electronics or the food industry, are also expected to switch to low-carbon hydrogen.

4. Who are the main regulators for the hydrogen market?

As the market is nascent in France, a specific regulator for the hydrogen market has not been appointed as yet. However, the French Energy Regulatory Commission (known as the "**CRE**") and the Environment and Energy Management Agency ("**ADEME**") play a key role in the development of the market.

Based on the provisions of the Hydrogen Ordinance dated 17 February 2021 and the Hydrogen Decree dated 1 September 2023 (see question 8), the opinion of the CRE was taken into account to establish the tender specification framing the tendering process announced in December 2024 and the general terms and conditions of the aid which will be granted to low-carbon and renewable hydrogen production facilities by electrolysis of water, having been selected through the said tendering process.

It is also important to mention France Hydrogène, this association brings together the actors of the French hydrogen sector structured across the entire value chain: large industrial groups developing large-scale projects, innovative SMEs and start-ups supported by laboratories and centres of research excellence, associations, competitiveness clusters, and local authorities mobilised for the deployment of hydrogen solutions. They play a key role, orienting the national strategy taking into account the business challenges.

5. Does the government hydrogen strategy or policy support the development of both low-carbon (blue) hydrogen and renewable (green) hydrogen?

The Hydrogen National Strategy and the investment plan France 2030 aim to focus on the development of low-carbon hydrogen by electrolysis of water and renewable (green) hydrogen. The French Government's strategy is first to promote hydrogen decarbonisation mechanisms through the development of electrolysers, in line with the European strategy for the development of hydrogen.

However, the CRE recently insisted on the fact that the priority should be the decarbonisation objective regardless of the primary energy source that is used (i.e., low-carbon hydrogen or hydrogen produced from renewable energy). While according to the CRE, the public support in favour of hydrogen should not be based on the category of hydrogen but only on the emission threshold of CO2 equivalents emitted per kilogram of hydrogen produced. The 2025 French hydrogen strategy provides that both low carbon hydrogen and green hydrogen are part of the planification. For example, regarding low-carbon hydrogen, the 2025 French hydrogen strategy, provides that some existing fertiliser production plants will be able to rely on carbon capture and storage (CCS) technology to decarbonise their activities.

The French government has shown its willingness to support and develop this "blue" hydrogen, notably through the final report of France Stratégie published in January 2024, and reiterated its commitment in its document "State of Play and Deployment Perspectives of CCUS in France" published in July 2024. Indeed, France has chosen to use this technology for capturing the most difficult-to-reduce emissions in the absence of other technically and economically viable decarbonisation solutions. This support is implemented through calls for tenders dedicated to large industrial decarbonisation projects. The *Grands Projets Industriels de Décarbonation* call for tenders ("AO GPID") opened on 21 December 2024 and will close on 15 May 2025. Its aim is to support the acceleration of industrial decarbonisation in France and the development of decarbonisation technologies.

In this dynamic, the French state provides decisive support to stimulate this future-oriented sector, at the intersection of environmental and economic needs. Projects that can submit their applications must provide financial guarantees. Indeed, the consultation document stipulates that an applicant company must provide a letter of intent from the organisation that will provide them with a first-demand guarantee. The applicant must also provide documents demonstrating a good financial standing. This reflects the State's intention to support hydrogen projects under the best conditions, taking fewer risks.

6. If the government hydrogen strategy or policy supports the development of low-carbon hydrogen, to what extent is carbon capture and storage being taken forward?

The French draft CCUS strategy is based on the principle that CCUS is not a technology for maintaining "business as usual", but to manage incompressible residual emissions that cannot be reduced, in the absence of other economically accessible decarbonisation solutions, or a transitional solution.

The French CCUS strategy is built around 4 main guidelines:

1. The rapid deployment of CCS projects, by major industrial areas, in three phases: (i) the first starting in 2026 with the industrial ports of Dunkirk, Le Havre and Fos-sur-Mer, (ii) the second from 2028, with the Lacq/Sud Ouest and Loire-Estuaire basins and (iii) the third from 2033, in the Grand Est through the potential development of onshore storage. There are various projects under construction at the Dunkirk site. Carbon capture on the territory: "K6" programme and CalCC project; Transport: D'Artagnan and GRTgaz-Equinor projects; Submarine storage in the North Sea (in particular, a strategic partnership agreement with Norway was finalised in January 2024).
2. The development of various carbon storage possibilities in France: the French government has also launched, on 29 April 2024, a call for expression of interest (appel à manifestation d'intérêt – "AMI Capture et Stockage de Carbone") for geophysical exploration campaigns and CO2 injection tests at pilot sites, with the first tests scheduled for 2025.
3. The launch of a public support mechanism for decarbonisation to ensure industrial competitiveness: the French government estimates the investment required to be between EUR 11 billion and EUR 18 billion, based on capture costs between EUR 40 per tonne of CO2 (/tCO2) and EUR 80 /tCO2, transport and storage costs between EUR 100 /tCO2 and EUR 150 /tCO2, and an initial investment by the manufacturers between EUR 100 million and EUR 400 million. Because of these additional costs – which according to the French Government are not easily reflected in the final product by the manufacturer to the consumers – the French strategy provides for a support in the form of Carbon Contracts for Difference ("**CCfD**"), awarded through a tendering process, for identified carbon capture and sequestration projects. There is a launch of a call for projects at the beginning of 2025, based on data from the inventory and the call for expressions of interest that closed on July 26, 2024, to subsidise actions aimed at improving the knowledge of the subsoil and promoting the search for geological CO2 storage capacities in France.
4. A regulatory framework for carbon transport infrastructures, which will be regulated by the CRE, including measures to share the financial risks related to such infrastructures between the French State, the grid operators and their manufactural users.

The French Government is aiming to save 4 to 8.5 million tonnes of CO2 per year, by 2030, and 15 to 20 million tonnes of CO2 per year, by 2050.

7. Are there targets for the production of hydrogen?

As previously specified, the French Hydrogen Strategy, published on 16 April 2025, adjusted France's objectives regarding hydrogen, France's target is to have 4.5 GW low-carbon hydrogen production capacity based on electrolysers and to save more than 6 Mt of CO2 (which is equal to the annual carbon emissions of a city like Paris) by 2030, and 8 GW, by 2035. France is aiming to be carbon neutral by 2050 (see question 1).

8. Are there any incentive mechanisms/business models in place to support the production of hydrogen?

1. The French public incentive plans

In its revised hydrogen strategy published on 16 April 2025, the Government reaffirmed its commitment to supporting R&D projects and the initial industrialisation of hydrogen equipment manufacturers through various calls for projects. In the short term, this includes a new round of the "Hydrogen Technology Bricks" call for projects.

In the Hydrogen National Strategy published in 2020, the French Government announced that EUR 7 billion would be allocated until 2030 to support the three priorities mentioned in response to question 2. The France 2030 plan has increased this amount to EUR 9 billion (see question 1).

As part of the Hydrogen National Strategy, the French Prime Minister announced in September 2022 that the 10 French projects approved by the European Commission as part of an Important Project of Common European Interest ("**IPCEI**") (see question 13) would be granted EUR 2.1 billion. Between July 2022 and February 2024, the European Commission successively authorised three waves of projects Hy2Tech, Hy2Use, and Hy2Infra. Among all the winners, 13 French projects were selected. On 28 May 2024, the European Commission also approved the fourth wave of IPCEI projects related to hydrogen, Hy2Move. This latest selection complements the previous waves by supporting the development and initial industrial deployment of hydrogen applications in the mobility and transport sector. 13 projects have been selected guided by 11 companies including four French ones: Airbus, Gen-Hy, Hydrogène de France, and Michelin.

In addition, as part of France 2030, the French Minister for Energy Transition (among other ministers) announced on 17 May 2023 the deployment of a new funding envelope of EUR 175 million to relaunch the "Territorial Hydrogen Ecosystems" call for proposals ("*AAP Ecosytèmes territoriaux hydrogène" or "EcosysH2*") – through which 35 ecosystems across France were financed with more than EUR 175 million of public support. Applications closed in September 2023, the submitted projects were evaluated, competed, and selected within three categories: new ecosystems with predominant industrial uses; new ecosystems with predominant mobility uses; extension of existing ecosystems through new mobility uses.

Meanwhile, the government has published the new hydrogen strategy; they have decided to reopen the "Hydrogen Technological Bricks IDH2" ("Briques technologiques et grands démonstrateurs") call for projects and to launch a new call for projects for the deployment of hydrogen utility vehicles. This call for projects is open from 17 May to 25 May 2025 and aims to support initiatives for the acquisition of new hydrogen-powered utility vehicles equipped with fuel cells, with a gross vehicle weight rating (GVWR) of 2.5 tonnes or more. The objective is to facilitate the deployment of hydrogen mobility for road vehicles used in the transport of people or goods, focusing public support on those categories of vehicles for which direct electrification is currently the least suitable.

2. The French incentive mechanisms in place

According to the Hydrogen National Strategy, support for hydrogen deployment will take the form of incentive mechanisms.

To date, incentive mechanisms are mainly based on subsidies granted to hydrogen-related projects selected through competitive procedures, e.g. calls for proposals (*appels à projets*) and calls for expression of interest (*appels à manifestation d'intérêt*) – see paragraph 1 above.

Meanwhile, Ordinance No. 2021-167 of 17 February 2021 with respect to hydrogen (the "**Hydrogen Ordinance**") establishes a specific legal framework including public support mechanisms which may only benefit low-carbon and renewable hydrogen production facilities by electrolysis of water. This public support is open to any person located on the territory of a Member State of the European Union or the European Economic Area who intends to build or operate a production facility on the national territory. It may take the form of either an operating aid (OPEX) or a combination of financial support to investment (CAPEX) and operating aid under terms and conditions to be set by the relevant administrative authorities. The operating aid cannot lead to remuneration of the producer exceeding a reasonable return on invested capital, taking into account the risks in relation to the activities benefiting from the aid.

In both cases, the facilities or projects benefiting from such support will be selected through a three-stage tendering procedure based on transparency and equal treatment principles. Such a procedure is quite similar to those used for offshore wind projects in France, where ADEME – already involved in the selection of hydrogen-related projects through the calls for proposals – plays a key role, whereas for offshore wind projects, the CRE plays that role.

As part of the development of financial support granted by the State in the hydrogen sector, Decree No. 2023-854 of 1 September 2023 (the "**Hydrogen Decree**"), specified a new competitive bidding procedure, now included in Articles R. 812-1 and following of the French code de l'énergie.

A second Decree No. 2024-289 published on 29 March 2024 considered that after reviewing the offers, the Ministry in charge of energy designated by order, the winner of the competitive bidding is selected and the other candidates are notified of the rejection of their offers.

The procedure is led by the French Minister of Energy (with the support of ADEME). It is initiated with a submission phase to select applicants to participate in the tender, which may be followed, where appropriate, by a competitive dialogue phase, and a bidding phase to designate the awarded bidder. The applicable selection criteria (with quantitative criteria accounting for at least 70% of the weighting) together with the conditions for build and operate the facility are set out in the draft tender specification drawn up by the French Minister of Energy.

Awarded bidders will be eligible for a support contract (that should take the form of a Carbon Contract for Difference - "**CCfD**") of 15 years to be signed within 6 months from the awardee's request, according to the draft tender specification available to date.

The draft tender specification was subject to public consultation until 20 October 2023. An addendum to the tender specification takes into account the possible cumulation of the French national aid granted under this tender with the European Union aid granted under the European Hydrogen Bank scheme, and anticipates the case where the French national aid would be limited to operating aid (and would not include investment aid) in order to avoid double and cross-subsidisation.

To date, three call for tender waves are planned the first one was in 2024: 150 MW then, 250 MW in 2025 and 600 MW in 2026, representing a total of 1 GW of electrolysers installed and a EUR 4 billion of public investment.

For the first launch of the call for tenders, the French Government announced that a competitive dialogue phase will apply to design and finalise the applicable tender specification. The French Government aims to begin this competitive dialogue phase in 2024.

Meanwhile, the contemplated incentive mechanism has been pre-notified to the European Commission and seems to be still under discussion before the latter as part of the state aid regime, as the final tender specification is still awaited.

9. Are there any standards in place for the classification and/or certification of low-carbon or renewable hydrogen?

The Hydrogen Ordinance provides standards for the classification of the various categories of hydrogen. These definitions have been incorporated in the **Fre**: at the Article L .811-1.

The article which defines the difference between "low carbon" and "renewable" hydrogen has been completed by a Ministerial Order. On July 1, 2024, a ministerial order was published, specifying the greenhouse gas emission threshold and the methodology for qualifying hydrogen as renewable or low-carbon. It distinguishes between "renewable" and "low-carbon" hydrogen on the basis of different emission thresholds, based on the definition adopted by the European Parliament in 2023 (which discussed the inclusion of nuclear hydrogen). Such classification makes it eligible for government subsidies.

This ministerial order specifies that the methodology for calculating emissions for low-carbon hydrogen is similar to that of the RFNBO delegated act and includes emissions generated by production, supply of inputs, transformation, transport, distribution, final use, as well as those accounted for due to carbon capture and geological storage:

- "hydrogen" is defined as the gas composed of dihydrogen molecules (in a proportion set in a ministerial order) which results from the implementation of an industrial process;
- "renewable hydrogen" is defined as hydrogen produced either by electrolysis using electricity from renewable energy sources, or by any other technology using exclusively one or several renewable energy sources and which does not conflict with other uses allowing their direct valuation;
- "low-carbon hydrogen" is the hydrogen whose production process generates emissions which are less than or equal to the threshold triggering the qualification of renewable hydrogen without however falling within this qualification since other criteria are not met; and
- "carbonaceous hydrogen" is defined as hydrogen which is not renewable hydrogen nor low-carbon hydrogen.

In addition, the draft revised Hydrogen National Strategy foresees government efforts at the international level to push for harmonised norms and standards to ensure fair competition and support French industry exports.

10. Does the regulatory framework clearly define the regulatory requirements relating to the production, storage, transportation or supply of hydrogen?

The regulatory framework applicable to hydrogen is mainly based on (i) the Hydrogen Ordinance and the Hydrogen Decree whose provisions have been incorporated into the French Energy Code, and (ii) the French Mining Code.

The Hydrogen Ordinance contains various regulatory requirements relating to the production, storage, transportation and supply of hydrogen (focusing however on renewable hydrogen), whereas the French Mining Code sets out provisions which apply only to storage of hydrogen.

As a general note, Law No. 2023-175 of 10 March 2023 relating to the acceleration of the production of renewable energies, authorises renewable hydrogen production facilities on brownfields or industrial basins of unsaturated brine in coastal areas but not located in an urbanised area as an exception to the prohibition under the French Coastal Law (loi Littoral). In addition, the Green Industry Law of 23 October 2023 aimed at reducing the time needed to obtain an environmental permit for major national projects (including hydrogen production facilities), facilitate urban planning procedures, and increase legal certainty for projects with regard to biodiversity obligations by ensuring that these issues can be addressed as early as possible in the life of the project.

11. Are there any foreign investment restrictions related to energy and infrastructure sectors?

Foreign investment restrictions apply to activities likely to prejudice the interests of national defence, public order or public safety and which concern infrastructure, goods and services that are essential to guarantee the integrity, security and continuity of energy supply. The same applies to research and development activities on critical technologies which include energy storage and technologies in relation to renewable energy production. As a result, provided that the transaction meets other criteria referred to in the French Monetary and Financial Code (see articles L. 151-1 et seq. and R. 151-1 et seq.), it may fall within the scope of French foreign direct investment regulations and be subject to the authorisation of the Minister in charge of Economy.

12. What international treaties are in place that may offer protection to international investors in hydrogen projects in the jurisdiction?

The Energy Charter Treaty ("ECT") is a multilateral investment treaty which specifically addresses energy trade, transit and investment between the contracting parties, which include France. Discussions as to the modernisation of the ECT led by the European Union have been ongoing for several years, and focus in particular on investment protection and "greening" the ECT. These discussions have focussed on reducing the protections accorded to fossil fuels and explicitly protecting emissions reduction technologies (including hydrogen).

Market developments and opportunities

13. Are there any government grants or other government funding available to hydrogen projects (including for research and development)?

As indicated in response to question 8 above, there are various government grants and subsidies available to hydrogen projects which are awarded on the basis of calls for tenders and calls for expression of interest issued by public authorities (e.g., *ADEME, Agence nationale de la recherche, Secrétariat Général pour l'investissement*).

As regards research and development projects, more than 150 projects have benefited from government subsidies to date, through various programs including:

- Hydrogen Research Program and Priority Equipment ("PEPR H2"): EUR 83 million over 8 years for 19 projects covering the hydrogen value chain, including production (electrolysis), storage, uses (fuel cells), system integration, socio-economic analyses and life-cycle analyses.
- Technological Bricks and Largs Demonstrators ("*Briques technologiques et grands démonstrateurs*") call for projects: EUR 350 million over the period 2024-2026 for 25 projects covering electrolysers, fuel cells, high-pressure tanks, etc.
- The Skills and Jobs for the Future ("*Compétences et Métiers d'Avenir*") call for expression of interest: 9 training projects in the hydrogen sector, worth EUR 41.5 million.

As regards production capacity, the "Territorial Hydrogen Ecosystems" call for proposals launched in 2018 and renewed in 2020 helped fund 46 projects with a total of EUR 320 million in aid and an investment amount of EUR 1.2 billion. A new wave has been launched in September 2023 and selected candidates are set to be announced early 2024.

In addition, several waves of the Important Project of Common European Interest ("IPCEI") on hydrogen have been launched jointly by European Union Member States since 2020. These initiatives should enable the development of numerous large-scale low-carbon and renewable hydrogen production projects in Europe and more particularly in France:

- Through the IPCEI "Hy2Tech", the European Commission approved in July 2022 the construction of four electrolyser production plants (held by McPhy (see question 15), Elogen, John Cockerill, Genvia) based on the 3 main electrolysis technologies (alkaline, proton exchange membranes, high temperature), but also hydrogen vehicles (Hyvia for commercial vehicles, Alstom for locomotives), fuel cells for road use (Symbio), and all the key components upstream in the value chain (Plastic Omnium and Forvia for tanks, Arkema for membranes).
- Through the IPCEI "Hy2Use", two French large-scale renewable hydrogen projects (held by Air Liquide France and Total Energies and Engie France as part of the MassHylia project) have been approved by the European Commission in September 2022 (see question 15).

For these first and second waves, the French government has reserved an exceptional public funding of EUR 1.9 billion, out of a total of EUR 31.8 billion of public and private investments deployed on the European level.

- Through the IPCEI "Hy2Infra", the construction of a 200 MW electrolyser production plant (Lhyfe project) was approved by the European Commission in February 2024 (see question 15).
- Through Hy2Move, the fourth IPCEI on hydrogen, approved by the European Commission in 28 May 2024, EUR 1,4 billion will be dedicated to hydrogen applications in the mobility and transport sector, promoting research, innovation, and the initial industrial deployment of hydrogen technologies.(see question 15)

14. Are there any notable pilot/demonstration projects in place or planned for the production or offtake of clean hydrogen?

There are different pilot projects being deployed in France to examine and test the feasibility of clean hydrogen production and use in various sectors.

For example, **GRHYD project** has been launched in 2014, and was inaugurated on 11 June 2018. GRHYD is a local-scale project led by Engie in partnership with GRDF, the French Atomic Energy and Alternative Energies Commission (Commissariat à l'énergie atomique et aux énergies alternatives), Areva H2Gen, and ADEME. The demonstrator uses wind-generated electricity and supplies 100 homes in the Dunkirk Urban Community with carbon-free hydrogen for heating, hot water and cooking. The hydrogen is mixed with natural gas to a maximum volume of 20% of the total volume of gas supplied. The experimentation of this demonstrator should make it possible to evaluate the economic and technical prospects of power-to-gas for housing.

The **Jupiter 1000 project**, piloted by the gas transport operator GRTgaz, has enabled it to carry out the first hydrogen injections into its network. The demonstrator, located in Fos-sur-Mer (South of France), has a capacity of 1 MW and a power production capacity of 5 million kWh over three years. By allowing hydrogen to be injected into existing networks, power-to-gas makes it possible to store the surplus renewable electricity in existing gas infrastructures, which leads to greater flexibility in the electricity network.

On 6 March 2020, Engie Solutions, Michelin and Morbihan Energies signed agreements to supply a Michelin industrial site in Vannes and to build a charging station for light and heavy vehicles, which will be located nearby ("**Hygo**"). The project is operational since October 2021 and carried out by Hygo (founded by Engie and Morbihan Energies). The project allows the development of the use of hydrogen at a local level in Morbihan.

In addition, several projects to experiment with the use of hydrogen-powered buses have been launched. For example, the Tethys project led by Sytral is experimenting with the use of two hydrogen-powered buses on a bus line in the Lyon public transport network.

On 28 September 2022, the Sealhyfe project was inaugurated in Saint-Nazaire. It is the world's first offshore production site that will produce up to 400 kg of green energy per day. The hydrogen will be produced on a floating platform from a 1 MW electrolyser designed by Plug Power and directly powered by offshore wind turbines. In June 2023, the French startup announced that it had produced the world's first "green hydrogen" from electricity supplied by a floating wind turbine.

The French and young company Hopium, which specialises in hydrogen mobility, announced that its fuel cell was approaching the industrialisation phase, with commercialisation planned for 2025. Recently, on 26 March 2025, the company announced the integration of a measurement system in a fuel cell currently under development.

15. Are there any commercial-scale clean hydrogen production projects in development or already operating?

Within the framework of the French Government's low-carbon and renewable hydrogen development policy, several calls for tenders have been launched.

In May 2021, McPhy announced its intention to develop an electrolyser gigafactory in Belfort. This project is part of the first wave of the IPCEI "Hy2Tech" and was approved by the European Commission on 15 July 2022 (see question 13). On 28 September 2022, the French Government announced that this project will receive support up to EUR 114 million. Nevertheless, this project might not come to fruition. The company announced on April 10, 2025, that it is seeking a buyer due to significant financial difficulties.

14 other projects are under development across the French territory as part of the IPCEI "Hy2Tech", covering hydrogen generation technology, fuel cells technology, storage and transportation / distribution technology and end user technology (see question 13).

In March 2021, Air Liquide and ArcelorMittal announced their intention to develop an innovative low carbon steel production unit using low carbon hydrogen in Dunkirk (North of France). Air Liquide will supply ArcelorMittal with low carbon hydrogen, contributing to the production of steel with reduced CO_2 emissions. This project is part of the second wave of the IPCEI "Hy2Use" and was approved by the European Commission on 21 September 2022 (see question 13).

In 2024, the IPCEI, named Hy2Move has been launched and among the 13 selected projects, four are French (see question 13). These projects aim at developing technologies and processes that go beyond current technology and will allow major improvements notably in the areas of mobility and transport applications, fuel cells, on-board hydrogen storage and generation of hydrogen for use in mobility and transport. While the specifics of the various projects are not yet known, it is noteworthy that Airbus has a significant presence and will receive support from the German, French, and Spanish Governments. Between engines and fuel cells, the French aerospace group plans to conduct its first flights by 2035. Recently, it launched the Goliat project to advance infrastructure aspects. Three other French companies are integrated into the new Hy2Move IPCEI:

- Gen-Hy on production technologies
- Hydrogène de France on mobility applications and fuel cells
- Michelin on fuel cells and production technologies

In March 2022, Air Liquide also received support from the French Government for its 200 MW electrolyser project near the port of Le Havre (on the English Channel) ("Air Liquide Normand'Hy"). This project is also part of the IPCEI "Hy2Use" and is expected to be operational in 2025. It is worth noting that in September 2023, TotalEnergies and Air Liquide signed a long-term supply agreement of green and low-carbon hydrogen for the TotalEnergies platform in Normandy. In the same approach, in May 2023, Air Liquide and Groupe Aéroport de Paris (ADP) announced the creation of a 50/50 joint venture specialising in supporting airports in their projects to integrate hydrogen into their infrastructures.

The other French project selected as part of the second wave of the IPCEI "Hy2Use" is the Masshylia project, consisting inof the construction of a 40 MW electrolyser production plant held by TotalEnergies and Engie, near the Fos-sur-Mer port (South of France) to supply Total's biorefinery of La Mède with green hydrogen.

In March 2024, Lhyfe announced it was selected as part of the third wave of the IPCEI "Hy2Infra" and granted a public support, approved by the European Commission, of EUR 149 million for the construction of a green hydrogen production plant with an installed electrolysers capacity of 100 MW near Le Havre.

In January 2025, Lhyfe released figures on its activity over the past twelve months. By the end of 2024, the hydrogen producer had an installed electrolysis capacity of 22 MW, primarily between France and Germany, compared to 6 MW at the end of 2023. This expansion marks a significant step in scaling up green hydrogen production and aligns with France's broader strategy to accelerate the deployment of renewable hydrogen infrastructure.

In addition to the French projects selected through the IPCEI scheme, there are a number of low-carbon and renewable hydrogen production projects planned and under development in France (at different stages of development), which can be found on the "Vig'Hy" platform, a "hydrogen observatory" organised by the French association "France Hydrogène".

Furthermore, the French company Storengy, on 11 April 2025, unveiled the results of its Call for Expressions of Interest for underground hydrogen storage in France. The company, which is a subsidiary of Engie, launched a Call for Expressions of Interest at the end of 2024 to specify the market needs (buyers, producers, users) along the French section of the future European hydrogen backbone. This backbone is intended to interconnect the networks of the Iberian Peninsula with northwestern Europe, passing through Portugal, Spain, France, and Germany.

16. Have there been any hydrogen-related disputes in your jurisdiction?

There are no notable disputes related to the installation of a hydrogen production facility in France to date.

Last updated June 2025

Germany

Policy and regulation

1. Is there a government hydrogen strategy or policy?

Yes, the German Federal Government has adopted a National Hydrogen Strategy for Germany in 2020. It was last updated in 2023 and supplemented by a dedicated Hydrogen Import Strategy in 2024.

In June 2020, the German Federal Government presented its **National Hydrogen Strategy** ("**National Hydrogen Strategy**"). This is a policy paper that sets out action items and policy goals to ramp up the production, transport and use of hydrogen and its derivatives until 2030.

To account for geopolitical changes due to Russia's invasion of Ukraine in 2022, reflect on learnings from the initial years of implementing the National Hydrogen Strategy and make good on goals set in the 2021 coalition agreement, the German Federal Government published a comprehensive **Update of the National Hydrogen Strategy** in July 2023. It was further supplemented by a dedicated **Hydrogen Import Strategy** ("**Hydrogen Import Strategy**") in July 2024, acknowledging that Germany will have to rely on imported hydrogen and hydrogen derivatives in the mid- to long-term to meet national demand.

Following federal elections in March 2025, the newly established German Federal Government remains committed to realizing the potential of hydrogen as an energy source and has – so far – not announced any major changes to the existing policy framework. The **Coalition Agreement** published in April 2025 ("**Coalition Agreement**") broadly states that the new German Federal Government supports the accelerated and pragmatic ramp-up of a hydrogen based industry, initially making use of hydrogen of all colours (i.e., not just green hydrogen). The new federal minister for the economy and energy, Katherina Reiche, has also been the head of Germany's National Hydrogen Council (below #4) for the last years.

Both the National Hydrogen Strategy and the Hydrogen Import Strategy are non-binding policy papers (only) and set out action items and policy goals that require legislative and executive implementation by all bodies of government.

2. What are the key goals and commitments included in the strategy/policy?

National Hydrogen Strategy

The National Hydrogen Strategy, as updated in 2023, focuses on the following:

- Accelerating the market ramp-up of hydrogen;
- Ensuring sufficient availability of hydrogen: the target for domestic electrolyser capacity is at least 10 GW in 2030, the remaining demand to be covered by imports;
- Development of an efficient hydrogen infrastructure; by 2027/2028, an initial hydrogen grid with more than 1,800 km pipeline length should be set up;
- Supporting the use of hydrogen in various sectors, such as industry, heavy-duty commercial vehicles, aviation, and shipping. In the power sector, hydrogen should contribute to a secure energy supply; and
- Creation of an appropriate regulatory framework to allow for efficient planning and approval procedures and a uniform standards and certification systems.

Import Strategy

The Import Strategy focuses on the following:

- Establishing a broad range of import channels, including pipeline and ship-based imports, to ensure a stable and secure supply of hydrogen and its derivatives;
- Developing and expanding hydrogen import terminals and integrating them into national and European hydrogen networks;
- Establishing a uniform standard for sustainable (green) hydrogen and a robust certification system;
- Strengthening cooperation with both European and non-European countries to secure long-term hydrogen supply agreements and support local energy transitions;
- Utilizing funding instruments like the H2Global mechanism (below #8) or IPCEI to promote the production and import of hydrogen; and
- Implementing a supportive regulatory framework.

3. Which industry sectors are most likely to be affected by hydrogen deployment?

The National Hydrogen Strategy expects that the main application of hydrogen will be in the industrial sector (chemicals & steel) and the traffic sector (fuel cells & sustainable fuel). Hydrogen will also have an application in the energy sector (especially as form of energy storage). While hydrogen is not expected to play a significant role in the heating sector, the National Hydrogen Strategy is committed to nevertheless providing a supportive regulatory framework.

- **Hydrogen**: The German Government aims to establish a robust domestic market for hydrogen technologies to support market penetration and exports. This initiative is part of the broader energy transition strategy, focusing on the sustainable and economic use of hydrogen.
- **Industry**: The German Government aims to gradually replace gaseous and liquid energy sources in the industrial sector with alternative technologies that have zero or very low carbon emissions. Hydrogen-based technologies are seen as a key option for the energy transition, particularly in sectors where they can replace fossil raw materials like natural gas, oil, or coal. This is in particular the case for the refinery, chemical, and steel sectors.
- **Transport**: The German Government aims to enhance hydrogen-based and PtX-based mobility to significantly reduce air pollutants and carbon emissions.
- **Heating**: The German Government does not expect hydrogen to play a significant role in the heating sector. Nevertheless, there are plans to amend the regulatory framework to support the use of hydrogen as a heat source, for example by allowing the repurposing of gas distribution networks to transport hydrogen and to install decentralised hydrogen boilers.

4. Who are the main regulators for the hydrogen market?

The Federal Network Agency (*Bundesnetzagentur*) is the main regulator for the German hydrogen market. The implementation of the National Hydrogen Strategy is supervised by the State Secretaries' Committee (*Ausschuss der Staatssekretärinnen und Staatssekretäre für Wasserstoff*) which is composed of representatives of all relevant German ministries. The German Federal Government is furthermore supported by the **National Hydrogen Council** (*Nationaler Wasserstoffrat*) which is an advisory body consisting of 26 experts from business, science and civil society. It is worth noting that the new federal minister for the economy and energy, Katherina Reiche, has been the head of the National Hydrogen Council for the last years.

With regard to the different funding and support programmes, the **Federal Ministry for Economic Affairs and Energy** (*Bundesministerium für Wirtschaft und Energie*) and **Project Management Jülich** (*Projektträger Forschungszentrum Jülich - PTJ*), the legal entity in charge of implementing, for example, the EU IPCEI funding programme, are other key players.

5. Does the government hydrogen strategy or policy support the development of both low-carbon (blue) hydrogen and renewable (green) hydrogen?

The National Hydrogen Strategy emphasises the importance of green hydrogen as a means for Germany to decarbonize, to become GHG-neutral and to meet international obligations under the Paris Convention. The Hydrogen Import Strategy also emphasizes green hydrogen and blue hydrogen.

Nevertheless, both the National Hydrogen Strategy as well as the recently published Coalition Agreement (above #1) pragmatically acknowledge that during the ramp-up phase of the hydrogen market, all colours of hydrogen will be used, at least until enough green hydrogen is available to meet demand. However, it is likely that government funding and other support schemes will primarily be available for green hydrogen.

6. If the government hydrogen strategy or policy supports the development of low-carbon hydrogen, to what extent is carbon capture and storage being taken forward?

CCS is not specifically covered in the National Hydrogen Strategy and Germany has, historically, been reluctant to support CCS. A German Carbon Storage Act (Kohlendioxid-Speicherungsgesetz) implementing the EU's CCS Directive has been in place since 2012, but regulations and statutory deadlines to apply for operating permits were so strict that only very few experimental CCS projects were granted permits in Germany.

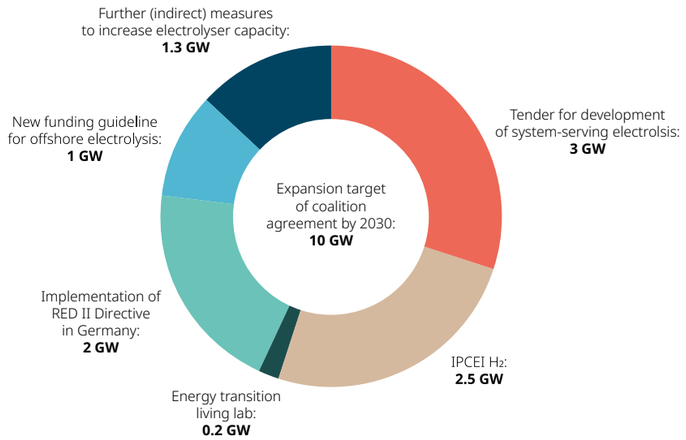
This has changed recently. In May 2024, the (then) German Federal Government published a proposal to significantly amend existing legislation to allow CCS in Germany and announced that it would develop a Carbon Management Strategy. As the German Federal Government dissolved in late 2024, this specific proposal has not become a law yet and the Carbon Management Strategy has not been published yet either. However, the Coalition Agreement (above #1) states that the new German Federal Government will "immediately" enact necessary legislation to allow CSS in Germany. It can therefore be expected that the regulatory framework for CCS in Germany will see significant changes in 2025.

7. Are there targets for the production of hydrogen?

There are no binding production targets. However, the National Hydrogen Strategy aims to establish up to 10 GW of hydrogen generation capacity on an industrial scale by 2030 in Germany. The remaining demand (assumption: 95-130 TWh in 2030) is expected to be covered by imports. As the potential demand for hydrogen and its derivatives will rise to 620-1.288 TWh in 2045, further production capabilities and imports will be necessary.

The National Hydrogen Strategy envisages a mix of instruments to reach a production capacity of 10 GW:

Mix of instruments



Source: BMWK

8. Are there any incentive mechanisms/business models in place to support the production of hydrogen?

The National Hydrogen Strategy focuses on supporting private investments in the sustainable production, transport, and use of hydrogen, but it also acknowledges the need for government funding to ramp-up production and availability of hydrogen. In particular:

Carbon Contracts for Difference

The German Government has launched an industry support program called "Carbon Contracts for Difference" (*Klimaschutzverträge*). Carbon Contracts for Difference are modelled after private-sector hedging contracts and concluded between the Federal Government and companies in energy-intensive industry sectors. In a nutshell, they allow companies to hedge against the risk of price increases when switching to climate-friendly energy sources and production processes. The support program uses an auction process where companies bid on the cost to avoid CO2 emissions. Payments are made if targets are achieved; otherwise, penalties or repayment obligations apply. Funding is structured around a contractually agreed price per avoided ton of CO2, with the Federal Government, thereby offsetting additional costs. If the costs of CO2 emissions eventually exceed the costs of using a climate-friendly energy source (e.g., because the price for EU ETS emission allowances continues to increase), the company would be required to repay the difference. Hydrogen-based solutions are eligible for funding, provided they meet stringent EU requirements for green or low-CO2 hydrogen.

The first round of Carbon Contracts for Difference was awarded in October 2024, a second round is currently under way.

H2Global

The German Government also supports the H2Global mechanism, a support scheme designed to facilitate the market ramp-up of renewable hydrogen and its derivatives. Under this scheme, an intermediary company (HINT.CO) conducts competitive auctions to enter into long-term hydrogen purchase agreements with (international) suppliers and will sell the hydrogen (or hydrogen based derivatives) under short term sales agreements to EU-based customers, again following a competitive auction. Hydrogen (or hydrogen derivatives) delivered must meet stringent sustainability requirements. In this double-auction model, the German government offsets the expected difference in purchase prices paid by HINT.CO compared to the (expected lower) sales prices HINT.CO can achieve from its customers.

The first round of auctions was supported with €900 million in funding. Additional auctions are ongoing or planned, with support being provided both by the German Government as well as other countries participating in the H2Global mechanism.

9. Are there any standards in place for the classification and/or certification of low-carbon or renewable hydrogen?

Germany follows the EU approach and has implemented the requirements of Commission Delegated Regulations (EU) 2023/1184 and (EU) 2023/1185 into national law. This has been done by amending the 37th Ordinance on the Implementation of the Federal Emissions Control Act (*37. Verordnung zur Durchführung des Bundes-Immissionsschutzgesetzes – 37. BImSchV*).

By the end of 2024, the European Commission has recognized three voluntary certification systems for RFNBOs: CertifHy, ISCC EU and REDCert. And Germany based TÜV Süd has been recognized by the German Federal Environment Agency (*Umweltbundesamt*) as one of the first certification bodies for RFNBOs.

10. Does the regulatory framework clearly define the regulatory requirements relating to the production, storage, transportation, or supply of hydrogen?

Germany has begun to introduce hydrogen specific legislation as of 2021. By now, all stages of the hydrogen value chain - production, transport, and consumption - are subject to certain legal and regulatory requirements. However, these requirements have so far been primarily a bundle of individual legislative measures and do not yet constitute a comprehensive regulatory framework for hydrogen. There is also no unified "Hydrogen Act". Rather, regulations relevant for the hydrogen sector can be found in different legal acts.

In summer 2024 the (then) German Federal Government also introduced a draft Hydrogen Acceleration Act (*Wasserstoffbeschleunigungsgesetz*), aimed at improving the regulatory framework for hydrogen in Germany and in further supporting its market ramp-up. The Hydrogen Acceleration Act envisaged simplifying permitting procedures, speeding up judicial review and declaring hydrogen projects to be of "overruling public interest" (to facilitate permitting). As the German Federal Government dissolved in late 2024, the Hydrogen Acceleration Act has not become a law yet.

- **Production**: Since 2021 the German Offshore Wind Energy Act (*Windenergie-auf-See-Gesetz*) contains provisions for so-called "other energy production areas" (*sonstige Energiegewinnungsbereiche*) in which hydrogen can be produced offshore. The aim is to promote the production of green hydrogen in so-called "other energy generation facilities" (*sonstige Energiegewinnungsanlagen*) using renewable electricity produced directly on-site from offshore wind plants. The WindSeeG regulates, inter alia, with the area development plan (*Flächenentwicklungsplan*), the approval and construction of other energy generation facilities and contains regulations for the eligibility to apply for a permit by way of tender procedures. There is currently no financial support for the offshore production of hydrogen under the EEG/WindSeeG, but this could change in the future if the Offshore Electrolysis Support Guideline is enacted (below #13). Regarding onshore electrolyzers, the German Government relaxed permitting requirements at the end of 2024. Only electrolysers with a production capacity of fifty tonnes of hydrogen per day require a formal environmental permitting process. Electrolysers with a rated power output of at least 5 MW but a production capacity of less than 50 tonnes of hydrogen per day only need to undergo a simplified environmental permitting process. All other electrolysers are not subject to environmental permitting (but may still require construction permits under applicable local laws).
- **Transportation**: The regulation of hydrogen networks is currently the focus of the regulatory framework in Germany. The German Energy Industry Act (*Energiewirtschaftsgesetz*) acknowledges hydrogen as a separate energy source. hydrogen is considered "energy" as far as it is pipeline-bound. And it qualifies as "gas" insofar as hydrogen is fed into an existing gas supply network.

  In late 2023 and 2024 Germany introduced specific regulations in the Energy Industry Act for the so called "Hydrogen Core Network" (*Wasserstoffkernnetz*). The Hydrogen Core Network is supposed to be the backbone of a pipeline network throughout Germany dedicated to the transport of hydrogen. The initial grid, consisting of approx. 9.000 kilometres of pipeline is expected to be operational by 2032. It will be connected to hydrogen networks in other EU Member States. Approx. 60% of the grid will be made up of existing gas pipelines that will be dedicated to hydrogen transport, the remaining 40% will have to be constructed. Costs are estimated to be approx. €19 billion. The initial layout of the Hydrogen Core Network received approval by Germany's Federal Network Agency in late 2024.

  Operators of the Hydrogen Core Network will recover grid construction costs through network usage fees levied on users of the grid. As the numbers of users will initially be low, grid usage fees are expected to be prohibitively high in the beginning. The Energy Industry Act therefore provides for a mechanism, the so called "amortisation account" (Amortisationskonto) under which the German Government initially fronts necessary construction costs to keep grid usage fees low. Costs and revenues will be tracked through the amortisation account, and it is expected that costs will eventually be recovered through future grid usage fees once the Hydrogen Core Network becomes fully operational and demand for hydrogen as energy source increases. This mechanism is scheduled to end by 31 December 2055. If costs have not been recouped by then, the German Government will cover remaining costs, with grid operators sharing up to 24% of the loss.

  The Energy Industry Act's existing regulations covering grid expansion have also been amended to cover the (future) expansion of hydrogen grids. Operators of long-distance gas pipelines and of regulated hydrogen grids are, beginning as of 2025, required to regularly assess likely scenarios for hydrogen demand in Germany for the next ten to fifteen years, but also up to 2045 and, based on these assessments, develop a grid expansion plan to cover the expected demand.

- **Storage**: The Energy Industry Act also contains new regulations for hydrogen storage facilities.
- **Supply**: No special regulatory requirements apply to the supply of hydrogen. Unbundling regulations must be observed for operators of hydrogen networks or hydrogen storage facilities, according to which these activities must be completely independent of the hydrogen supply.
- **Consumption**: To stimulate the hydrogen ramp-up at the consumption level, the legislator has chosen, on the one hand, subsidy instruments and, on the other hand, legal obligations for the use of green hydrogen in line with EU requirements. In the transport sector, a strict regulatory approach was chosen with the legal obligation for fuel suppliers to comply with certain GHG reduction quotas. For the industry, on the other hand, the legislator has adopted a soft regulatory approach and introduced climate protection contracts (above #8) as a means of promoting demand for hydrogen. The new German government has, in its Coalition Agreement, also indicated its intention to consider introducing a quote for sustainable gas ("Grüngasquote") but no specific legislation has been introduced so far. In addition, the former German government had presented a draft Power Plant Security Act (Kraftwerkssicherheitsgesetz), which envisaged the construction of hydrogen-ready gas power plants which were supposed to switch to hydrogen as an energy source after 8 years. This draft has not become a law yet and it remains to be seen whether the new German Government will continue to support the draft.

11. Are there any foreign investment restrictions related to energy and infrastructure sectors?

Yes. The German Foreign Trade and Payments Act (*Außenwirtschaftsgesetz*) and the Foreign Trade and Payments Ordinance (*Außenwirtschaftsverordnung*) establish a strict investment control regime for direct and indirect investments in energy and infrastructure assets by non-EU/EFTA investors. They are not specifically targeted as hydrogen assets. However, if hydrogen energy and hydrogen infrastructure assets qualify as "critical infrastructure" within the meaning of German regulations (e.g. generation and storage assets beyond a certain capacity), every acquisition of 10% or more of the voting rights in the respective companies is subject to a mandatory notification and clearance obligation and must not be executed before it has been cleared by the German Ministry of Economic Affairs and Energy. In all other cases, acquisitions of 25% or more of voting rights can be voluntarily notified or otherwise may be subject to a discretionary ex-officio review (including sanction possibilities) for up to five years after signing.

The German Foreign Trade and Payment Act requires that the respective company to be invested in is an "operator" of existing critical infrastructure. Therefore, a greenfield investment is typically not subject to review, as future critical infrastructure is not included in the scope of the foreign investment control.

12. What international treaties are in place that may offer protection to international investors in hydrogen projects in the jurisdiction?

Germany maintains a network of more than 140 bi- and multilateral treaties providing protection for investors across much of the Middle East, Africa, East Asia, Latin America, and the Caribbean. These treaties provide legal protection for qualifying investors, including those investing in hydrogen projects.

The scope of protections granted to foreign investors vary slightly from treaty to treaty but typically includes (i) protection against expropriation without compensation, (ii) the right to be treated fairly and equitably (which includes the protection of legitimate expectations), (iii) national treatment, and (iv) most-favoured nation treatment. Most investment treaties allow qualifying foreign investors to enforce the rights granted to them in the treaty before a neutral tribunal established under international law.

Investors from countries other than those with which Germany maintains treaties can potentially still gain access to protection under an investment treaty through corporate structuring. Moreover, a comprehensive strategy to protect against political risks should incorporate another mechanism such as carefully drafted contracts with the host state, its authorities, and/or relevant state-owned entities. Taking pro-active measures to protect against political risks as early as possible is particularly important for investments in new technologies such as hydrogen because the applicable regulatory framework is often still evolving and unexpected changes have the potential to significantly impact the value of an investment at a moment's notice.

Market developments and opportunities

13. Are there any government grants or other government funding available to hydrogen projects (including for research and development)?

Germany has, in the past, made available significant funding for the ramp-up of the green hydrogen industry. While it is likely that the new Federal German Government formed in March 2025, also considering budget restraints, may not provide subsidies as liberally as before, there still appears to be a broad political consensus that the ramp-up of the hydrogen market will continue to require government funding.

- Between 2006 and 2016 approx. €700 million has been approved under the National Innovation Programme I on Hydrogen and Fuel Cell Technology (NIP I), and between 2016 and 2026, a total of €1.4 billion in funding will be provided in phase II (NIP II).
- Under the Energy Research Programme, funding is provided for energy-related research. Between 2020 and 2023, €310 million was provided for practice-oriented basic research on green hydrogen. And €200 million was provided to strengthen practice-oriented energy research on hydrogen technology.
- The so called "Package for the Future" (*Zukunftspaket*) established by the previous German Federal Government envisages approx. €7 billion to speed up the market rollout of hydrogen technology in Germany and another €2 billion for fostering international partnerships in the hydrogen sector.
- 60+ German hydrogen projects are also part of the EU's IPCEI initiative, partly receiving also additional national support.
- The previous German government has also begun development of an Offshore Electrolysis Support Guideline (*Offshore-Elektrolyse-Förderrichtlinie*) and conducted initial public consultations. However, no final decision appears to have been taken yet.

In addition, there are numerous further funding programmes initiated by the German States for regional hydrogen purposes.

14. Are there any notable pilot/demonstration projects in place or planned for the production or offtake of clean hydrogen?

There are several pilot projects being deployed in Germany to develop electrolyser production, and to examine and test the feasibility of clean hydrogen production and use of hydrogen in different sectors:

- **H2Giga**: The H2Giga project aims at mass production of electrolysers for the scale-up of hydrogen. The project focuses on establishing the series production of electrolysers in a manner that is not limited to specific technologies. Together, established manufacturers of electrolysers, suppliers from various technology sectors (including many small and medium-sized enterprises) as well as research institutions and universities are working on the advancement of existing electrolysis technologies.
- **H2Mare**: The H2Mare project focuses on the offshore production of green hydrogen and other power-to-X products. H2Mare aims to integrate a water electrolyser directly into an offshore wind turbine and thus provide innovative technologies to produce green hydrogen offshore. The direct coupling of wind turbines and electrolysers is expected to minimize the costs of hydrogen production, as no grid connected will be needed. H2Mare also works on solutions to directly produce secondary products such as green methanol or green ammonia in addition to green hydrogen (i.e. offshore power-to-X).
- **TransHyDE**: The TransHyDE project aims at developing a hydrogen transport infrastructure, while also evaluating and demonstrating several technologies for hydrogen transport. For that purpose, TransHyDE will separately test and scale up four transport technologies each in four respective demonstration projects: (i) hydrogen transport in high-pressure containers, (ii) hydrogen transport in existing and new gas pipelines, (iii) transport of hydrogen bound in ammonia and (iv) hydrogen transport by means of LOHC.

15. Are there any commercial-scale clean hydrogen production projects in development or already operating?

There are several commercial-scale clean hydrogen projects being developed or commissioned in Germany:

- **Air Liquide**: Air Liquide has built a 20 MW PEM electrolyser in Oberhausen, North Rhine-Westphalia. It is the largest production facility for climate-neutral hydrogen in Germany so far with a production capacity of up to 2.900 tons of renewable hydrogen per year and is the first plant in Germany to receive an RFNBO certification.
- **Hydrogen Core Network**: The hydrogen core network will be the backbone of the German hydrogen supply network, aiming at efficient and reliable distribution across the country (above #10). Many smaller and regional projects are included and will be consolidated into one extensive network. The network will connect industrial hubs, including the South and East of Germany, and incorporate hydrogen storage solutions.
- **GetH2**: This initiative, supported by e.g. bp, RWE, OGE, Evonik, BASF and ThyssenKrupp as well as municipalities and public sector institutions (e.g. Technical University Clausthal) plans to realize pipeline networks, electrolysis plants in the megawatt range and hydrogen applications in refineries, in the steel industry or in heavy-duty transport. The initial 5.100 km GetH2 network is supposed to be constructed by 2030 and will become part of the Hydrogen Core Network (above #10).
- **LHyVE**: The project "Leipzig Hydrogen Value chain for Europe (LHyVE)" shall establish a regional hydrogen network around the city of Leipzig (Saxony) consisting of hydrogen production and hydrogen storage facilities, a regional hydrogen network for the distribution of hydrogen and different hydrogen customers. It is expected to be part of the German Hydrogen Core Network (above #10). The project is supported by, inter alia, Leipziger Gruppe, Ontras and BMW and is expected to launch in 2026.

- **LGH2**: bp aims to produce green hydrogen on an industrial scale. For this purpose, an electrolysis plant with a capacity of 100 MW is to be built in Lingen which will be supplied with electricity from renewable energy sources. The green hydrogen will be delivered to the nearby bp refinery in Lingen and other offtakers in Germany and Europe.
- **doing hydrogen**: The project "doing hydrogen" is the establishment of an eastern German hydrogen hub which connects H2 projects in Mecklenburg-Western Pomerania, Brandenburg, Berlin, Saxony, and Saxony-Anhalt to form a hydrogen hub including production, transport, storage, and consumption. The project is supported by, inter alia, Gascade, Ontrans, Enertrag and Vattenfall and shall be ready to launch in 2026. It will include 616 km of pipeline that are expected to become part of the Hydrogen Core Network (above #10).
- **H2 MOBILITY**: Deutschland GmbH & Co. KG (held by Air Liquide, Daimler, Linde, OMV, Shell and TOTAL. BMW, Honda, Hyundai, Toyota, and Volkswagen) is working on the expansion of the hydrogen fuelling infrastructure in Germany. The initial goal is to operate one hundred hydrogen stations in seven German metropolitan areas (Hamburg, Berlin, Rhine-Ruhr, Frankfurt, Nuremberg, Stuttgart, and Munich) and along connecting trunk roads and highways. Recently, H2 Mobility has announced a consolidation of its existing network and closed some of its fuelling stations due to low demand.

16. Have there been any hydrogen-related disputes in your jurisdiction?

To our knowledge, no hydrogen-related disputes of relevance have been brought before the German courts so far.

Last updated May 2025

India

Ashurst collaborated with **Indian Law Partners** in the preparation of this content. We are grateful for their input.

Policy and regulation

1. Is there a government hydrogen strategy or policy?

Yes, the 'National Hydrogen Mission' was announced by the Prime Minister of India on 15 August 2021 and subsequently the Ministry of Power, Government of India (GoI) notified the Green Hydrogen / Green Ammonia Policy ("**Green Hydrogen Policy**") on 17 February 2022.

Subsequent to the Green Hydrogen Policy, on 4 January 2023, the Union Cabinet of GoI approved the 'National Green Hydrogen Mission' ("**Green Hydrogen Mission**") with an outlay of INR 197,440,000,000 (Indian Rupees One Hundred Ninety-Seven Billion Four Hundred Forty Million) (approx. USD 2,367,858,629) with a target of 5MMT production capacity of Green Hydrogen per annum to further boost the growth of green hydrogen in India. The Green Hydrogen Mission has an outlay of INR 6 billion (approx. USD 70 million) for the FY 2024-2025 under various heads. In October 2023, the Ministry of New and Renewable Energy ("**MNRE**") released R&D Roadmap of INR 4,000,000,000 (Indian Rupees Four billion) (Approx. USD 47,971,204) which seeks to provide guidance for developing a vibrant research and development ecosystem which can help commercialize green hydrogen and contribute to India's ambitious climate and energy goals. It focuses on developing new materials, technologies, and infrastructure to improve the efficiency, reliability, and cost-effectiveness of green hydrogen production, storage, and transportation. The R&D program will also prioritize safety, address technical barriers, challenges in developing a hydrogen economy and issue call for proposals and start awarding specific projects under the Mission.

As per the R&D Roadmap, Projects are bifurcated and structured per timelines needed to achieve the targets in following manner: (1) Mission Mode Projects (Short term – up to 5 years), (2) Grand Challenge Projects (Medium term – up to 8 years), and (3) Blue Sky Projects (Long term – up to 15 years), and the Roadmap recommends performance targets and demonstration projects for the categories of Projects mentioned, respectively.

As India accelerates its transition towards a sustainable future, its renewable energy (RE) sector has witnessed unprecedented growth. In 2024, the country made significant strides in solar and wind energy installations, policy advancements, and infrastructural improvements, setting the stage for ambitious targets in 2025. With a commitment to achieving 500 GW of non-fossil fuel-based energy capacity by 2030, India is emerging as a global leader in clean energy. As on 20th Jan 2025, India's total non-fossil fuel-based energy capacity has reached 217.62 GW.

As of December 2024, India's total renewable energy installed capacity has reached 209.44 GW, marking an impressive 15.84% increase compared to 180.80 GW in December 2023. The total capacity added during 2024 amounted to 28.64 GW, representing a significant year-on-year increase of 119.46% compared to the 13.05 GW added in 2023.

2. What are the key goals and commitments included in the strategy/policy?

The Green Hydrogen Mission provides the vision, intent and direction for harnessing hydrogen energy and some key goals are as follows:

- to develop India as a global hub for manufacturing hydrogen and fuel-cells technology across the value chain;
- put forward a specific strategy for the short term (4 years), and broad strokes principles for long term (10 years and beyond) would be devised;
- provide necessary flexibility to capture benefits from advances in the technological landscape;
- the GoI will facilitate demand creation in identified segments, including seeking use of green hydrogen in industry such as in fertilizer, steel, petrochemicals and so on;
- engaging in activities to create volumes and infrastructure, demonstrate usage in niche applications including transport and industry;
- have focused research and development, implement a facilitative policy to support usage, and put in place a robust framework for standards and regulations for hydrogen technologies;
- to aid the government in meeting its climate targets and making India a green hydrogen hub, which will help in meeting the target of production of five million tonnes of green hydrogen by 2030 and the related development of renewable energy capacity.

The Green Hydrogen Policy itself did not set any goals/milestones for or by stakeholders, however, a supplementary report published by the National Institute for Transforming India (NITI Aayog) in June 2022 provides that India can achieve the following targets if the right steps are taken, with a USD 1 billion investment into hydrogen research and development to enable breakthrough technologies for the world at scale and the speed that is required to be the world's largest:

- electrolysis (green hydrogen generation) capacity of over 60 GW/5 million tonnes by 2030 for domestic consumption, which will help India meet the 500 GW renewable energy target;
- producer of green steel at 15-20 million tonnes by 2030 — a pioneering effort to make green steel mainstream for the world;
- electrolyser with an annual manufacturing capacity of 25 GW by 2028 delivering affordable ones for India and the world;
- producer of green ammonia for exports by 2030 helping India's allies to decarbonise, this may require up to 100 GW of green hydrogen.

The recently released R&D Roadmap for the green hydrogen ecosystem in India provides for objectives in relation to hydrogen production, hydrogen storage, hydrogen transport, safety and end-use application. The R&D Roadmap provides for various objectives and provides guidance with respect to *inter alia*:

- Need of extensive research in for Hydrogen Production in following areas/sections: Catalysis; Separations; Theory & Modelling; Interfacial Chemistry & Materials, Life Cycle Assessment. Further, it recommends the following inter alia: Mission Mode projects, Testing / Certification Infrastructure Augmentation, Fiscal support, Governing / monitoring mechanisms.
- National/International R&D in: Underground storage of Hydrogen Projects, Metal Hydride Storage Projects, Solid-state Hydrogen Storage; MOF Materials, and Advance/Novel Materials;
- Transportation of Hydrogen in India (comparative analysis of hydrogen transportation in India and globally);
- End-use applications for Hydrogen as a fuel;
- Hydrogen Plasma Smelting Technique for production of Green & Clean Steel; and
- Observations w.r.t utilization of hydrogen as: An Industrial chemical (utilized as a Molecule), a blend with CNG in combustion devices, and as a pure energy molecule in Electrochemical devices;

Safe & Effective use of Hydrogen via (inter alia Accurate modelling of hydrogen explosions; Upgrading Hydrogen sensing technology; Better analysis of Long-term effects of hydrogen exposure on materials; and better understanding of Hydrogen deflagrations in partially enclosed areas.)

The Union Budget for 2025-26 saw an increase in the Green Hydrogen Mission allocation from INR 3 billion (approx. USD 35 million) to INR 6 billion (approx. USD 70 million). This move aims to support India's goal of becoming a global hub for green hydrogen production, export, and technology.

The government also offers 25 years of free power transmission for new renewable energy plants established before July 2025. This incentive aims to reduce production costs and attract investment in hydrogen-based industries.

3. Which industry sectors are most likely to be affected by hydrogen deployment?

The Green Hydrogen Mission primarily aims to decarbonise industrial, mobility and energy sectors; and supports pilot projects in emerging end-use sectors and production pathways. The industry sectors where clean hydrogen may displace fossil fuels in India, subject to pilot trials, include:

- Refinery
- Iron ore and steel
- Nitrogenous fertilizers
- Petrochemicals production
- Fuel Cell Electric Vehicles (FCEVs) and Battery Electric Vehicles (BEVs)
- Power generation

4. Who are the main regulators for the hydrogen market?

The main regulator for the hydrogen market in India is the Ministry of New and Renewable Energy ("**MNRE**") as it is responsible for overall coordination and implementation of the Green Hydrogen Mission. Further, Ministry of Petroleum and Natural Gas ("**MoPNG**") is responsible for regulation of the production, transportation and storage of hydrogen.

However, as per the Green Hydrogen Mission, all concerned Ministries, Departments, agencies and institutions of the Central and State Government such as the Ministry of Power, Ministry of Road Transport and Highways, Ministry of Commerce & Industry etc. will undertake focused and coordinated steps to ensure successful achievement of the Green Hydrogen Mission objectives.

5. Does the government hydrogen strategy or policy support the development of both low-carbon (blue) hydrogen and renewable (green) hydrogen?

For now, the Green Hydrogen Policy and the Green Hydrogen Mission only support the development of Green Hydrogen.

6. If the government hydrogen strategy or policy supports the development of low-carbon hydrogen, to what extent is carbon capture and storage being taken forward?

For now, there is no specific policy which supports the development of low-carbon hydrogen. While the GoI has announced the National Hydrogen Mission, it has not, so far, communicated a clear ambition for low-carbon hydrogen deployment. Further, the Green Hydrogen Policy focuses on Green Hydrogen and Green Ammonia.

7. Are there targets for the production of hydrogen?

India's target is to develop green hydrogen production capacity of at least 5 MMT (million metric tonne) per annum with an associated renewable energy capacity addition of about 125 GW in the country by 2030.

8. Are there any incentive mechanisms/business models in place to support the production of hydrogen?

The Green Hydrogen Mission provides various incentives including the ones stated below, in order to support the establishment of Green Hydrogen ecosystems:

- Under the Strategic Interventions for Green Hydrogen Transition (SIGHT) Programme, two distinct financial incentive mechanisms are provided targeting domestic manufacturing of electrolysers (Component I) and production of Green Hydrogen (Component II). INR 174.9 billion (approx. USD 2.14 billion) has been set aside for the SIGHT Programme.

  On 28 June 2023, the Ministry of New and Renewable Energy (MNRE) sanctioned the following SIGHT Programme:

  (i) Component I (incentive scheme for Electrolyser Manufacturing) issued scheme guidelines, for a period from financial year 2025-2026 to financial year 2029-2030 with a total outlay of INR 44.4 billion (approx. USD 537 Million).

  Under Tranche I, support will be provided for electrolyser manufacturing, in terms of INR/kW corresponding to manufacturing capacity. The base Incentive will start with INR 4440/kW (approx. USD 53.73) in the first year and will gradually taper down on an annual basis. The incentives proposed in Scheme I will be provided for 5 years from the date of commencement of manufacturing of electrolysers. Scheme I aims to incentivise manufacturing of efficient and high–quality electrolysers in India.

  On 16 March 2024, the MNRE notified the scheme guidelines for Tranche II of Component I. In order to promote indigenously developed electrolyser technologies, the Scheme under Tranche II has introduced distinct capacity buckets (Bucket 1, Bucket 2A, Bucket 2B). Minimum Capacities for Bucket 1 and 2A shall be 100MW. Minimum and Maximum capacity for bidding under Bucket 2B shall be 30 MW and 10 MW, respectively. (ii) Component II (incentive scheme for Green Hydrogen production) and issued scheme guidelines, for a period from financial year 2025-2026 to financial year 2029-2030 with a total outlay of INR 130.5 Billion (approx. USD 1.57 Billion).

  Mode I of Component II is bidding on least incentive demanded over the 3 (three) year period, through a competitive selection process. To be eligible for incentive under Component II, the bidder must ensure Green Hydrogen production in accordance with the detailed criteria laid down in the National Green Hydrogen Standard as notified by MNRE (see response to question 8). In cases where the end product is a derivative of Green Hydrogen such as Green Ammonia, the incentive would be made available based on the amount of Green Hydrogen (in kg) utilized to produce the given amount of derivative. For Green Ammonia the equivalent amount of Green Hydrogen is prescribed at 0.1765 kg of Green Hydrogen per kg of Green Ammonia. For any other derivative, MNRE would declare an equivalence factor based on the criteria above.

  As stated above, under Mode I of Component II, the beneficiaries would be selected through a competitive selection process and a direct incentive in terms of INR/kg of Green Hydrogen production will be provided for a period of 3 (three) years from the date of commencement of Green Hydrogen production. The incentive would be capped at INR 50 (approx. USD 0.61) per kg in the first year of production, INR 40 (approx. USD 0.48) during the second year of production and INR 30 (approx. USD 0.36) during the third year of production.

  On 16 January 2024, the MNRE launched Mode II under Component II, which has two parts: Mode 2A for green ammonia production and Mode 2B for green hydrogen production. In Mode II of Component II, the aggregation of demand and calling for bids for the production and supply of green hydrogen and its derivatives is done at the lowest cost through a competitive selection process.

In Mode 2A, the implementation agency (i.e. the Solar Energy Corporation of India) shall aggregate demand and call for bids for the production and supply of green ammonia at the lowest cost through a competitive selection process [capacity quoted should be constant over the period of Ammonia Purchase Agreement (in thousand metric tonnes i.e. MT)] with the incentive being fixed. The incentive would be capped at INR 8.82 (approx. USD 0.11) per kg of green ammonia in the first year of production and supply, INR 7.06 (approx. USD 0.085) per kg during the second year of production and supply and INR 5.30 (approx. USD 0.064) per kg during the third year of production and supply.

- In Mode 2B, the implementation agency/ agencies (i.e. Oil & Gas companies and Centre for High Technology (CHT)) shall aggregate demand and call for bids for the production and supply of Green Hydrogen at the lowest cost for a single refinery or multiple refineries, as decided by the Implementing Agency, through a competitive selection process [capacity quoted should be constant over the period of the Hydrogen Purchase Agreement (in thousand metric tonnes i.e. MT)] with the incentive being fixed. The incentive would be capped at INR 50 (approx. USD 0.61) per Kg in the first year of production, INR 40 (approx. USD 0.48) during the second year of production and INR 30 (approx. USD 0.36) during the third year of production. Support to pilot projects in emerging end-use sectors and production pathways. INR 14.66 billion (approx. USD 180 million) has been set aside for such pilot projects.

The Green Hydrogen Policy issued by the Ministry of Power, GoI provides amongst others, the following benefits:

- Manufacturers of Green Hydrogen or Green Ammonia[1]1 are allowed to purchase renewable power from the power exchange or set up renewable energy capacity themselves or through any other developer. The open access for sourcing renewable energy will be granted within 15 days of receipt of application. The unconsumed renewable power can be banked up to 30 days with the distribution company and can be taken back when required.
- Distribution licensees can also procure and supply renewable energy to the manufacturers of Green Hydrogen or Green Ammonia in their States at concessional prices which will only include the cost of procurement, wheeling charges and a small margin as determined by the State Commission.
- Complete waiver of inter-state transmission charges for a period of 25 years from the date of commissioning of the project, will be allowed to the manufacturers of Green Hydrogen and Green Ammonia using renewable energy (commissioned after 8th March 2019), pumped storage system or battery storage systems or any hybrid combination of these technologies for the projects commissioned on or before 31st December 2030.
- The renewable energy plant which manufactures Green Hydrogen or Ammonia will be given connectivity to the grid on priority basis to avoid any procedural delays.
- Manufacturers of Green Hydrogen or Green Ammonia will be allowed to set up bunkers near ports for storage of exports / use by shipping, at applicable charges by the Port Authorities.

Further, a National Single Window System (NSWS) of the Government of India has also been launched, which will provide a single window to industry for obtaining all approvals related to projects under the National Green Hydrogen Mission. Further, on 06 June 2022, the GoI's Ministry of Power, notified the Electricity (Promoting Renewable Energy Through Green Energy Open Access) Rules, 2022 (**Rules**) in order to accelerate India's ambitious renewable energy programmes, with the objective of ensuring access to affordable, reliable, sustainable and green energy for all. The aim of such legislation is to promote the generation, purchase, and consumption of green energy and to cut emissions by 45% in line with India's updated Nationally Determined Contributions (NDC) target for 2030. These Rules also provide for the incentive to exempt users from paying cross-subsidy charges on power produced from waste-to-energy units or to produce green ammonia and green hydrogen.

Further, on 8th May 2023, the Government of Gujarat also announced its policy for leasing out government fallow land for green hydrogen production using non-conventional energy sources such as solar, wind, wind solar hybrid energy (**Policy 2023**). The Policy 2023 requires the production of at least 100,000 MT (One Hundred Thousand Metric Tonnes) of Green Hydrogen per year by the company through a solar, wind, wind solar hybrid energy plant and provides for the lease period of government land for 40 (Forty) years. Amongst other things, Policy 2023 fixes the annual rent of the land allotted by the government to INR 15,000 per hectare (approx. USD 182) with an escalation of 15 percent every 3 (three) years.

Lastly, in India, the MNRE and its autonomous institutes under its administrative control have signed various memorandum of understandings/ programme/ agreements/ letter of intent/ joint declarations of intent with foreign countries/ institutes/ organisations such as Australia, Finland, France, Germany, Saudi Arabia, UAE, Uzbekistan and the United States of America.

9. Are there any standards in place for the classification and/or certification of low-carbon or renewable hydrogen?

Currently there are no specific set of definitive standards for the classification and/or certification of blue hydrogen.

On 18th August, 2023 the Green Hydrogen Standard for India was passed by MNRE. The standards (outlining emission thresholds which must be met in order for the produced hydrogen to be classified as "Green Hydrogen") are as follows:

1 Green Hydrogen/Green Ammonia is defined as Hydrogen/Ammonia produced by way of electrolysis of water using Renewable Energy; including Renewable Energy which has been banked and the Hydrogen/Ammonia produced from biomass.

Green Hydrogen:

- shall mean hydrogen produced using renewable energy inter alia production through electrolysis or conversion of biomass. Renewable energy also includes electricity generated from renewable sources which is stored in an energy storage system or banked with the grid in accordance with applicable regulations.

For Green Hydrogen produced through electrolysis:

- Non-biogenic greenhouse gas emissions arising from water treatment, electrolysis, gas purification and drying and compression of hydrogen shall not be greater than 2 kilogram of CO2 equivalent per kilogram of Hydrogen (kg CO2 eq/kg Hydrogen), taken as an average over the last 12-month period.

For Green Hydrogen produced through conversion of biomass:

- Non-biogenic greenhouse gas emissions arising from biomass processing, heat/steam generation, conversion of biomass to hydrogen, gas purification and drying and compression of hydrogen shall not be greater than 2 kilogram of CO2 equivalent per kilogram of hydrogen (kg CO2 eq/kg Hydrogen), taken as an average over the last 12-month period.

MNRE in due course would further specify detailed methodology for the measurement, reporting, monitoring, onsite verification and certification of Green Hydrogen and its derivatives. Bureau of Energy Efficiency would be the nodal agency for accreditation of agencies for the monitoring, verification and certification of Green Hydrogen production projects.

10. Does the regulatory framework clearly define the regulatory requirements relating to the production, storage, transportation or supply of hydrogen?

The Green Hydrogen Policy provides certain details with respect to production, storage, transportation and supply of hydrogen, such as:

Production:

- Green Hydrogen / Green Ammonia (Hydrogen / Ammonia) should be produced from biomass and by electrolysis of water using renewable energy, including renewable energy which has been banked, and from a co-located renewable energy plant, or sourced from a remotely located renewable energy plants.
- Land in renewable energy parks can be allotted for the manufacture of Green Hydrogen / Green Ammonia.
- The GoI proposes to set up manufacturing zones, and Green Hydrogen / Green Ammonia production plants can be set up in such manufacturing zones.

Storage:

- Manufacturers of Green Hydrogen / Green Ammonia would be allowed to set up bunkers near Ports for storage of Green Ammonia for export / use by shipping at applicable charges.

Transportation:

- Connectivity to the ISTS for Renewable Energy capacity set up for the purpose of manufacturing Green Hydrogen / Green Ammonia would be granted on priority under the Electricity (Transmission system planning, development and recovery of Inter State Transmission charges) Rules 2021.
- The waiver of inter-state transmission charges would be granted for a period of 25 years to the producer of Green Hydrogen and Green Ammonia from the projects commissioned before 31st December 2030.

Banking:

- Banking would be permitted for a period of 30 days for Renewable Energy used for making Green Hydrogen/ Green Ammonia.
- The charges for banking would be as fixed by the State Commission which should not be more than the cost differential between the average tariff of renewable energy bought by the distribution licensee during the previous year and the average market clearing price (MCP) in the Day Ahead Market (DAM) during the month in which the Renewable Energy has been banked.
- In order to achieve competitive prices, MNRE may aggregate demand from different sectors and have consolidated bids conducted for procurement of Green Hydrogen/Green Ammonia through any of the designated implementing agencies.

Compliance:

- Renewable Energy consumed for the production of Green Hydrogen / Green Ammonia shall count towards Recruitment Process Outsourcing (RPO) compliance of the consuming entity. The renewable energy consumed beyond obligation of the producer would count towards RPO compliance of the Distribution Company (DISCOM) in whose area the project is located.

- Distribution licensees may also procure and supply Renewable Energy to the manufacturers of Green Hydrogen / Green Ammonia in their States. In such cases, the distribution licensee should only charge the cost of procurement as well as the wheeling charges and a small margin as determined by the State Commission.
- MNRE will establish a single portal for all statutory clearances and permissions required for the manufacture, transportation, storage and distribution of Green Hydrogen / Green Ammonia. The concerned agencies/authorities will be requested to provide the clearances and permissions in a time-bound manner, preferably within a period of 30 days from the date of application.

The R&D Roadmap for Green Hydrogen ecosystem in India, which was published in October 2023, recommends research and development actions for each part of the green hydrogen value chain including but not limited to hydrogen production, storage, transport, safety and end-use application.

11. Are there any foreign investment restrictions related to energy and infrastructure sectors?

The Foreign Direct Investment Policy of India allows 100% investment under the automatic route in following activities:

- exploration activities of oil and natural gas fields,
- infrastructure related to marketing of petroleum products and natural gas,
- marketing of natural gas and petroleum products, petroleum product pipelines, natural gas/pipelines,
- LNG regasification infrastructure,
- market study and formulation and petroleum refining in the private sector,

subject to the existing sectoral policy and regulatory framework in the oil marketing sector and the policy of the Government on private participation in exploration of oil and the discovered fields of national oil companies.

Further, up to 49% equity investment under automatic route is allowed for activities such as Petroleum refining by the Public Sector Undertakings (PSU), without any disinvestment or dilution of domestic equity in the existing PSUs.

Moreover, the Foreign Direct Investment Policy of India allows up to 100% investment under the automatic route in the renewable energy sector including Green Hydrogen.

12. What international treaties are in place that may offer protection to international investors in hydrogen projects in the jurisdiction?

India is a signatory to 7 bilateral investment treaties (BITs) that are in force on 10 January 2023, and in addition certain other treaties may contain protections for investors in India. These can be accessed from UNCTAD's Investment Policy Hub.

India is neither a member nor an observer of the Energy Charter Treaty, therefore, protection to international investors follow international recommendations and consensus such as by the OECD, UNCTAD, and WTO.

Market developments and opportunities

13. Are there any government grants or other government funding available to hydrogen projects (including for research and development)?

The Green Hydrogen Mission provides INR 197.4 billion (approx. USD 2.4 billion), including an INR 174.9 billion (approx. USD 2.14 billion) for the SIGHT programme, INR 14.66 billion (approx. USD 180 million) for pilot projects, INR 4 billion (approx. USD 48.7 million) for R&D, and INR 3.88 billion (approx. USD 47.3 million) towards other mission components.

Further, the Ministry of Petroleum & Natural Gas has a Hydrogen Corpus Fund (HCF) and this fund participates in funding R&D projects which are led by the oil industry. Among the projects currently being funded are those for finding multiple pathways for production of hydrogen, H-CNG, and hydrogen production through decomposition of natural gas.

Further, the recently released R&D Roadmap aims to foster a robust research and development ecosystem to drive the commercialization of green hydrogen and contribute to India's ambitious climate and energy objectives. It focuses on enhancing materials, technologies, and infrastructure to boost the efficiency, reliability, and cost-effectiveness of green hydrogen production, storage, and transportation. Additionally, safety measures and solutions to technical challenges in developing a hydrogen economy are prioritised.

MNRE (Hydrogen Division), Government of India has issued "Scheme Guidelines for funding of testing facilities, infrastructure, and institutional support for development of Standards and Regulatory Framework under the National Green Hydrogen Mission" on 4 July 2024. The scheme targets the development of good quality and performance testing facilities to ensure the sustainability, safety and quality of Green Hydrogen production and trade.

Objectives of the Scheme include:

- Identify gaps in the existing testing facilities for components, technologies and processes in the value chain of Green Hydrogen and its derivatives.
- Upgrade existing testing facilities available with different testing agencies.
- Ensure safe and secure operations of equipment / instruments used in the Green Hydrogen Value Chain.
- Encourage private and governmental participation towards establishing world class testing facilities in India.

The Scheme will be implemented till the Financial Year 2025-26, with a total budget of INR 2 billion (approx. USD 23 million) and with theNational Institute of Solar Energy as the Scheme Implementing Agency.

14. Are there any notable pilot/demonstration projects in place or planned for the production or offtake of clean hydrogen?

On 20 April 2022, the Ministry of Petroleum and Natural Gas, GoI notified that Oil India Limited (OIL) had commissioned India's first 99.999% pure Green Hydrogen pilot plant, with an installed capacity of 10 kg per day at its Jorhat Pump Station in Assam.

Further, on 30 July 2022, the Prime Minister of India participated in the Ujjwal Bharat Ujjwal Bhavishya–Power @2047 Programme and launched a pilot project named the "Green Hydrogen Mobility Project" at Leh, Ladakh, for five fuel cell buses to run in and around Leh. This pilot project would be the first deployment of FCEVs for public use in India. Further, the "Green Hydrogen Blending Pilot Project" was also launched at NTPC Kawas Township as India's first green hydrogen blending project helping in reducing the usage of natural gas.

Under the Research and Development projects supported by MNRE, a 5 Nm3/h (normal cubic meter per hour) Green Hydrogen production plant based on solar energy and electrolysis has been established at Gurugram, Haryana and a 6 kg per hour Green Hydrogen production plant based on biomass gasification has been established at IISc Bangalore, Karnataka.

Further, 1 (one) company has set up a manufacturing facility for Polymer Electrolyte Membrane electrolysers at Bengaluru. GoI has not provided any subsidy for such pilot projects. The Ministry of Petroleum and Natural Gas on its website has further listed pilots based on green hydrogen which are being planned. The below listed pilots are in preliminary stages and the modalities are being worked on to achieve its purpose.

- Two pilots for setting up solar hydrogen refuelling stations at two locations for demonstration of fuel cell vehicles at tourist sites like Delhi-Agra, Gujarat (Statue of Unity) etc.
- One pilot for setting up a green hydrogen plant to explore an opportunity of replacing conventional hydrogen in refinery to green hydrogen.
- One pilot for production of green hydrogen and its blending with CNG at an appropriate site in Rajasthan for dispensing at retail outlets.
- One pilot for setting up green hydrogen infrastructure and pipeline injection of green hydrogen in the City Gas Distribution (CGD) network.

Further, under the Ministry of Road Transport & Highways, Toyota Kirloskar Motor Pvt. Ltd. along with International Centre for Automotive Technology (ICAT) conducted a pilot project to study and evaluate the world's most advanced FCEV Toyota Mirai which runs on hydrogen, on Indian roads and climatic conditions. This was a first of its kind project in the country aimed at spreading awareness about Hydrogen, FCEV technology and disseminating its benefits to support a hydrogen-based society for India. The Union Minister of Road Transport & Highways, GoI inaugurated this pilot project on 16 March 2022.

MNRE has announced various scheme guidelines in order to facilitate the setting-up of hydrogen hubs, implementation of pilot projects for use of green hydrogen in the steel sector and pilot projects for use of hydrogen in the shipping sector.

Further, MNRE has invited proposals dated 4 November 2024 for setting up Centres of Excellence (CoE) under the Research and Development Scheme of Green Hydrogen Mission, with an aim to establish world class CoE for innovation and sustainability, thereby enhancing energy independency in the long term.

The MNRE has launched an INR 2 billion (approx. USD 23 million) pilot scheme to promote green hydrogen production and usage in decentralized applications like cooking, heating, and off-grid power, aiming to assess its feasibility and safety in household and community settings.

15. Are there any commercial-scale clean hydrogen production projects in development or already operating?

There are a few existing commercial-scale clean hydrogen production projects in India, and there are a number of projects in the pipeline, at different stages of development, including the following:

- Larsen & Toubro's (L&T) Green Hydrogen Plant in Hazira, Gujarat produces 45 kg of Green Hydrogen daily and L&T in January 2023 announced it had signed an agreement with the Norway-based H2Carrier to develop floating green ammonia projects for industrial-scale applications.

- Reliance Industries Limited (RIL) has signed a preliminary agreement with the Government of Gujarat to invest INR 5.95 trillion (USD 72.6 billion) over the span of 10 to 15 years to set up 100 GW renewable energy power plant and green hydrogen eco- system development.
- Indian Oil Corporation Ltd. (IOCL) is going to set up subsidiary to house its green energy businesses and is setting up green hydrogen plant at its Panipat refinery. IOCL on 28th August, 2023 invited global tenders for setting up the unit next to its Panipat refinery on land owned by it. At 10 KTA capacity, this will be among the largest green hydrogen plants in India.
- Chennai Petroleum Corporation, a subsidiary of IOCL, has recently issued an EOI for the design, manufacturing and commissioning of the electrolyser and related items for the production of green hydrogen at its refinery at Manali in Chennai.
- Greenko Group announced that India will for the first-time export green energy from 2025, with the first shipments going to a Singapore power plant as it has signed an MoU with Singapore's Keppel Infrastructure.
- GAIL announced that it has awarded a contract to set up one of the largest Proton Exchange Membrane (PEM) electrolyser in India which would be installed at GAIL's Vijaipur Complex, in the Guna district of Madhya Pradesh.
- Bharat Petroleum Corporation Ltd. (BPCL) has invited bids and is in the process of installing a 5 MW electrolyser system to set up a green hydrogen production facility in a phased manner in one of its city gas distribution projects.
- Fusion Fuel Green, which has offices in Portugal and Ireland, has signed an agreement with BGR Energy Systems, an engineering, procurement, and construction (EPC) company based in Chennai, India, to install green hydrogen production facilities in Tamil Nadu.
- An MoU was signed between European Investment Bank and India Hydrogen Alliance for providing USD 1.06 Billion for development of Green Hydrogen hubs and projects across India.
- A Letter of Intent was signed between the Department of Science and Tech & Fraunhofer Institute for Solar Energy Systems (Germany), which is projected as a long-term collaboration for Green Hydrogen and other clean technologies.
- Diversified renewable energy company ACME Group signed a land agreement with Tata Steel Special Economic Zone (TSSEZL) for 343 acres for its green hydrogen and green ammonia project at the Gopalpur Industrial Park in Odisha. The Group plans to set up a 1.3 MTPA green ammonia production facility.
- Avaada Group signed a Memorandum of Understanding with Tata Steel Special Economic Zone Limited (TSSEZL) for setting up a Green Hydrogen and Ammonia manufacturing unit at TSSEZL's Gopalpur Industrial Park, in Odisha.
- Reliance Green Hydrogen & Green Chemicals Limited, ACME Cleantech Solutions, Greenko Zero and several other companies (in total of 9 companies) have emerged as successful bidders for Government Incentives for setting up of facilities with production capacity of up to 4.50 lakh tonnes of Green Hydrogen. A Government-owned entity Solar Energy Corporation of India (SECI) on 10 July 2023 had invited bids for green hydrogen producers, for setting up of facilities with production capacity of up to 4,50,000 tonnes of Green Hydrogen under the SIGHT Scheme, specifically under Mode-I-Tranche-I.
- THDC India Limited, an Indian Public Sector power company, has inaugurated India's largest green hydrogen pilot project in Rishikesh, Uttarakhand which would produce 50 kg of green hydrogen on a daily basis, using energy from a 1 MW rooftop solar plant.
- India's state-owned power generation company, National Thermal Power Corporation (NTPC) signed a land-lease agreement with Andhra Pradesh Industrial Infrastructure Corporation (APIIC) for building India's largest green hydrogen project in Andhra Pradesh. The said green-hydrogen hub shall be built on 1,200 acres of land in Pudimadaka, which would test & manufacture electrolysers, fuel cells and other related ancillaries.
- First Commercial-scale Green Hydrogen plant in India, at Jindal Stainless Limited's manufacturing unit which is expected with initial production of 78 tonnes per year, will be owned & operated by Hygenco India. After 20 years, the ownership shall be transferred to Jindal Stainless Limited. This pact stands as India's first commercial long-term offtake agreement of Green Hydrogen.
- Cochin International Airport Ltd. (CIAL) signed an MoU with Bharat Petroleum Corporation Ltd. (BPCL) for setting up a green hydrogen plant in the airport premises which shall result in world's first green hydrogen plant & fuelling station within airport premises.
- India's first multi-purpose green hydrogen pilot project (combined heat and power) at 1,500 MW Nathpa Jhakri Hydro Power Station (NJHPS) in Jhakri, Himachal Pradesh with the capability to cater to the high velocity oxygen fuel (HVOF) coating facility to meet the combustion fuel requirements, in addition to generating electricity through its 25kW capacity fuel cell.
- The Union Government has sanctioned 3 pilot projects for use of hydrogen in steel production – a 50 ton-per-day (TPD) plant by Matrix Gas and Renewables Ltd. (in consortium with Gensol Engineering Ltd., Indian Institute of Technology Bhubaneshwar, Metsol AB, Sweden), a 40 TPD plant by Simplex Casting Ltd. (consortium members: BSBK, Ten Eight Investment, IIT Bhilai) and a 3,200 TPD by Steel Authority of India Ltd. (Ranchi) with a total outlay of INR 3.47 billion (approx. USD 40 million) from the Union Government. These projects are expected to be commissioned in the next three years.

- NTPC Green Energy Limited, a subsidiary of NTPC Limited in collaboration with a state-owned energy company has developed India's first dedicated transmission network, with an estimated USD 21.6 billion investment to develop 20 GW of renewable energy projects, producing 1,500 tons per day of Green Hydrogen and 7,500 tons per day of green hydrogen derivatives such as green methanol, green urea and sustainable aviation fuel.
- As part of the Green Hydrogen Mission, the Government has initiated five pilot projects for using Hydrogen in buses and trucks. Earlier the Ministry of New and Renewable Energy had issued guidelines for implementing pilot projects in the Transport Sector under this Mission.
- NTPC Green Energy Limited (NGEL) with New & Renewable Energy Development Corporation of AP Ltd. (NREDCAP) to develop a massive green hydrogen hub, covering 1,200 acres in Pudimaka near Vishakhapatnam, with an aim to develop 1,500 tonnes of Green Hydrogen and 7,500 tonnes of derivatives like green methanol and sustainable aviation fuel. This project aligns with India's target of 500 GW by 2030.
- INOX Air Products commission first phase of a Green Hydrogen plant with a glass-making facility co-located in Rajasthan, India which will escalate the annual production capacity to 190 tonnes of green hydrogen.
- Government of India has launched 5 pilot projects for usage of green hydrogen in buses and trucks, as part of the Green Hydrogen Mission. Projects are awarded to major companies, including, but not limited to Tata Motors Limited, NTPC, Ashok Leyland, covering 10 different routes across the nation with total financial support of approx. INR 2.08 billion (approx. USD 24,282,772) from the Government of India.
- JSW Green Hydrogen/Ammonia Project in Mangaluru: JSW is developing a green hydrogen and ammonia production facility in Mangaluru, Karnataka. Once operational, this plant will produce green ammonia, aligning with the company's renewable energy goals.
- Kandla Port in Gujarat is expected to commence green hydrogen production by August 2025. The initiative aligns with the Green Hydrogen Mission and is projected to enhance port-led green energy initiatives and industrial decarbonization.
- GAIL announced that it has awarded a contract to set up one of the largest Proton Exchange Membrane (PEM) electrolyser in India which would be installed at GAIL's Vijaipur Complex in the Guna district of Madhya Pradesh. This plant utilizes a polymer electrolyte membrane (PEM) electrolyser to produce green hydrogen, contributing to the company's efforts in blending hydrogen with natural gas.
- In October 2024, the Steel Authority of India (SAIL) partnered with global miner BHP to reduce carbon emissions in its steel plants. The collaboration focuses on using hydrogen and biochar to lower emissions in blast furnace operations.
- In March 2025, Adani Energy Solutions secured an INR 28 billion (USD 326.8 million) project to develop a power transmission system in Gujarat. This project supports a green hydrogen and ammonia manufacturing unit in Mundra and is expected to be completed within three years.
- Bharat Petroleum Corporation Limited (BPCL) and Singapore's Temasek-backed Sembcorp's wholly owned subsidiary i.e., Sembcorp Green Hydrogen India Private Limited, have signed a joint venture agreement for development of green hydrogen and renewable energy production in India supporting the nation's clean energy transition. BPCL is committed for building a robust renewable energy portfolio with a target of 10 GW and become a Net Zero Energy Company by 2040.

16. Have there been any hydrogen-related disputes in your jurisdiction?

We are not aware of any significant hydrogen-related disputes in India, except the tender related dispute stated below, as the manufacturing and production of green hydrogen in India is currently at a very nascent stage.

In November 2023, the Independent Green Hydrogen Producers' Association (IGHPA) filed a writ petition in the Delhi High Court challenging the green hydrogen tender launched by Indian Oil Corporation (IOCL). The petition alleged that the tender clauses unfairly favoured one specific joint venture between IOCL and other companies, stifling competitive bidding and potentially leading to higher costs for consumers. The petitioner also submitted that the Supreme Court has repeatedly warned against specific clauses which favour a single tenderer.

However, the writ petition was rendered infructuous and disposed of through an order passed by the Delhi High Court in April 2024, given the tender in question had been cancelled by the IOCL in February 2024.

Last updated June 2025

Indonesia

Policy and regulation

1. Is there a government hydrogen strategy or policy?

The Indonesian Government, through its Ministry of Energy and Mineral Resources (**MEMR**), has recently launched the **National Hydrogen and Ammonia Roadmap** (**National Hydrogen Roadmap**), setting out a 35-year plan for the development of a sustainable hydrogen ecosystem in Indonesia. The roadmap was prepared through a demand driven-based method, integrating three steps of data analysis and interpretation, expert judgement through focus group discussions and consensus on target and action plans from the various stakeholders involved.

Implementation of the National Hydrogen Roadmap will be done in **three main phases**, the initiation phase (2025-2034), the development and integration phase (2035-2045) and the acceleration and sustainability phase (2046-2060).

Several actions will be undertaken during the **initiation phase**, including development of strategic guidelines, conducting studies on technical and economic aspects of the hydrogen policy, initiation of low carbon hydrogen pilot projects (with the aim of identifying technical, operational and economic bottlenecks, and to assess their commerciality), establishing the regulatory framework and standards for the low carbon hydrogen ecosystem and projects, setting out incentive and carbon trading schemes, and initiating investment financing schemes.

The initiation phase will be followed by the **development and integration phase**, during which further studies will be performed to increase infrastructure integration, and other activities will be carried out, including increase in investment for hydrogen infrastructure and storage facilities, establishing policies to accelerate green hydrogen utilization, and supporting the development and implementation of technological innovation in the hydrogen supply chain.

The acceleration and sustainability phase sets out long-term goals for the National Hydrogen Roadmap, including to have an integrated green hydrogen supply chain through an increase in infrastructure investments and active international cooperation to cement Indonesia's role in the global green hydrogen supply chain.

The National Hydrogen Roadmap sets out the current strategy of the Indonesian government on hydrogen utilization and infrastructure development. Besides this, there is currently no specific regulation on hydrogen in Indonesia. However, hydrogen is currently governed (partially) through various sets of regulations, for instance, hydrogen is classified as "new energy" under **Law No. 30 of 2007 on Energy** (**Energy Law**) and **Government Regulation No. 79 of 2014 on National Energy Policy** (**Energy Policy**). Hence while there is no specific regulation for hydrogen, there is a general policy for new energy sources within Indonesia's regulatory framework.

In Presidential Regulation No. 22 of 2017 on the National Energy Plan (Energy Plan), there is also a general action plan on the utilization of liquified new energy (including hydrogen) for the transportation sector. This sets out the Indonesian government's plans to:

- develop technology to produce hydrogen and utilize hydrogen for transport;
- develop a hydrogen-fuelled vehicle industry; and
- draft regulations on hydrogen-fuelled vehicles for public and private transportation.

In a press conference in June 2022, the (then) Indonesian Minister of Energy and Mineral Resources, Arifin Tasrif, **stated that hydrogen** is expected to be one of the contributors to Indonesia's energy transition and has an important role in decarbonising the global energy system. This is further illustrated by the government announcing plans to utilize hydrogen for transportation system and industrial sectors in the New Capital City of Nusantara, and the recent issuance of the National Hydrogen Roadmap. The Parliament is also drafting a **New and Renewable Energy Bill** which, **according to announcements**, is anticipated to provide a clearer framework for new energy, which includes hydrogen as one of the new energy sources.

Separately, against the backdrop of Indonesia's energy transition, on November 16, 2022, the Indonesian Government and the International Partners Group (which comprises the Governments of Japan and the United States, who are co-leaders of the partnership, and Canada, Denmark, the European Union, Germany, France, Norway, Italy, and the United Kingdom together the International Partners Group or **IPG**) launched the Just Energy Transition Partnership for Indonesia (**JETP**). JETP Indonesia has an initial commitment of US$20 billion, of which US$10 billion is IPG funding and the remaining US$10 billion is private financing from Glasgow Financial Alliance for Net Zero (GFANZ). JETP Indonesia marks the largest energy transition financing package in the world to date.

The Indonesian Government and the IPG provide guidance to the JETP Secretariat, which in turn coordinates various working groups led by international institutions to produce a credible and workable Comprehensive Investment and Policy Plan (**CIPP**). The CIPP is a strategy document that the Indonesian Government will use as a basis for planning and policymaking in relation to its energy sector as part of the JETP process and is aimed at ensuring its energy transition. The CIPP provides that Indonesia must **accelerate the decarbonization of end-use industries through the development of green industries such as hydrogen**. Pursuant to the CIPP, for Indonesia to reach net-zero emissions by 2050, from 2040 onwards, fossil-fuel based power plants (coal and gas) must be retired and retrofitted to fully run on bioenergy or ammonia for coal power, and hydrogen for gas power. The CIPP mentions that after 2040, clean hydrogen production is projected to emerge as an additional key source of electricity demand in Indonesia.

2. What are the key goals and commitments included in the strategy/policy?

The National Hydrogen Roadmap lays out detailed plans for the use of hydrogen in transportation, for industrial purposes, and generally using hydrogen to contribute to the energy transition, including for power generation.

Hydrogen-fuelled vehicles

The Indonesian government has plans to utilize hydrogen in the transportation sector. Based on the Energy Plan, these plans are to be carried out by the Ministry of Transportation, the MEMR, the Ministry of Industry (**MOI**) and the Ministry of Research and Technology. The government aims for the outcomes of the Energy Plan to be achieved by 2050. Based on the National Hydrogen Roadmap, there are two main options for the utilization of hydrogen, (i) as fuel through direct combustion or (ii) through electricity conversion for fuel cells. The former will be used for trains and ships and the latter for fuel cell electric vehicles.

Industry

The National Hydrogen Roadmap sets out the plan to utilize hydrogen within various industrial processes, including for ammonia (Haber-Bosch process), methanol (for the thermal catalytic reaction between hydrogen and carbon monoxide/carbon dioxide) and steel productions (acting as a reduction agent), oil refinery (hydrotreating and hydrocracking) and other industries such as textile, paper and pulp, and wood.

Energy transition

In general, the Energy Law provides for the prioritization of new and renewable energy. This is consistent with the goals expressed in other laws such as **Law No. 30 of 2009 on Electricity, as amended by Law No. 11 of 2020** (**Electricity Law**), which states that the utilization of primary energy sources must be performed by prioritizing new energy and renewable energy sources.

MEMR recently issued **MEMR Regulation No. 10 of 2025 on Energy Transition Roadmap** (**Energy Transition Roadmap**), which sets out high-level guidelines on energy transition through various approaches, including (among others) utilizing hydrogen for retrofitting of fossil fuel plants and production of green hydrogen.

Pursuant to the Energy Policy, Indonesia aims to have at least 23% of its energy mix consisting of new and renewable energy by 2025 and 31% by 2050, provided that this is economically feasible. As of 2024, the share of new and renewable energy in **Indonesia's energy mix** was **14.68%**.

3. Which industry sectors are most likely to be affected by hydrogen deployment?

Numerous sectors in Indonesia including transportation, industrial manufacturing, heat, and power generation may use hydrogen.

Hydrogen deployment is expected to be most prevalent in Indonesia's energy sector as a substitution feedstock to coal for power generation. Coal-fired power plants (**CFPPs**) currently represent **approximately 61%** of Indonesia's installed capacity. The Indonesian Government is now focusing on reducing the dominance of coal in the generation mix by attempting to retire coal-fired power plants. In light of this, hydrogen fuel may become an alternative to fossil fuel, especially for companies/industries that are looking to reduce their carbon emissions.

Furthermore, the Directorate General of New and Renewable Energy (**DGNRE**) within MEMR **has stated that the utilization of hydrogen** will primarily be used for internal combustion technology commonly used by motorized vehicles in Indonesia and will support Indonesia's electric vehicle national programme.

4. Who are the main regulators for the hydrogen market?

In Indonesia, the main regulator overseeing the hydrogen market is the MEMR, which is the primary government institution in charge of formulating energy-related policies and regulations. Within the MEMR, the DGNRE is specifically tasked with the supervision of new and renewable energy resources and assets, including hydrogen. Additionally, the MOI oversees industrial development and regulations, which would include those related to hydrogen production facilities and manufacturing processes. Furthermore, local governments at provincial and municipal levels may have jurisdiction over specific aspects of hydrogen production, distribution, and utilization within their regions. These regulatory bodies collectively set standards, issue permits, and ensure compliance with laws and regulations governing the hydrogen market in Indonesia.

5. Does the government hydrogen strategy or policy support the development of both low-carbon (blue) hydrogen and renewable (green) hydrogen?

The National Hydrogen Roadmap classifies blue and green hydrogen (and certain other hydrogen classifications) as clean hydrogen. As set out in Point 1 above, throughout the 35-year span of the National Hydrogen Roadmap, it establishes action plans in each of its three phases to ensure the development of blue and green hydrogen. Besides the National Hydrogen Roadmap, Indonesia's legislation currently does not distinguish between the types of hydrogen (including blue or green hydrogen).

Based on the National Hydrogen Roadmap, the Indonesian Government plans to develop hydrogen-related regulations and standards by 2030.

In addition, **MEMR has declared** that Indonesia will rely on the development of green hydrogen in the future, especially to pursue the decarbonisation of industrial sectors (such as the cement, ceramics and glass industries). This is also outlined in the National Hydrogen Roadmap, where MEMR estimates that at the end of the acceleration and sustainability phase in 2060, annual hydrogen supply will reach 17.5 tonnes.

6. If the government hydrogen strategy or policy supports the development of low-carbon hydrogen, to what extent is carbon capture and storage being taken forward?

Between 2023 to 2024, the Indonesian Government issued 3 separate regulations on Carbon, Capture and Storage (**CCS**) and Carbon, Capture, Utilization and Storage (**CCUS**):

- Presidential Regulation No. 14 of 2024 on the Organization CCS Activities (**PR 14/2024**)
- MEMR Regulation No. 2 of 2023 on the Organization of CCS and CCUS for Upstream Oil-and-Gas Business Activities (**MEMR 2/2023**)
- MEMR Regulation No. 16 of 2024 on Organization of Carbon Storage in Carbon Storage Permit Areas (Wilayah Izin Penyimpanan Karbon or WIPK) (**MEMR 16/2024**)
- PTK-070/SKKIA0000/2024/S9 on the Implementation of CCS and CCUS in Oil and Gas Contractors' Work Areas (**PTK 070**)

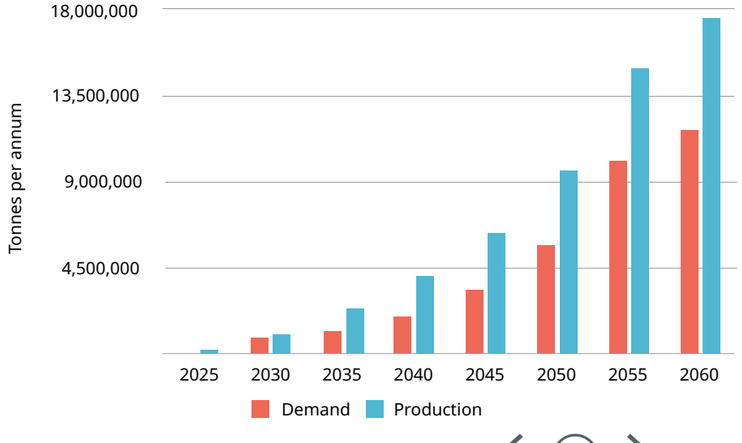
The above regulations together provide a legal basis and regulatory framework for CCS activities and projects to be implemented in Indonesia. These regulations demonstrate the Indonesian Government's strong commitment towards advancing CCS and its ambition to apply this technology for the abatement of CO2 emissions for domestic industries, and also to serve as a hub for the region and seek to monetize and give a second life to its increasing number of depleted reservoirs. CCS is considered by the Government to be one of the main pillars of its strategy to decarbonize especially for sectors where carbon abatement is otherwise limited (such as oil & gas, steel, cement and other heavy industries).

CCS will also serve as a key stage in clean hydrogen production, where under the National Hydrogen Roadmap, CCS will help produce low carbon hydrogen, classified as blue and/or turquoise hydrogen.

7. Are there targets for the production of hydrogen?

There are currently no specific targets for the production of hydrogen in Indonesia. The National Hydrogen Roadmap only establishes estimates for the production of hydrogen, where the annual supply of green hydrogen in 2060 is estimated to reach 17.5 million tonnes. The below chart provides an estimate for the supply and demand of hydrogen in Indonesia spanning from 2025 up to 2060:

Projected Hydrogen Demand and Supply Accumulation



Earlier this year, the Indonesian Government (through MEMR) and the Parliament agreed on an updated government regulation to supersede the current Energy Policy. The **current draft** indicates Final Energy (energy sources and energy which can be directly used by end consumers) utilization targets for various energy sources, including hydrogen, starting from between 700 to 1,500 Tonnes of Oil Equivalent (TOE) in 2030 and between 31.4 million to 35.4 million TOE in 2060.

8. Are there any incentive mechanisms/business models in place to support the production of hydrogen?

While the National Hydrogen Roadmap aims to set out incentives and schemes for the development and utilization of hydrogen, there are currently no incentive mechanisms in place specifically for the production of hydrogen. However, **Presidential Regulation No. 112 of 2022 on the Acceleration of Renewable Energy Development for the Supply of Power** stipulates certain government incentives which are available for the development of renewable energy. These incentives are applicable in the context of green hydrogen, which is produced using electrical energy from renewable electrical energy.

These incentives include:

Economic Incentives:

- Income tax facilities
- Import tax facilities (in the form of import duty exemption)
- Land and building tax facilities
- Financial support/facilities for geothermal development
- Financial and/guarantee facilities through state-owned-enterprises appointed by the government

Non-Economic Incentives:

- Ministry support (which includes the prioritization of renewable energy projects);
- Ease of licensing
- Guarantee of land availability from the local government

Additionally, there are a number of government incentives available for National Strategic Projects which are determined by the Indonesian government (i.e. these are significant projects with a strategic nature are part of a scheme by the Government to accelerate growth and improve public welfare and regional development in Indonesia). These incentives include, amongst others, central government guarantee against political risks, waivers of certain regulatory requirements (e.g. local content requirements), easing of licensing processes, support on land acquisition & rights of way, and tax holidays.

Furthermore, the Minister of Finance (**MOF**) has issued MOF Regulation No. 103 of 2023 on the Provision of Fiscal Support through a Funding and Financing Scheme in the Framework of Accelerating Energy Transition in the Electricity Sector (**MOF 103/2023**) in order to provide a framework for the mobilization of the JETP funding. MOF 103/2023 provides the framework for the Indonesian government to screen and select eligible projects, including the development of new Renewable Energy Power Plants (**REPPs**), to receive JETP funding as well as additional funding from other sources such as from the State budget and future external funding which is not part of the JETP package. MOF 103/20231 introduces an "Energy Transition Platform", which is one of the Indonesian Government's fiscal measures established to support the development of REPPs to replace coal-fired power generation. The Energy Transition Platform is established to procure financing from international financial institutions and/or other institutions/agencies and channelling the funds to support Indonesia's energy transition.

9. Are there any standards in place for the classification and/or certification of low-carbon or renewable hydrogen?

There are no standards in Indonesia for the classification or certification of low-carbon or renewable hydrogen. The Indonesian Government aims to establish specific standards for hydrogen by 2030, as laid out in the National Hydrogen Roadmap.

However, the Indonesian Government has recently enacted a framework for carbon pricing, a carbon tax and carbon trading which will regulate carbon emissions across a wide range of industries. One of these regulations is **Ministry of Environment and Forestry Regulation No. 21 of 2022 on the Guidelines for the Implementation of Carbon Pricing** which establishes "Carbon Credits" as an instrument for proof of performance of greenhouse gas emissions reduction. Each Carbon Credit represents a greenhouse gas emissions reduction or increase in greenhouse gas absorption which is equal to 1 tonne of CO2. As such, if an entity reduces its greenhouse gas emissions through the utilization of green hydrogen, it will be eligible to receive Carbon Credits.

10. Does the regulatory framework clearly define the regulatory requirements relating to the production, storage, transportation or supply of hydrogen?

There are currently no specific regulatory requirements or restrictions for the production, storage, transportation or supply of hydrogen in Indonesia.

11. Are there any foreign investment restrictions related to energy and infrastructure sectors?

As set out in Points 1 and 2, the Indonesian Government has plans to utilise hydrogen in the transportation and industrial sectors (such as steel industry, cement, glass and other manufacturing sub-sectors). Pursuant to **Presidential Regulation No. 10 of 2021 on Investment Business Fields, as amended by Law No. 49 of 2021**, transport and industrial manufacturing are 100% open to foreign investment, with the exception of sea transportation and domestic commercial air transportation (both of which are restricted to a maximum of 49% foreign ownership).

12. What international treaties are in place that may offer protection to international investors in hydrogen projects in the jurisdiction?

Indonesia has not ratified any specific international treaty pertaining to hydrogen. Indonesia's commitments to energy transition are embodied through its ratification of the Paris Agreement under the United Nations Framework Convention on Climate Change through **Law No. 16 of 2016**.

Additionally, **Indonesia has entered into several Bilateral Investment Treaties** (BIT) to promote greater investment flows between Indonesia and other countries, and to set out standards of protection for investments made in Indonesia by foreign investors. As of January 2023, Indonesia had BITs in place with Singapore, UAE, Russia, Denmark, Finland, Iran, Saudi Arabia, Venezuela, Qatar, Mozambique, Czech Republic, Thailand, Bangladesh, Cuba, Syrian Arab Republic, Morocco, Mauritius, Mongolia, Jordan, Uzbekistan, Sri Lanka, Ukraine, Poland, Sweden, Tunisia, and the Republic of Korea.

These BITs may contain protections for international investors which include the guarantee of fair and equitable treatment, physical security within the territory of Indonesia, protection from unwarranted expropriation or dispossession, and compensation for losses owing to war or other armed conflict.

In addition to BITs, **Indonesia is party to a number of investment-related intergovernmental agreements** such as the Agreement on Trade-Related Investment Measures (TRIMs), the General Agreement on Trade in Services (GATS) and the Multilateral Investment Guarantee Agency (MIGA) Convention. These agreements provide for, amongst others, fair treatment of investment, transparency in the trade system and protection against political risks.

Market developments and opportunities

13. Are there any government grants or other government funding available to hydrogen projects (including for research and development)?

Please refer to Point 8 above.

14. Are there any notable pilot/demonstration projects in place or planned for the production or offtake of clean hydrogen?

The following projects are currently under development in Indonesia:

- **Muara Karang green hydrogen production plant**: In October 2023 PLN kicked off the production of green hydrogen at what is said to be the first facility of its kind in Indonesia. The facility is located within the site of the Muara Karang gas-fired power plant in Jakarta and is expected to produce around 51 million tonnes of green hydrogen annually via electrolysis.
- **East Sumba hybrid project**: A green hydrogen hybrid project with solar and wind power generation is currently being developed in East Sumba (NTT province) by Hydrogène de France.
- **Ulubelu pilot project**: A green hydrogen fuel project being developed by Pertamina. The project aims to produce green hydrogen fuel from the Ulubelu geothermal working area with Pertamina's own Refinery Unit III Plaju as the offtaker.
- **Garuda Hydrogen Hijau project**: A green hydrogen facility project aiming to produce 150,000 tonnes of renewable ammonia per year, using 600MW of wind and solar power, which is planned to be developed by ACWA Power together with Indonesia's state-owned electricity company Perusahaan Listrik Negara (PLN) and its state-owned fertiliser company Pupuk Indonesia. The final investment decision for this project is planned by the end of 2025.
- **Sakakemang CCS**: A CCS project developed by Repsol targeted to be operational by 2028, with a potential carbon storage capacity of 6 million tons of CO2 until 2040.

In addition, Pertamina, together with various strategic partners, are also developing other clean hydrogen clusters in Indonesia, namely the Batam Bintan clean hydrogen cluster (export) project, Sumatra clean hydrogen cluster (export) project, and Cilegon clean hydrogen cluster (domestic) project.

As set out in Point 1, the Government of Indonesia has also expressed its intention to utilize hydrogen in the New Capital City of Nusantara. However, no formal plans have been made public to date.

15. Are there any commercial-scale clean hydrogen production projects in development or already operating?

Yes, there is the **Muara Karang green hydrogen production plant** which is already in operation since October 2023, as mentioned in Point 14 above.

16. Have there been any hydrogen-related disputes in your jurisdiction?

We are not aware of any hydrogen-related disputes in Indonesia to date.

Last updated May 2025

Ireland

Ashurst collaborated with **Arthur Cox LLP** in the preparation of this content. We are grateful for their input.

Policy and regulation

1. Is there a government hydrogen strategy or policy?

The **National Hydrogen Strategy** outlines a timeline roadmap in relation to production, transportation, storage and end uses and identifies 21 short-term actions to enable the development of the hydrogen sector.

2. What are the key goals and commitments included in the strategy/policy?

The National Hydrogen Strategy aims at reducing uncertainty by providing a strategic vision of the role hydrogen will play in the Irish economy. Main points and timelines are set out at pages 5-6. First end use sectors are expected to be heavy duty transport, followed by industry and flexible power generation. Aviation and maritime are expected to be large end-users but will take longer to develop (page 43). Transport is expected initially to be provided by compressed tankers followed later by hydrogen pipelines. A list of 21 actions for this decade (at pages 86-87) include, in addition to implementation of relevant EU law:

- assessing the potential for hydrogen end uses in a National Industrial Strategy for Offshore Wind (2024-2026);
- reviewing licensing and regulatory regimes relevant to underground hydrogen storage (2024-2028);
- continuing to prove technical capabilities of the current network (2023-28) and developing a plan to transition the network to hydrogen (2023-26); and
- progressing work to support development of strategic hydrogen clusters and reviewing current approaches to energy system planning (2024-26).

Actions include the establishment of an innovation fund to support demonstration projects across the hydrogen value chain, details of which are to be communicated further.

Other relevant policy documents are:

- **Ireland's Climate Action Plan 2025 and Annex of Actions**, which refers also to the National Hydrogen Annual Work Programme and Hydrogen Task Force;
- **Gas Networks Ireland's Network Development Plan 2023** and **Pathway to a Net Zero Carbon Network**; and
- **Ireland's updated NECP**.

In Ireland, the key objectives and commitments indicated in the Climate Action Plan and the NDP align with EU policy with the intent that hydrogen will play a significant role in achieving Ireland's decarbonisation goals. Beyond 2030, the intent is that the gas network in Ireland can be fully decarbonised by utilising hydrogen and, in the interim, hydrogen could be in the network in low blended volumes. Ireland intends to align with the EU Hydrogen Strategy and EU Energy System Integration Strategy.

Ireland signed the EU Hydrogen Initiative by which signatories commit to continue research and investment in the production and use of hydrogen as a future-oriented technology.

In relation to power generation, Ireland has set a high renewable energy target (80% of electricity demand to be met by renewables by 2030). It has committed to delivery of 5GW of offshore renewable generation capacity by 2030 plus an additional 2GW of offshore capacity earmarked for hydrogen production which it considers could support as much as 2-4 TWh of renewable hydrogen production by 2030. Accommodating this volume of renewable capacity on a small island system will require investment in transmission infrastructure and significant investment in interconnection and storage. In this context, green hydrogen is seen as part of an integrated energy system in terms of providing back-up for intermittent renewables, seasonal storage of renewable energy, and ensuring security and resilience in energy suppliers.

3. Which industry sectors are most likely to be affected by hydrogen deployment?

The National Hydrogen Strategy envisages that hydrogen will have a role in decarbonising:

- power generation;
- heating;
- industry; and
- transport (particularly public transport, road freight, shipping and aviation).

4. Who are the main regulators for the hydrogen market?

The Commission for Regulation of Utilities (CRU) is the regulatory authority in the energy sector in Ireland. The Gas Act 1976 transposes EU Directive 2009/73/EC on the internal market in natural gas including the requirements in relation to third party access to the gas system and powers and functions of the CRU. Powers and functions of the CRU in relation to gas markets and gas safety are also provided for in the Electricity Regulation Act 1999 and the Gas (Interim) (Regulation) Act 2002. Functions include advising the Minister on the development of the gas industry and regulating the development of natural gas undertakings with respect to safety. In carrying out certain duties (under section 9(3) of the Electricity Regulation Act 1999 and Directive 2009/73/EC), the Minister and Regulator shall have regard to the need to "integrate large and small scale production of gas from renewable resources in networks in the most cost effective way".

The National Hydrogen Strategy notes that, while blends of hydrogen are within the remit of the existing regulatory and safety regime, "a new framework will be needed to be established for pure hydrogen transportation applications" and a statutory body will need to be assigned to develop and oversee this. Regulation (EU) 2024/1789 now applies in Ireland and transposition of Directive (EU) 2024/1788 is awaited.

The national regulator responsible for health and safety of workers and those affected by work activity is the Health and Safety Authority (HSA). Under the Dangerous Substances (Flammable Liquids and Fuels Distribution and Commercial Supply Stores) Regulations 2019, which apply to the keeping, conveying, loading and unloading of dangerous substances (including hydrogen), the HSA is the appeals authority in relation to licence applications for retail stores.

5. Does the government hydrogen strategy or policy support the development of both low-carbon (blue) hydrogen and renewable (green) hydrogen?

The policy focus is on green hydrogen. The National Hydrogen Strategy states that low-carbon hydrogen production "is not expected to play a significant role in Ireland" on the basis that it is not a zero-emissions solution and is therefore inconsistent with long-term national climate goals.

Ireland's updated NECP states that Ireland will focus its efforts on the scale up and production of renewable "green" hydrogen as it supports both decarbonisation and energy security needs. Prior to 2030, Ireland will explore the potential to produce green hydrogen from grid-connected electrolysis using surplus renewables.

6. If the government hydrogen strategy or policy supports the development of low-carbon hydrogen, to what extent is carbon capture and storage being taken forward?

Ireland's updated NECP indicates plans to examine feasibility of CCS in Ireland. Climate Action Plan 2025 indicates that a CCUS Task Force is developing a workplan to report on market readiness and progress development of policy and a regulatory framework in an Irish context.

The gas network operator (now Gas Networks Ireland, formerly Ervia) completed a CCS feasibility study (see **here**), which considered receiving CO2 from emitters in Cork and Dublin at the battery limit of the carbon capture facilities. In 2022, the Sustainable Energy Authority of Ireland published a report on suitability, costs and deployment options in Ireland.

Gas Networks Ireland in its Network Development Plan pledges to continue to monitor developments in CCS and incorporate these findings into potential future decarbonisation pathways.

7. Are there targets for the production of hydrogen?

The Government commits in the Climate Action Plan 2025 to delivery of at least 5GW of offshore renewable generation capacity by 2030, and notes actions to deliver 20GW of offshore capacity by 2040 and 37GW by 2050, which it considers would help to support as much as 24 TWh of renewable hydrogen production by 2050.

Considerations around hydrogen are also addressed in the draft **Offshore Renewable Energy Future Framework Policy Statement**. Proposed actions include assessing renewable hydrogen and renewable hydrogen derivatives transport options, including assessing the viability of potential hydrogen export pipeline routes by 2040.

8. Are there any incentive mechanisms/business models in place to support the production of hydrogen?

Several instruments provide support which may indirectly promote the production of hydrogen:

- the **Accelerated Capital Allowance** is a tax incentive scheme which promotes investment in energy efficient products and equipment and in 2022 there was an expansion of the relief for investment in hydrogen powered vehicles and refuelling equipment;
- the **Zero-Emission Heavy-Duty Vehicle Purchase Grant Scheme** aims to promote the decarbonisation of the heavy duty sector and to assist market participants in the transport industry to transition from fossil fuels;

- the **GNC Vehicle Grant Scheme** is administered by Gas Networks Ireland and assists Irish fleet operators in the purchase of new CNG vehicles; and
- DECC **consulted** on a Renewable Heat Obligation expected to be introduced in 2025. It is intended to incentivise suppliers of fuels in the heat sector to ensure a proportion of fuels they supply is renewable.

9. Are there any standards in place for the classification and/or certification of low-carbon or renewable hydrogen?

Commission Delegated Regulations (EU) 2023/1185 and (EU) 2023/1184 supplementing the Renewable Energy Directive (EU) 2018/2001 apply in Ireland.

10. Does the regulatory framework clearly define the regulatory requirements relating to the production, storage, transportation or supply of hydrogen?

Regulation (EU) 2024/1789 applies in Ireland and transposition of Directive (EU) 2024/1788 is awaited. There is no specific regulatory framework in Ireland for hydrogen, although hydrogen injected to the natural gas system is likely caught by certain existing regulatory regimes.

The definition of "natural gas" in the Gas Act 1976 would, subject to certain technical criteria being met, include hydrogen. This means that the existing regulatory regime that applies to gas in Ireland would also apply to hydrogen i.e. the transmission, distribution and supply of hydrogen by pipeline would require a licence.

The storage of hydrogen in Ireland is subject to all applicable health & safety legislation.

In relation to the transportation of hydrogen, existing European Union legislation includes hydrogen within the definition of alternative fuels and such legislation regulates the operation of public hydrogen refuelling points to ensure compliance with EU standards.

The role of hydrogen in road transport vehicles is likely to be further explored in **the 2025 update** to Ireland's National Policy Framework for Alternative Fuels Infrastructure 2017-2030.

11. Are there any foreign investment restrictions related to energy and infrastructure sectors?

The **Screening of Third Country Transactions Act 2023** gives effect to EU legislation which establishes a framework for the screening of foreign direct investments into the European Union on grounds of security or public order. The screening mechanism commenced on 6 January 2025. Further information is available here: **An Overview of the Proposed Foreign Investment Screening Regime in Ireland - Arthur Cox LLP**.

Economic activity in Ireland must also comply with EU sanctions law.

12. What international treaties are in place that may offer protection to international investors in hydrogen projects in the jurisdiction?

Ireland is a party to international treaties with investment provisions (including Co-Operation Agreements with various countries internationally). The United Nations Conference on Trade and Development lists a number of treaties with investment provisions that Ireland is a signatory to and which are in force.

Ireland currently has no bilateral investment treaties in force as the EU has competence in this area on behalf of Member States. In May 2023, Ireland and Germany agreed a **joint declaration** of intent to cooperate in green hydrogen, in recognition that Germany will wish to import hydrogen.

Market developments and opportunities

13. Are there any government grants or other government funding available to hydrogen projects (including for research and development)?

Gas Networks Ireland had a **Gas Innovation Fund** and is working with the CRU to secure further innovation funding.

Ireland is to receive **funding** under the EU Just Transition Fund, which may be used, among other things, to develop systems and infrastructure for clean energy. The European Investment Bank has also made EUR 3.4 billion available to help accelerate the shift towards renewable energy and sustainable transport and EUR 2 billion of this will be invested in a number of projects across Europe, including wind power in Ireland and building pioneering PV plant using batteries and hydrogen.

The **EU Clean Hydrogen Partnership** is funding a study to explore the role of hydrogen in decarbonising energy in Valentia Island, Co. Kerry (the H2ORIZON study).

14. Are there any notable pilot/demonstration projects in place or planned for the production or offtake of clean hydrogen?

Gas Networks Ireland indicates that it is active in European gas organisations assessing the readiness of existing gas networks to carry hydrogen and blends of natural gas and hydrogen, and that there is increasing confidence in the ability of the existing distribution networks to carry up to 100% hydrogen.

Gas Network Ireland indicates in the NDP that it is engaging with hydrogen producers on their connection enquiries. It states that has begun work packages to prepare the network to transport hydrogen, and the development of a hydrogen technical and safety strategy, intended as a road map for the transition to hydrogen. Longer term plans, including clustering of hydrogen networks with production and offtake, are set out in **the Pathway to a Net Zero Carbon Network**. ESB has announced plans to invest in a hydrogen facility at its Moneypoint site. The development is to include a green hydrogen production, storage and generation facility. Further information is available **here**.

Gas Networks Ireland established a **Network Innovation Centre** in Dublin at which it is developing a hydrogen technical strategy and working with University College Dublin's Energy Institute. It has collaborated with academic institutions on several studies and initiatives. It is also a partner in the **European Hydrogen Backbone.**

15. Are there any commercial-scale clean hydrogen production projects in development or already operating?

Projects under development include the following:

- **Bord na Móna** secured planning permission for a 2MW hydrogen electrolysis plant on its existing wind farm site at Mount Lucas, Co. Offaly. The development will form part of Bord na Móna's first phase of its hydrogen development strategy, with **construction** to commence in 2024.
- **Constants Energy Limited** has planning permission for a green hydrogen production facility in Co. Mayo.
- **Mercury Renewables Limited** wishes to develop a €200 million hydrogen production plant and accompanying wind farm.
- EI-H2 announced plans to develop a €120 million **green hydrogen facility** comprising a 50MW electrolysis plant at Aghada, Co. Cork.
- ESB and dCarbonX signed a **Memorandum of Understanding** for the joint assessment and development of Irish offshore green hydrogen subsurface storage.
- ESB signed a **Memorandum of Understanding** with the Shannon Airport Group to explore the development of a hydrogen lighthouse project in the environment surrounding the airport's site.
- the **Galway Hydrogen Hub** (GH2) consortium (NUI Galway, the Port of Galway, CIÉ Group and Bus Éireann, Aran Islands Ferries, Lasta Mara Teo and Aer Arann Islands) have plans for a Hydrogen Valley in Galway.
- Energia produces hydrogen at one of its windfarms, as **detailed further here**.

16. Have there been any hydrogen-related disputes in your jurisdiction?

There is no publicly available information on ongoing or previous disputes concerning hydrogen in Ireland.

Last updated April 2025

Italy

Policy and regulation

1. Is there a government hydrogen strategy or policy?

Italy has established a comprehensive government hydrogen strategy with the "National Hydrogen Strategy" presented in November 2024 by the Ministry of Environment and Energy Security (MASE). This strategy aligns with Italy's decarbonization goals under the integrated energy and climate plan (PNIEC), the Net Zero 2050 target and the National Recovery and Resilience Plan (PNRR).

The National Hydrogen Strategy has been developed along three lines:

- demand: an attempt was made to understand what the potential demand for H2 might be between now and 2050 and what the various developments might be, also in view of the evolution of other decarbonisation carriers;
- supply: the analysis also took into account the relative competitiveness of the various hydrogen solutions;
- transport: the link between supply and demand.

Based on these elements, strategic actions and policies to support the sector were proposed.

2. What are the key goals and commitments included in the strategy/policy?

Key goals and commitments National Hydrogen Strategy are, inter alia, the following:

- decarbonization scenarios: the goal is to achieve net Zero emissions by 2050, with hydrogen playing a central role in decarbonizing hard-to-abate sectors like steelmaking;
- production and technology development: installing 3 GW of electrolyser capacity by 2030 (such capacity will be increased by 2050, for green hydrogen production); developing a domestic electrolyser manufacturing industry; promoting blue hydrogen (with carbon capture) as a transitional solution and exploring nuclear-based hydrogen in the long term;
- infrastructure and logistics: building the Southern Hydrogen Corridor, a pipeline network connecting Italy to Austria and Germany, enabling imports of 10 million tons of hydrogen annually by 2030; establishing regional hydrogen valleys to integrate production and consumption;
- funding and incentives: allocating more than Euro 6 billion in public funds; exempting renewable energy used in electrolysis from grid charges and simplify permitting for hydrogen infrastructure.

These goals aim to reduce Italy's reliance on fossil fuels, enhance energy security, and establish the country as a Mediterranean hydrogen hub.

3. Which industry sectors are most likely to be affected by hydrogen deployment?

The sectors most affected by hydrogen development will be:

- hard-to-abate sectors, such as energy-intensive manufacturing processes, steelmaking, or aviation;
- transport sector, in particular heavy duty (e.g. long-haul trucks) and railways;
- industrial sector, with specific reference to those segments where hydrogen is already used as a raw material, for example in the chemical sector and in oil refining.

4. Who are the main regulators for the hydrogen market?

The main Italian regulators for hydrogen market are:

- the Ministry of Environment and Energy Security (MASE);
- the Italian Energy Authority (ARERA); and
- the GSE (the authority in charge in case of public incentives).

5. Does the government hydrogen strategy or policy support the development of both low-carbon (blue) hydrogen and renewable (green) hydrogen?

The main focus is on green hydrogen. On the other hand, the National Hydrogen Strategy provides also for support for the development of low-carbon hydrogen through Carbon Capture and Storage (CCS) technologies, recognising CCS as a key lever for the decarbonisation of industrial sectors that are difficult to electrify and for the production of blue hydrogen (since blue hydrogen refers to the production of hydrogen from fossil fuels, where the CO2 emitted during the process is captured and stored, instead of being released into the atmosphere). From a practical implementation point of view, the main Italian project is the Ravenna CCS, launched in 2024 by Eni and Snam, which is the first national plant for the capture, transport and permanent storage of CO_2 for environmental purposes. The involvement of Snam and Eni shows the national interest in CCS as a strategic solution for low-carbon hydrogen production and industrial decarbonisation. However, CCS is still in its infancy in Italy, with Ravenna as the only industrial-scale project operational by 2025, and its large-scale application will depend on technological maturity.

6. If the government hydrogen strategy or policy supports the development of low-carbon hydrogen, to what extent is carbon capture and storage being taken forward?

The importance of the development of low-carbon hydrogen is recognised by the National Hydrogen Strategy but, at the moment, there is not the maturity from a technological point of view to foresee the potential impact of low carbon hydrogen.

7. Are there targets for the production of hydrogen?

It should be noted that the National Hydrogen Strategy establishes "scenarios" rather than "targets".

Hydrogen production scenarios are foreseen in the National Hydrogen Strategy, with a priority focus on green hydrogen and a complementary role for blue hydrogen.

The National Hydrogen Strategy is divided into several time frames, from short to long term, setting scenarios up to 2050. The scenarios identified quantify gross hydrogen consumption, which could reach 11.93 Mtoe (million tonnes of oil equivalent) in the high diffusion scenario, 9.08 Mtoe in the intermediate scenario, and 6.39 Mtoe in the baseline scenario.

In relation to electrolysis capacity and domestic production, the target is installing 3 GW of electrolysis capacity by 2030.

To support these scenarios, investments are planned for production infrastructure and for the expansion of renewables.

8. Are there any incentive mechanisms/business models in place to support the production of hydrogen?

Italy participates in four IPCEI (Important Projects of Common European Interest) initiatives focused on hydrogen. Below is the complete list of active IPCEI projects in Italy:

- IPCEI Hy2Tech (Hydrogen 1): development of end-use technologies for hydrogen applications in mobility, industry, and energy.
- IPCEI Hy2Use (Hydrogen 2): industrial applications of hydrogen, prioritizing hard-to-abate sectors (steel, cement, chemicals).
- IPCEI Hy2Infra (Hydrogen 3): development of critical infrastructure: large-scale electrolyzers, transport networks, storage, and liquid organic hydrogen carrier (LOHC) terminals.
- (IPCEI Hy2Move (Hydrogen 4): technologies for hydrogen mobility: heavy-duty vehicles, ships, aircraft, and refuelling stations.

In addition, please consider that the so-called "tariff decree" (i.e., a measure through which the Italian Government is expected to intervene to reduce the price gap between green hydrogen and fossil fuels, thus making the green energy carrier economically viable for potential off-takers) is ready to be submitted for review in Brussels.

The decree, which was subject to public consultation in recent months, is considered by industry stakeholders as a key element to enable the launch of a green hydrogen market in Italy. It will also allow the hydrogen valleys funded by the PNRR to negotiate sales contracts for H_2 with potential off-takers contracts that, without this additional public support measure, would likely be priced out of the market. Indeed, the tariff decree is expected to introduce a system for allocating incentives based on the Contract for Difference (CfD) model.

Finally, it should be noted that the consumption of electricity from renewable sources in electrolysis plants for the production of green hydrogen, even if the production plant and the electrolysis plant are connected through a network with third-party access obligations, is not subject to the payment of general charges relating to the electricity system. In addition, the produced hydrogen is not subject to the application of excise duty if not directly used in thermal engines as fuel.

9. Are there any standards in place for the classification and/or certification of low-carbon or renewable hydrogen?

Also in relation to hydrogen, Legislative Decree no. 199 of 8 November 2021 provides for the issuance of Guarantees of Origin (GO) in the application of, and in accordance with, CEN - EN 16325 standards. The sole purpose of the GO is to demonstrate to final customers the amount of energy from renewable sources in an energy supplier's energy mix as well as that supplied to consumers under renewable energy agreements.

Implementing legislative decree no. 199/2021, the MASE has adopted a ministerial decree with reference to the – *inter alia* – guarantee of origin for green hydrogen.

10. Does the regulatory framework clearly define the regulatory requirements relating to the production, storage, transportation or supply of hydrogen?

Legislative decree no. 190/2024 among other things, provides for the regulation and simplification for the construction and operation of electrolysers. In particular, in terms of procedural simplifications, it is provided that the construction of electrolysers with power less than or equal to the threshold of 10 MW does not require the issuance of a specific permit (free-building activities). For other types of electrolysers, a more structured authorization regime is envisaged.

Ministerial Decree of 7 July 2023 provides for a specific fire prevention technical regulation for hydrogen production plants using electrolysis and related storage systems. This decree applies both to newly built plants and to existing ones in the event of significant modifications affecting fire safety.

Within Law Decree 13/2023, which amended different provisions of Legislative Decree 152/2006, Art. 41 (titled "*Simplifications for the development of green and renewable hydrogen*") establishes that the competence for the environmental impact assessment (i.e, "EIA procedure") for projects related to the green and renewable hydrogen production belongs to the State.

Moreover, based on the modifications provided for by the aforementioned Art. 41, green hydrogen production plants are defined as "*integrated chemical plants for the production of green or renewable hydrogen, i.e. plants for the production on an industrial scale, by means of chemical transformation processes, of green or renewable hydrogen, in which several production units are functionally connected to each other*". It must be highlighted that these projects are added to those the PNRR-PNIEC Technical Commission must give priority to, as part of its investigative activities in EIA procedures under state jurisdiction.

With further reference to the most recent legislation, Art. 6 of Regulation (EU) 2023/1804 (i.e., "AFIR"), which is directly applicable within the Italian law, focuses on the objectives for hydrogen refuelling infrastructure for road vehicles. In this respect, the most important provisions could be summarised as follows:

(i) Member States must ensure that, by 31 December 2030, a minimum number of publicly accessible hydrogen refuelling stations are installed on their territory;

(ii) Member States shall ensure that, by 31 December 2030, publicly accessible hydrogen refuelling stations are installed along the TENT core network at a maximum distance of 200 km between them, designed for a minimum cumulative capacity of 1 ton/day and with at least one 700 bar dispenser;

(iii) Member States shall ensure that, by 31 December 2030, at least one publicly accessible hydrogen refuelling station is installed at least one publicly accessible hydrogen refuelling station;

(iv) in order to meet growing market needs, Member States have to establish, in their national strategic frameworks, a clear linear trajectory towards the achievement of the 2030 targets that ensure sufficient coverage of the core TEN-T network.

It should be finally noted that the RED III European Directive has been adopted with the aim of providing binding targets for the strengthening of renewable energy production and transport in the European economy, also with respect to green hydrogen. In this regard, the directive provides that European industry will have to gradually increase its use of renewable energy by 1.6% per year and that the transport sector will be able to achieve several targets by the end of the decade, including a 14.% reduction in total greenhouse gas emissions.

Based on the analysis provided so far, despite the fact that legislation on the hydrogen production is developing, both at European and Italian level, the regulatory framework can still be defined as immature and it is reasonable to expect further regulations aimed at defining in a more detailed manner, also from a technical point of view, the production, storage, transportation and supply of hydrogen.

11. Are there any foreign investment restrictions related to energy and infrastructure sectors?

Yes, such restrictions are provided under the Golden Power regulation, which refers to the special power of the Italian Government to limit or stop (i) foreign direct investments and (ii) corporate transactions involving Italian strategic assets.

The Golden Power provisions specify that the Italian Government shall review transactions concerning Italian public and private companies which, inter alia, hold "assets having strategic relevance" in the energy, transport and communication sector.

This would require notifying the Italian Government of the details of the transaction. The Government may, within 45 business days of such notification (unless this term is extended should further information be required), determine if it considers the assets as being strategic and accordingly exercise certain special powers which may result in the imposition of sector specific conditions or, in extreme cases, the veto to the transaction, if it determines that such steps are necessary for the protection of the essential interests of the State, or the protection of security and public order.

12. What international treaties are in place that may offer protection to international investors in hydrogen projects in the jurisdiction?

The United Nations Conference on Trade and Development (UNCTAD) website reports a total of 102 Bilateral Investment Treaties (hereinafter the "BITs") that Italy has entered into, many of which are in force and those in force are with non-EU countries. In addition certain other treaties may contain protections for investors in Italy (a full list can be **accessed at the site**).

European investors can instead rely on future investment protection on domestic law and domestic courts of the EU member states, as well as EU law and potentially the European Court of Justice in order to enforce their rights. Italy has terminated all of its BITs with other EU member states several years ago. Moreover, the European Commission has stated that intra-EU BITs are incompatible with European law since all Member States are subject to the same rules on cross-border investments, such as freedom of establishment and of capital, thus implying that any rights conferred by intra-EU BITs on a bilateral basis to investors of some Member States constitute nationality-based discrimination.

A mention needs to be made to the Energy Charter Treaty (hereinafter the "ECT"), entered into force in April 1998 and specifically addressing energy trade, transit and investment between its contracting parties, which included Italy. Italy withdrew from the ECT with effect as of 1st January 2016. A sunset clause provided in the same ECT extends the validity of the ECT for 20 years after the effective withdrawal date (i.e. until 1st January 2036) but only for investments made prior to the withdrawal date. The ECT cannot be invoked to seek protection of investments made in Italy in the energy sector after the withdrawal date.

Market developments and opportunities

13. Are there any government grants or other government funding available to hydrogen projects (including for research and development)?

The PNRR foresees funds dedicated to hydrogen of over €3 billion, with investment lines linked to the use of hydrogen in the hard-to-abate, road and rail sectors, as well as for the creation of hydrogen valleys (i.e. industrial areas with an economy based fundamentally on hydrogen).

The Minister of Ecological Transition (Ministero della Transizione Ecologica - MITE), on 23 December 2021, issued a Ministerial Decree in order to implement the investment in research and development on hydrogen, provided within the PNRR, with the allocation of €110 million. The investment aims to support research and development activities focused on hydrogen in the following areas:

- production of clean and green hydrogen;
- innovative technologies for storage and transport of hydrogen and its transformation into derivatives and e-fuels;
- fuel cells for stationary and mobility applications; and
- integrated intelligent management systems to increase the resilience and reliability of intelligent hydrogen infrastructures.

Further actions related to the use of resources provided by the PNRR in the hydrogen sector are expected in the coming months.

Further resources can be granted by the Innovation Fund and the National Operational Plan (Programma Operativo Nazionale - PON) 2021-2027, and then allocated at local level by involving the relevant regional bodies. Finally, resources from the Important Projects of Common European Interest (Importanti progetti di Comune Interesse Europeo - IPCEI) could also be used to support the large-scale industrial development of green hydrogen projects.

The Italian Government has also identified a number of funds for the period of 2020 - 2021. The funds available are the Sustainable Development Fund (Fondo Crescita Sostenibile - FCS), the Law-Decree of 14 August 2020, no. 104, and Mission Innovation, composed of funds for research and funds for enterprises.

Between 2022 and 2033, additional funds will be available: National Electricity System Research (Ricerca di Sistema Elettronico Nazionale), CleanTech Fund, and Development and Cohesion Fund (Fondo per lo Sviluppo e la Coesione - FCS). Like the European funds, part of the national resources could be invested in green hydrogen projects.

14. Are there any notable pilot/demonstration projects in place or planned for the production or offtake of clean hydrogen?

For the next few years, the goal in Italy is to develop the application of hydrogen in transport, railways and industry sectors.

(i) In this respect, several proposals have been made: the PNRR provides an investment of 3.64 billion Euro for the construction of hubs for the production of green hydrogen in industry and transport, but also for the redevelopment of derelict industrial areas. These are the so-called **Hydrogen Valleys**, of which 54 projects across the Country are currently being financed. Such Hydrogen Valleys will not only represent production centres, but real hubs from which an hydrogen market can develop, with the ultimate goal of decarbonising carbon-intensive sectors and contributing to the Country's economic independence. In this regard, an example within the Italian territory is Valle Camonica, where the **"H2iseO" plan** of Ferrovie Nord and Trenord, in collaboration with Snam and A2A, will soon start, which will intervene on 100 kilometres of the current diesel-fuelled railway line by starting the first green hydrogen trains;

(ii) the construction of stations for both road and rail transport has been proposed. In this respect, there are already two stations in the Provinces of Bolzano and Mestre, with the aim of building 38 hydrogen filling stations by 2026. As for the companies involved, the approved projects have been presented by - among others - Eni, Italgas and Snam 4 Mobility;

(iii) the development of flagship projects for the use of hydrogen in industrial sectors.

A number of small-scale pilot projects are also planned in other sectors, e.g. biological methanation or secondary steelmaking sites and in the electrolyser sector.

It appears that Enel and Eni are working together on two pilot projects to supply green hydrogen to refineries identified by the oil group, a joint note announced.

It should finally be noted that, according to the public consultation documentation initiated by the MASE on the draft of the Ministerial Decree on the production of hydrogen, Italy is developing a national auction system to allocate incentives for increasing renewable hydrogen production.

In this respect, the MASE envisages that incentives will be allocated over the period 2024-2027 through competitive auction procedures, carried out within specific quotas. In addition the incentives, which will last for 10 years, will be paid out as follows:

(i) a maximum value of 5 Euro per Kg of hydrogen for production from electrolysis plants of less than 10 MW capacity;

(ii) a maximum value of 4 euros per Kg of hydrogen for production from electrolysis plants with a capacity of 10 MW or more;

(iii) a maximum value of 3 Euro per Kg in case of biohydrogen.

The GSE will publish notices of the procedures, with at least one procedure per six-month period.

As mentioned in the draft Ministerial Decree, "the quotas will also have to take into account the possibility of participation also for hydrogen production plants located on the territory of other Member States of the European Union and other third countries bordering Italy, with which the European Union has entered into a free trade agreement, that physically export their hydrogen production to Italy".

15. Are there any commercial-scale clean hydrogen production projects in development or already operating?

In Italy, according to ENTSOG association (European Network of Transmission System Operators for Gas), five projects concern integrated systems for the production, transport and use of hydrogen, while four concern the final use of the vector. Such projects include:

- the **European Blue Dolphin project** involving the company Fincantieri, which envisages the construction of up to 50 hydrogen-powered vessels;
- the **DIVINA project** with which the companies Snam, RINA and Bormioli aim to introduce hydrogen into the glass industry cycle;
- the **H2iseO project** for a railway hydrogen valley in Valcamonica, the hydrogen road refuelling plant in Bolzano, realised by IIT and Autostrada del Brennero;
- the **Silver Frog project**, promoted by the companies Hydrogenics, Meyer Burger, EcoSolifer, SolarPower Europe, European Energy and aimed at installing 10 GW of electrolysis capacity to produce green hydrogen from solar energy in northern Italy and distribute it through special pipelines to the chemical industry;
- a project (already completed) by Snam, which used a **10% mixture of methane and hydrogen to power a pasta factory in Contursi**;
- Snam, RINA and GIVA Group's project to use hydrogen in the steel forging process;
- SGI's (Società Gasdotti Italia) **Pegasus project** for the production of 100% renewable natural gas from green hydrogen generated by electrolysis;
- The **Prometeo project**, an initiative coordinated by ENEA (National Agency for New Technologies and Sustainable Economic Development) involving several Italian companies (Snam, Fondazione Bruno Kessler, Maire Techimont, NextChem), which aims to bring the cost of green hydrogen down to less than €2 per kg by combining different production technologies; and
- EP Produzione S.p.A. is going to realize an hydrogen valley in Sassari (SS) – locality Porto Torres. In this regard, EP Produzione S.p.A. started the authorisation procedure. The goal is to install a new plant for H2 production by means of electrolysis of 5 MW.
- **The Green hydrogen valley**, which envisages the construction of three green hydrogen production plants in the Municipalities of Brindisi, Taranto and Cerignola (Apulia Region) - for a total electrolysis capacity of 220 MW powered by around 400 MW of photovoltaic solar energy - and of the relevant pipelines that will connect the hydrogen generation sites to possible users.
- **The HyMed**, proposed in 2022 as the world's largest floating offshore wind and green hydrogen production project. This project, built by Aquaterra Energy and Seawind Ocean Technology, is expected to be operational by 2027.
- **NatPower H** promoted an initiative – to be realized by the year 2024 - for the construction of the first worldwide plant for the refuelling of green hydrogen for the recreational boats (*imbarcazioni da diporto*). In this respect, the green hydrogen, produced by wind and solar energy, as well as by other renewable energy infrastructures, will be converted into a stable and natural resource to meet the growing demand for sustainable energy sources.
- Various European projects for the spread of hydrogen busses have been started. In this respect, among the most relevant Projects, it could be mentioned the "**High VLO.City Project" (2012-2019)**, which aims to facilitate the implementation of fuel cell buses and hydrogen refuel ling stations.

16. Have there been any hydrogen-related disputes in your jurisdiction?

Within the Italian jurisdictional framework, disputes surrounding the issue of hydrogen production started to arise when the calls for incentives have been published.

Among the most recent judgements, it could be mentioned the decision no. 11336 of 29 December 2023, in which the Council of State rejected the appeal filed by the appellant Company against the decision of the Veneto Region, which had held inadmissible its request for access to the hydrogen incentives set out in the PNRR.

Last updated June 2025

Japan

Policy and regulation

1. Is there a government hydrogen strategy or policy?

Japan's hydrogen strategy is contained in a number of separate pieces of legislation and policy documents:

- The Green Growth Strategy Through Achieving Carbon Neutrality in 2050 (published December 2020) (Green Growth Strategy);
- The Act Concerning the Promotion of a Smooth Transition to a Decarbonised Economic Structure (enacted 30 June 2023) (GX Promotion Act);
- The Basic Hydrogen Strategy (published December 2017 and revised on 6 June 2023); and
- The 7th Strategic Energy Plan (cabinet decision made on 18 February 2025).

2. What are the key goals and commitments included in the strategy/policy?

The Green Growth Strategy and Basic Hydrogen Strategy set specific goals for hydrogen production and usage by 2030, 2040 and 2050.

The Japanese Government aims to achieve a hydrogen supply cost level of 30 ¥/Nm3 in 2030 (approximately one third of the current hydrogen sales price) and 20 ¥/Nm3 in 2050. Additionally, the Japanese government is aiming for a national Japanese hydrogen market size of 3 million tons by 2030 (including domestic production and imports), 12 million tons by 2040 and 20 million tons by 2050.

Power Generation - The Green Growth Strategy sets a target of 10% of power generation by hydrogen and ammonia. Power generation as a source of hydrogen demand is estimated at five to ten million tons of hydrogen per annum by 2050 (amounting to 15-30 GW of power generation capacity). Between the years 2025 to 2030, the Japanese government aims to expand hydrogen/ammonia consumption for co-firing power generation and to promote single-fired hydrogen/ammonia power generation.

Fuel Cell Vehicles – A specific target for hydrogen use by commercial vehicles has not been set, however it is anticipated to amount to a demand of 6 million tons per annum by 2050.

Industrial Hydrogen Use – A target of "zero carbon steel" by 2050 has been set and this is anticipated to increase domestic demand for hydrogen in the steel industry to approximately 7 million tons per annum by 2050.

While the 7th Strategic Energy Plan does not specify a quantitative target for hydrogen production or consumption by a particular year, it sets out a clear policy direction and a framework for large-scale adoption and integration of hydrogen into Japan's energy system. The 7th Strategic Energy Plan's approach is to:

- Promote the establishment of hydrogen supply chains through strong government support, focusing on bridging the price gap between hydrogen and conventional fuels;
- Encourage technological development and capital investment to reduce costs and improve the competitiveness of hydrogen and its derivatives;
- Implement regulatory and support policies to facilitate the large-scale supply and use of low-carbon hydrogen both domestically and internationally; and
- Support the expansion of hydrogen use in a wide range of fields, including power generation, industry and transport, as part of the broader decarbonisation strategy.

3. Which industry sectors are most likely to be affected by hydrogen deployment?

The Basic Hydrogen Strategy and 7th Strategic Energy Plan anticipates that hydrogen will play a role in the following sectors:

- Power generation;
- Fuel cell (FC) vehicles (FCVs):
- FC buses;
- FC forklifts;
- FC trucks; FC shipsIndustrial applications;
- Steelmaking; and
- Oil refining.

4. Who are the main regulators for the hydrogen market?

Ministry of Economy, Trade and Industry (**METI**) – Responsible for the establishment and general enforcement of the GX Promotion Act. METI has significant influence on decision making in relation to investment schemes and financing under the GX Promotion Act and its implementation;

Ministry of Environment – Responsible for setting GX-related regulations concerning environment-related matters and its enforcement;

Ministry of Land, Infrastructure and Transport and Tourism – Responsible for setting GX-related regulations concerning matters such as transportation, houses and buildings, infrastructure and low carbon concrete and its enforcement;

Ministry of Internal Affairs and Communications – Responsible for the development and maintenance of infrastructure and facilities such as hydrogen stands;

Ministry of Finance – Responsible for the issue of the GX Transition Bonds;

Agency for Natural Resources and Energy (**ANRE**)- ANRE is an agency of METI and is responsible for the implementation of practical matters concerning the enforcement of the GX Promotion Act, such as the organisation of auctions;

New Energy and Industrial Technology Development Organization (**NEDO**) – Responsible for the promotion of technological developments concerning hydrogen;

Organization for Cross-regional Coordination of Transmission Operators, Japan (**OCCTO**) – Responsible for the maintenance of a stable and efficient supply of electricity from a neutral and impartial position; and

Prefectures – Responsible for the establishment and enforcement of local ordinances and rules concerning the hydrogen market.

5. Does the government hydrogen strategy or policy support the development of both low-carbon (blue) hydrogen and renewable (green) hydrogen?

The Japanese Government classifies hydrogen and ammonia production by carbon intensity rather than colour codes (i.e. green or blue). As such, the key threshold for 'low-carbon hydrogen' in the Green Growth Strategy is defined as 3.4kg of CO2 emissions per kilogram of hydrogen on a well-to-gate basis, and the threshold for 'low-carbon ammonia' is defined as 0.84kg of CO2 emissions per kilogram of ammonia on a gate-to-gate basis.

The Green Growth Strategy contemplates both the production of hydrogen through the processing of fossil fuel (e.g. steam methane reforming) combined with carbon capture utilization and storage (CCUS) (commonly referred to as "blue hydrogen"), as well as the production of hydrogen through renewable energy generation plus electrolysers (commonly referred to as "green hydrogen").

The Japanese government foresees a continued role for blue hydrogen which is intended to form part of the production target for 2030 (described in question 2). However, the Green Growth Strategy is silent on the subject of blue hydrogen in relation to the 2050 hydrogen production targets.

6. If the government's hydrogen strategy or policy supports the development of low-carbon hydrogen, to what extent is carbon capture and storage being taken forward?

The Japanese Government views the use of both carbon capture utilisation (CCU) and storage (CCUS) technologies as essential to its broader Green Growth Strategy. Japan has been promoting the development and use of CCU and CCUS both domestically and internationally.

The Japanese Government aims to support the development and introduction of CCUS through the enactment of a specific law for launching new CCUS projects by 2030 and to secure 6 million to 12 million tons of annual carbon dioxide storage by 2030.

In 2019 METI successfully concluded the Tomakomai project in Tomakomai City, Hokkaido, Japan. The Tomakomai project involved the construction and testing of CCUS facilities which ultimately culminated in the successful injection of 300,000 tons of CO2 underground.

In June 2021 Japan established the Asia CCUS Network, an international industry-academia-government platform for knowledge sharing and improvement of the business environment for the utilization of CCUS throughout the Asian region.

On 24 May 2024, the "CCS (carbon capture and storage) Business Act" was promulgated and is coming into effect in phases. This Act aims to develop a business environment in which private companies are able to launch CCS businesses in Japan by 2030. The Act also contains a licensing system for trial-drilling and carbon dioxide storage, and an approval system for the implementation plan of such projects.

7. Are there targets for the production of hydrogen?

The Japanese Government is aiming for a national Japanese hydrogen market size (demand side) of 3 million tons by 2030, 12 million tons by 2040 and 20 million tons by 2050. In terms of cost, the Japanese government is targeting to achieve a hydrogen supply cost level of 30 ¥/Nm3 by 2030 (approximately one third of the current hydrogen sales price) and 20 ¥/Nm3 by 2050.

8. Are there any incentive mechanisms/business models in place to support the production of hydrogen?

Funding Support

(i) GX Transition Bonds

The GX Promotion Act includes policy tools intended to encourage companies to make investments for decarbonisation by providing long-term support to projects in green transformation areas which are not yet financially viable as stand-alone projects. One of the key areas targeted by the GX Promotion Act in this regard is the promotion of the use of hydrogen and ammonia through the provision of long-term government subsidies.

In order to plug the current financial viability "gap" that is often a feature in projects utilising new technologies, the GX Promotion Act contemplates the issuance of "bonds for the transition to a decarbonised economic structure" (GX Transition Bonds) which are targeted to raise approximately ¥ 20 trillion. The funds raised through the GX Transition Bonds will in turn be made available to fund eligible projects. Eligible projects are those that satisfy the following:

Principal Conditions, an eligible project must be:

(a) presently un-investable due to uncertainty stemming from the use of innovative technologies;

(b) likely to promote national energy security, reduce emissions and increase industrial competitiveness and economic growth;

(c) targeted at changing corporate investment and demand-side behaviour; and

(d) directly result in increased capital and human resource investments in the Japanese domestic economy.

Note: Overseas projects that do not reduce Japanese domestic emissions are not eligible.

Eligible projects also have to satisfy at least one of the requirements under the Industrial Competitiveness section and Emissions Reduction section:

Industrial Competitiveness, an eligible project must:

(a) include investment in technological innovation which is expected to increase international export demand or domestic demand;

(b) contribute to both (i) the reduction in the use of fossil fuels; and (ii) improve profitability through the use of advanced technologies; or

(c) include measures to address the current lack of domestic demand due to the early stage development of the product (including supply side investment).

Emissions Reduction, an eligible project must :

(a) invest in research and development that will contribute to domestic reduction in emissions;

(b) provide capital to an investment that will directly reduce domestic emissions; or

(c) include measures to address the current lack of domestic demand due to the early stage of the product produced by the project, but which is expected to have nationwide demand in the future and will reduce emissions in the long-term.

The deployment of the GX Transition Bond funds, includes an auction by METI (implemented by ANRE and OCCTO) called the "Long- Term Decarbonized Energy Auction" which will make funds available to projects seeking to modify existing thermal power plants in order to convert such plants to ammonia co-fired plants. Participants to this auction are operators that newly invest in new carbon-free and low-carbon electricity sources, with a focus on battery energy storage systems, to realise carbon neutrality by 2050. Each successful bidder in the auction will receive support at the auctioned price for 20 years, subject to such successful bidder returning 90% of its total profit generated from other transactions such as the sale of electricity and environment attributes. Hydrogen and ammonia co-fired thermal power is one of the eligible power sources for the auction. At the time of writing this guide, the date of the next auction is pending.

(ii) Contracts for Difference (CfD) style hydrogen subsidies programme

The Hydrogen Society Promotion Act establishes a framework for awarding subsidies including the CfD-style subsidies. This Act was promulgated on 24 May 2024 and came into effect on 23 October 2024..

The first applications for the CfD-style subsidies completed in March 2025. At the time of writing this guide, the results have not been made public. The applications were required to fulfil the following core requirements in their project plans:

1 Projects must contribute to the stable hydrogen supply (use) at low price and promote decarbonisation under a fundamental premise of safe operation. Projects must utilise decarbonisation resources in economically reasonable and efficient manners (the (S + 3E)* perspective); *S + 3E = Safety + Energy security + Economic efficiency + Environmental sustainability.

2 Projects must contribute to the realisation of green transformation, namely:

(a) Projects should be designed to encourage industries to shift their fuel sources from fossil fuel to hydrogen by investing in new facilities and boosting business innovation.

(b) Due to the above-mentioned nature of the project, projects will be requested to contribute considerably to increase the global competence of the industries concerning low-carbon hydrogen supply and use.

(c) Projects should contribute to the reduction of domestic carbon emission volume based on the standard compliant with global carbon emission calculation rules, and the carbon intensity level must be below the certain value (the green transformation perspective).

3 Establishment of an independent supply chain:

(a) Subject to certain exceptions, the projects must start the supply by FY2030 and be industry-leading and independent projects that will contribute to the establishment of successive supply chain in the future.

(b) Projects must continue the supply for 10 years following the end of the subsidised period to establish the economic independence of the project.

(c) Projects must have plans to develop new industries and markets in and outside Japan by utilising the know-hows gained by the subsidised business in order to return the benefits from the subsidy to the society.

Both the supplier and user in the project will be requested to prepare a project plan together to demonstrate that the supplier and user are working under the same policy of promoting the shift of fuel source on the user side and the project is designed to achieve such goal. The government intends to support suppliers that are willing to make investments and launch low-carbon hydrogen pilot projects (such as suppliers that produce/import low-carbon hydrogen and supply the same).

Each low-carbon hydrogen supply project will be evaluated from the perspectives of 1) the significance of the project under the policy (S+3E and GX policy) and 2) the likelihood of achieving the project objective. The costs intended to be covered by subsidies are: 1) costs relating to hydrogen production for domestic use and 2) the costs related to the hydrogen production and maritime transport for international hydrogen projects (for overseas projects, the costs proportionate to the supply to Japan).

The base price and the reference price for each project are as follows:

Base price: This is a price that allows the recovery of the hydrogen production and supply costs and the securing of profit. Each project operator will propose a base price in the form of a calculation formula or a fixed value. Base prices will be fixed throughout the subsidised period as a general rule. Matters such as cost overrun must be covered by project operators. Exchange rates for overseas productions and price fluctuations due to any changes in raw material costs will be in principle reflected in base prices.

Reference price: The publicly announced price index for the fuel replaced by hydrogen that may be referred to as a reference. The highest among the following 1 to 3 will be set as a reference price:

1. The price of the existing fuel that will be replaced by hydrogen arriving in Japan + environmental value;
2. Actual sales price of hydrogen; and
3. The price based on the historical trade or sales price.

If a reference price exceeds the corresponding base price and operators are likely to earn excess profit, such operators will be requested to pay the difference between the reference price and the base price to the government. If any project is found to (i) be operating businesses that are significantly different from the proposed plan during the life of the project (including the ten years which projects are requested to continue their operation after the termination of the subsidy) or (ii) have suspended the supply due to the policy of the operator, then the operator of such project will be asked to refund the subsidy.

(iii) Green Innovation Fund

As part of the Green Growth Strategy, METI has established a ¥2 trillion "Green Innovation Fund" falling under the administration of NEDO to provide continuous support for R&D projects, demonstrations and the social implementation of selected projects for a period of 10 years.

The Green Innovation Fund will focus on priority fields for which implementation plans have been formulated within the Green Growth Strategy. Selected projects will have the following characteristics:

- Average size of R&D projects (¥20 billion or more);
- Projects for which existing short-term government support programs are sufficient will not be eligible;
- The project implementers should be companies or other profit-making businesses capable of carrying out the entire process of implementing the project; and
- The project must include innovative and fundamental R&D elements that are worthy of being commissioned by the government.

NEDO has identified 14 focus areas for the Green Innovation Fund which includes the hydrogen and fuel ammonia industry.

(iv) ANRE Hydrogen Supply Chain & Cluster Subsidy

The Japanese Government, through ANRE, has introduced a ¥5.7 billion (approximately $39 million) subsidy tender to advance the front-end engineering and design (FEED) of hydrogen hub infrastructure. This programme is intended to support the development of critical infrastructure, including pipelines and storage facilities, which will be utilised by a range of companies engaged in hydrogen-related activities. The subsidy is set to cover up to 50% of FEED costs for successful applicants, with the application period open from 5 March to 30 June, pending approval by the Japanese parliament.

Tax Support

The Green Growth Strategy views tax support as one of the key policy levers for achieving the 2030 and 2050 targets. The following tax support mechanisms are of particular relevance:

- Establishment of the Investment Promotion Tax System Toward Carbon Neutrality: A tax credit of 10% or a special depreciation rate of 50% will be provided for certain qualifying projects.
- Expansion of the R&D tax system: The R&D investment deduction of 25% will be raised to 30% of the total amount of corporate tax payable for certain qualifying companies.

9. Are there any standards in place for the classification and/or certification of low-carbon or renewable hydrogen?

At the local level, Aichi Prefecture introduced its own "low-carbon hydrogen certificate" scheme (applicable to Aichi, Mie and Gifu Prefectures) for hydrogen that satisfies a certain criteria. However, this is not tradeable as it is not a national scheme. Also, the Tokyo Metropolitan Government introduces a system (starting from April 2024) to certify users of hydrogen produced from renewable electricity.

Apart from this regional approach, the J-Credit Scheme is available, under which the government certifies the amount of greenhouse gas emissions (such as CO2) reduced or removed by carbon sinks through efforts to introduce energy-saving devices and manage forests, as "credit". The utilization of hydrogen is one of the applicable uses under the J-Credit Scheme.

(The above is based on the information available as of 28 March 2025).

10. Does the regulatory framework clearly define the regulatory requirements relating to the production, storage, transportation or supply of hydrogen?

There are no laws or regulations specific to hydrogen in Japan at the time of writing this guide. Hydrogen is regulated as a "high pressure gas" under the High Pressure Gas Safety Act, which plays a primary role in regulating the production, storage, transportation and supply of hydrogen. Various other regulations also apply to each aspect of the hydrogen value chain, of which major ones are set out below. This is an evolving area under constant review and discussion for further legislative changes, which requires close attention. Moreover, for some regulations, the applicable criteria differs depending on the municipality and thus the relevant local criteria would need to be confirmed.

Value Chain	Main Regulations	Major Applicable Regulations
Installation of production facilities and storage facilities	Permission for notification of production and storage, etc.	• High Pressure Gas Safety Act • Cabinet Order Concerning the Control of Hazardous Materials
	Requirements for ventilation, removal of dust etc., to prevent explosions	• Industrial Safety and Health Act and related ordinance • Noise Regulation Act and Vibration Regulation Act
	Requirements for spacing and distance etc., of equipment in facilities	• Act on the Prevention of Disaster in Petroleum Industrial Complexes and Other Petroleum Facilities
	Area limits on hydrogen stations	• Building Standards Act • Port and Harbour Act
	Permission etc., for construction of port facilities involving hydrogen use	• Port and Harbour Act
Marine transport	Requirements and permission etc., on loading methods and containers of liquefied hydrogen, etc.	• Ship Safety Act and related regulations • Port Regulations Act and related regulations
Production	Notification and periodic measurement of soot, smoke and NOx	• Regulation for Enforcement of the Air Pollution Control Act
Storage by tank	Technical requirements on temperatures and location of containers	• Regulation on Safety of General High Pressure Gas • Regulation for Enforcement of the Warehousing Service Act
Supply	Transport by land: restrictions on passage of vehicles in long or underwater tunnels	• Road Act
	Transport by pipelines: appointment of chief gas engineers and requirements regarding pipeline location, etc.	• Regulation for Enforcement of the Air Gas Business Act • Regulation on Safety of General High Pressure Gas • Regulations on Safety of Industrial Complexes • Seacoast Act, River Act and Road Act
	Transport by hydrogen stations: requirements regarding location and structure of equipment	• Regulation on Safety of General High Pressure Gas • Regulation Concerning the Control of Hazardous Materials

(The above is based on information available as of 30 May 2025)

11. Are there any foreign investment restrictions related to energy and infrastructure sectors?

The Foreign Exchange and Foreign Trade Act (the Act) and the Cabinet Order on Inward Direct Investment restrict inward direct investment in various categories of business from the perspective of security and the smooth operation of Japan's economy, including energy and infrastructure sectors that deal with electric power (including electricity generation), gas and heat supply.

Under the Act, any inward direct investment by foreign investors in the restricted sectors are subject to the pre-notification to the government via the Bank of Japan and such investment will be subject to the inward direct investment review.

Such regulated inward direct investment includes the acquisition of 1% or more of the shares in a listed company in Japan or acquisition of any share in a non-listed company in Japan. However, foreign investors may be exempted from pre-notification requirements if certain conditions are met. For example, if the foreign investor or its closely-related party (i) does not serve as a director or a statutory auditor of the listed company, (ii) does not have access to non-public technical information pertaining

to any designated sector, and (iii) does not, whether directly or through other shareholders, make any proposal at any shareholders' meeting with respect to the transfer or disposition of any business belonging to a designated sector, then such foreign investor is exempted from the requirement to make pre-notifications.

Even where foreign investors are exempted from the pre-notification requirement, if the number of shares acquired by the foreign investors exceeds certain thresholds, then such foreign investors must submit a post-facto notification to the government. Different thresholds for a post-facto notification apply depending on whether the foreign investor is a financial institution or not.

12. What international treaties are in place that may offer protection to international investors in hydrogen projects in the jurisdiction?

The United Nations Conference on Trade and Development **(UNCTAD**) website states that Japan is a signatory to 39 bilateral investment treaties (BITs), and certain other treaties with Investment Provisions (TIPs) and Investment Related Instruments (IRIs) which may also contain protections for investors in Japan. These can be accessed via UNCTAD's Investment Policy Hub.

Bilateral and regional free trade agreements (**FTAs**) may contain protections for investors in Japan. A chart that illustrates the FTAs, to which Japan is party, can be accessed here (in Japanese).

Japan is a signatory to the Energy Charter Treaty (**ECT**), a multilateral investment treaty which specifically address energy trade, transit and investment between its contracting parties. Therefore, international investors in hydrogen projects in Japan may seek protections under the ECT.

Market developments and opportunities

13. Are there any government grants or other government funding available to hydrogen projects (including for research and development)?

See answer to question 8.

14. Are there any notable pilot/demonstration projects in place or being planned for the production or offtake of clean hydrogen?

Japan has already commissioned several notable pilot/demonstration projects in the hydrogen sector, and planning other in the future:

- **Oarai Nuclear Facility (planned)** - The Japan Atomic Energy Agency plans to produce clean hydrogen by harnessing heat from a high-temperature gas-cooled nuclear reactor at its Oarai facility in Ibaraki. The agency has applied for regulatory approval to connect a hydrogen production plant to its test reactor, with pilot operations targeted for 2030.
- **Hokkaido Green Hydrogen Plant (2024)** – A joint venture between Hokkaido Electric Power, Green Power Investment, Nippon Steel Engineering and Air Water aims to produce 550 tons of green hydrogen per annum and is expected to commence operations in 2024.
- **Asahi Kasei hydrogen pilot plant in Kawasaki (2024)** - Operating four 0.8 MW alkaline water electrolysis modules to test multi-module green hydrogen production under real-world conditions.
- **Takasago Hydrogen Park (2022)** – Mitsubishi Power plans to develop the Takasago Hydrogen Park to be used to validate hydrogen-related technologies such as the development and testing of hydrogen gas turbines using hydrogen as a sole source of fuel.
- **Suiso Frontier (2022)** – Kawasaki Heavy Industries constructed the world's first liquified hydrogen carrier which delivered its first shipment of liquified hydrogen from Victoria, Australia to Kobe, Japan on 25 February 2022.
- **JERA Hydrogen Utilization Demonstration Project (2021)** – JERA will trial the practical use of hydrogen at one of its existing LNG thermal power plants. The Project will switch a portion of the LNG fuel used to generate electricity at JERA's large-scale LNG thermal power plant in Japan to hydrogen and evaluate the resulting operational and environmental characteristics over a period of approximately 5 years from October 2021 to March 2026.
- **Fukushima Hydrogen Energy Research Field (FH2R) (2020)** – This project was constructed in Namie town, Fukushima Prefecture and includes a renewable energy-powered 10MW-class hydrogen production unit. FH2R can produce up to 1200 Nm3 of hydrogen per hour using renewable energy.

15. Are there any commercial-scale clean hydrogen production projects in development or already operating?

The Fukushima Hydrogen Energy Research Field (described above) makes use of renewable energy for its hydrogen production, adjusting production in accordance with renewable energy availability. FH2R uses 20MW of solar power generation facilities alongside grid power to run a 10MW-class hydrogen production unit. It has the capacity to produce, store, and supply up to 1,200 Nm3 of hydrogen per hour (rated power operation).

16. Have there been any hydrogen-related disputes in your jurisdiction?

No.

Last updated June 2025

Kenya

Ashurst collaborated with **Anjarwalla & Khanna** in the preparation of this content. We are grateful for their input.

Policy and regulation

1. Is there a government hydrogen strategy or policy?

Yes, the Government of Kenya, launched its Green Hydrogen Strategy and Roadmap (the **Strategy**), during the Africa Climate Summit 2023. The full copy of the Strategy can be accessed **here**.

In addition, the Ministry of Energy and Petroleum released the draft National Energy Policy 2025- 2034 (the **Draft Policy**), which identifies green hydrogen as a priority for green industrialisation and sustainability. The full copy of the Draft Policy can be accessed **here**.

The Energy and Petroleum Regulatory Authority (EPRA) has also issued the Guidelines on Green Hydrogen and its Derivatives (the **Guidelines**), effective 1 May 2024, that now serve as the interim rule-book for sustainability criteria for green hydrogen and its derivatives in Kenya, relevant statutory instruments, standards and a monitoring mechanism for projects under development. The full copy of the Guidelines can be accessed **here**.

2. What are the key goals and commitments included in the strategy/policy?

2.1 Green Hydrogen Strategy and Roadmap

Green Hydrogen is stated to be a key part of Kenya's decarbonization strategy to help the country meet its obligations set out in the development blueprints, Vision 2030, the Bottom-Up Economic Transformation Agenda, its Nationally Determined Contributions (NDC) that were revised to a higher standard as of May 2025, the National Long Term Low Emission Development Strategy, the National Climate Change Action Plans, and other climate change obligations enshrined in agreements such as the Paris Agreement and Africa Agenda 2063.

The Strategy outlines a phased implementation split into two five-year phases that aim to harness Kenya's renewable energy sources to enhance agricultural production, industrialisation and decarbonization. The Key objectives of the Strategy are as follows:

- Improve the balance of payments by substituting imports with local production of hydrogen based commodities such as fertilisers and methanol.
- Enhance food security through local, green fertilised production.
- Promote green industrialisation and decarbonisation, reducing fossil-based hydrogen and supporting low-carbon economic transformation.
- Attract investment, both public and private, into green hydrogen infrastructure and downstream industries.

The following are some of the priority action plans for the operationalisation and implementation of the Strategy:

- Establish a high-level "green hydrogen program coordination committee";
- Establish a green hydrogen secretariat to operate as a "one-stop-shop";
- Organize National Green Hydrogen roundtables on finance and green fertilizer;
- Develop a monitoring and evaluation plan;
- Develop a green hydrogen strategy and roadmap resource mobilization plan;
- Include dedicated provisions on green hydrogen in the national energy policy;
- Support/fast-track catalytic projects that demonstrate commercial viability, including implementation of KenGen's Olkaria green hydrogen demonstration project;
- Develop a green hydrogen stakeholder engagement and communication plan;
- Establish local and international partnerships to scale up training and capacity building; and
- Expand regional and international cooperation and partnerships on green hydrogen.

2.2 Draft Energy Policy

Green hydrogen remains an attractive alternative energy source, and the Draft National Energy Policy outlines a strategic vision for green hydrogen as a cornerstone of Kenya's net-zero transition. The Government plans to build a foundation for a green hydrogen economy that's not only environmentally sustainable but also drives infrastructure development and creates new markets. The 2025 Energy Policy highlights the strategic opportunities that Kenya has in relation to green hydrogen such as its strategic geographical location and vast renewable energy sources that can attract foreign investment. The policy sets out four key actions:

- Set up a national coordination body to bring together government, investors, and regulators so green hydrogen projects can move forward smoothly.
- Use climate funds to make green hydrogen more affordable, through contracts for difference that help cover the cost gap between green hydrogen and cheaper fossil fuel alternatives.
- Invest in shared infrastructure such as pipelines, storage, and export facilities so that developers are not held back by high logistics costs.
- Support local jobs and skills by encouraging partnerships and training that ensure Kenyans can benefit directly from this new industry.

2.3 Guidelines on Green Hydrogen and its Derivatives

The Guidelines are a milestone under the Green Hydrogen Strategy and Roadmap for Kenya that defines the country's short- and medium-term goals towards a green hydrogen economy. The Guidelines provide a framework for monitoring the implementation of green hydrogen projects in Kenya as well as the relevant statutory requirements, promote compliance with local and international standards and provide a monitoring mechanism for projects under development. These Guidelines also contain incentives to promote investment in the sector including export processing zones (EPZ) where investors in green hydrogen and its derivatives can benefit from:

- A 10-year withholding tax holiday.
- Exemption from stamp duty and from VAT on machinery and raw materials.
- Operation under a single license.
- 25% corporate tax after the first 10-year tax holiday expires.
- 100% investment deduction allowance over 20 years.
- No exchange control.

3. Which industry sectors are most likely to be affected by hydrogen deployment?

The sectors most likely to be affected by the development of hydrogen are:

- The power sector with hydrogen potentially replacing fossil fuels, or reducing their usage;
- Manufacturing i.e., with hydrogen being used for the production of fertilizers, ammonia, methanol, and green steel;
- Transport through decarbonising road transport, shipping, and aviation; and
- Agriculture through the production of green fertilizer/ammonia.

The government has committed to enhancing Kenya's climate action by adopting innovative, clean, and sustainable energy technologies including the use of hydrogen.

4. Who are the main regulators for the hydrogen market?

The hydrogen market in Kenya is nascent and laws and regulations addressing the regulation of the hydrogen value chain are yet to be enacted. However, based on the existing laws, the following are the key regulatory bodies that are likely to play a role in the regulation of the hydrogen market in Kenya:

- The Energy and Petroleum Regulatory Authority (**EPRA**), oversees the energy and petroleum sector in Kenya and is responsible for the regulation of the production, conversion, distribution, supply, marketing, and use of renewable energy. In the hydrogen sector, EPRA would be responsible for the development of the regulatory framework, licencing of the various sector players, and ensuring the safe and sustainable development, production, and utilisation of hydrogen and its derivatives. Under the Guidelines, EPRA is now also responsible for developing and implementing the regulatory framework governing the production, conversion, storage, transportation, and utilisation of green hydrogen and its derivatives in Kenya. This includes setting sustainability criteria, overseeing licensing processes, ensuring safety standards, and facilitating stakeholder engagement to promote the growth of the green hydrogen economy.

- The Kenya Bureau of Standards (**KEBS**) is a key government regulatory body responsible for setting standards, metrology, and conformity assessment in Kenya. It is anticipated that KEBS will play a crucial role in establishing quality standards, ensuring safety, and promoting conformity assessment processes for the production, storage, handling, and distribution of hydrogen and the hydrogen derivatives in Kenya;
- The National Environmental Management Authority (**NEMA**) is a government agency established to exercise general supervision and coordination over all matters relating to the environment and to be the principal instrument of the Government in the implementation of all policies relating to the environment. NEMA regulates the transportation of hazardous substances (including hydrogen) with the aim of mitigating any potential environmental risks and promoting sustainable practices in the transportation of hazardous substances;
- The Water Resources Authority (**WRA**) is responsible for the formulation and enforcement of standards, procedures and regulations for the management and use of water resources in Kenya. In the hydrogen market, WRA's role would include overseeing the use of the available water resources needed in the electrolysis process for the production of hydrogen; The Fertilizer and Animal Foodstuff Board of Kenya (FAFB), to the extent of application of hydrogen towards fertiliser production. FAFB is responsible for the regulation of the production, manufacture, packaging, importation and marketing of fertilizers;
- Green Hydrogen Program Coordination Committee (**GH2-PCC**), C is a multisectoral committee comprising of government ministries and state agencies relevant to the green hydrogen economy, private sector and civil society. The committee provides strategic oversight and monitors the implementation of the Green Hydrogen Strategy and Roadmap for Kenya. The GH2-PCC also represents Kenya in international green hydrogen forums to promote national interests; and
- Green Hydrogen Secretariat (**Secretariat**). The GH2-PCC is supported by a Green Hydrogen Secretariat that is described as a "one-stop-shop" to streamline project approval, fast-track implementation of flagship projects, and provide market research along with value chain analysis. The Secretariat is established under EPRA.

5. Does the government hydrogen strategy or policy support the development of both low-carbon (blue) hydrogen and renewable (green) hydrogen?

Kenya's hydrogen strategy and policy framework as outlined in the Strategy, the Guidelines, and the Draft Policy, focuses exclusively on the development of renewable (green) hydrogen. While the Strategy makes broad references to supporting a low-carbon future and the adoption of low-emission technologies, it does not currently support the development of low-carbon (blue) hydrogen, which relies on natural gas combined with carbon capture and storage (CCS).

Further, the Joint Declaration on Renewable Clean Hydrogen signed in March 2023 between the Government of Kenya and the European Investment Bank (EIB) (the Joint Declaration) not only supports the investment in renewable clean hydrogen but will improve the country's understanding of how best to identify, structure, unlock and implement green hydrogen investment.[2]

6. If the government hydrogen strategy or policy supports the development of low-carbon hydrogen, to what extent is carbon capture and storage being taken forward?

The Strategy touches on the need to de-carbonize the road and transport sector for the realization of a low carbon future but does not expressly mention DAC and CCUS.

The Draft Policy does recognise CCS as one of several emerging technologies, alongside green hydrogen and advanced energy storage, however, it is only mentioned in the context of general research and development support, establishment of partnerships to support development of low carbon technologies and capacity building for low-carbon technologies. There are no concrete plans, regulatory commitments, or pilot projects related to CCS in either the policy or the Guidelines.

However, Kenya is among the first countries in the Global South to announce a project on CCUS, aiming to decarbonize high-emitting industrial sectors.[3] RepAir, a Direct Air Capture (DAC) firm, and Cella, a carbon storage technology company, have partnered to launch an innovative Carbon Capture and Storage venture. The project uses Kenya's renewable energy resources and favourable geology in the Rift Valley to remove and store CO_2, supporting the country's climate and green investment goals.[4]

Whilst the CCUS technology is still in the early stages of development in Kenya, the Climate Change (Amendment) Act No. 9 of 2023 includes provisions that allow for the creation of guidelines on removal or sequestration credits that take carbon dioxide out of the atmosphere and either use or store it via afforestation, reforestation and nature-based solutions or technology removal. The Climate Change (Amendment) Act No. 9 of 2023 provides for technologies in the white list that can deliver mitigation outcomes that can contribute to the Nationally Determined Contributions and carbon capture is one such technology in the white list.

2 Kenya: EIB and Kenya strengthen green hydrogen cooperation. 1 March 2023.
3 https://www.ccus-expo.com/industry-news/ccs-partnership-established-kenya-between-repair-cella
4 https://carbonherald.com/repair-teams-up-with-cella-for-innovative-dac-initiative-in-kenya/

7. Are there targets for the production of hydrogen?

Yes, the Strategy outlines the following targets for hydrogen production from 2023 through to 2032:

- In the short term (2023-2027) – domestic market development: Develop policy and regulatory instruments, have the first commercial-scale green hydrogen projects(s) operational, and establish cooperations with international RTD[5]4 centres;
- In the medium term (2028-2032) – domestic market growth by 2030: 50% import substitution of nitrogen fertilisers (300,000 – 400,000 tonnes/year), pilot projects in other sectors including baseload power and transport, production of green shipping fuels, and explore regional export opportunities for green fertilisers;
- In the long term (2032 and beyond) – domestic and export market growth: roll out further green hydrogen applications, like transport and green steel, and expand existing and explore new export opportunities for green hydrogen products "Made in Kenya".

8. Are there any incentive mechanisms/business models in place to support the production of hydrogen?

Currently, there are no incentive mechanisms in place specifically tailored for the production of hydrogen, however, there are general incentives that can support hydrogen projects.

The Ministry of National Treasury & Economic Planning published the Green Fiscal Incentives Policy Framework that is still in draft form. It seeks to identify and prioritize the implementation of a coherent suite of green fiscal reforms that will allow the country to exploit the opportunities of continuing a low-emission development path while enhancing climate resilience and environmental sustainability.

The Guidelines also contain incentives to promote investment in the sector including export processing zones (EPZ) where investors in green hydrogen and its derivatives can benefit from:

- A 10-year withholding tax holiday.
- Exemption from stamp duty and from VAT on machinery and raw materials.
- Operation under a single license.
- 25% corporate tax after the first 10-year tax holiday expires.
- 100% investment deduction allowance over 20 years.
- No exchange control.

Of the general tax incentives, these may be available on a project or sector basis.

9. Are there any standards in place for the classification and/or certification of low-carbon or renewable hydrogen?

There are no existing standards in place for the classification and/or certification of low carbon or renewable hydrogen. However, the Guidelines, state that a framework will be developed to establish certification, sustainability, and traceability criteria aligned with international standards including lifecycle greenhouse gas emission thresholds and definitions distinguishing green hydrogen from other forms.

However, EPRA has been appointed the official issuer of I-RECs in Kenya following approval by the I-TRACK Foundation Board, taking over from the Green Certificate Company (GCC).[6] I-RECs are used to track and verify renewable electricity consumption across international markets and represent proof that one megawatt-hour (MWh) of electricity was generated from a renewable energy source. This gives it authority to verify and certify renewable energy production under internationally recognised standards.

The Central Bank of Kenya has recently released a draft Kenya Green Finance Taxonomy (the **KGFT**). The KGFT is intended to be a classification system or catalogue that defines a minimum set of activities that are eligible to be defined as "green" in line with international best practice and national priorities and it provides a basis for regulators to align or reference green financial products.

The KGFT is currently in draft form and undergoing stakeholder engagement.

5 This term has not been defined in the Strategy. We assume that it refers to Research and Technology for Development.
6 https://www.trackingstandard.org/the-energy-and-petroleum-regulatory-authority-approved-as-i-rece-issuer-in-kenya/#:~:text=Kenya's%20Energy%20and%20Petroleum%20Regulatory,REC(E)%20in%20Kenya.

10. Does the regulatory framework clearly define the regulatory requirements relating to the production, storage, transportation, or supply of hydrogen?

There is no existing regulatory framework for hydrogen and no corresponding regulatory requirements relating to the production, storage, transportation, or supply of hydrogen in Kenya.[7] However, the Draft Policy sets out a detailed agenda to support the establishment of a green hydrogen industry as part of the country's broader green industrialization and environmental sustainability goals. The policy outlines four key areas of intervention. First, it proposes the establishment of a centralized coordination framework to support private and public sector investments, regulation, and financing for green hydrogen, including the formation of a Green Hydrogen Committee and a stakeholder engagement strategy. Second, it seeks to introduce Contracts for Difference and other financial mechanisms to make green hydrogen and its derivatives cost-competitive and to support research, innovation, and project development. Third, the policy emphasizes the development of common hydrogen infrastructure particularly for transport, storage, and export to reduce logistical bottlenecks. Finally, it promotes local value creation through strategic collaboration, capacity building, training programs, secondments, and public awareness campaigns. The policy includes clear performance indicators and targets implementation between 2025 and 2034, with a projected total investment of KES. 65 billion, to be sourced from the Government of Kenya, development partners, and private sector actors.

11. Are there any foreign investment restrictions related to energy and infrastructure sectors?

There are no foreign investment restrictions related to the energy and infrastructure sector that we are currently aware of.

12. What international treaties are in place that may offer protection to international investors in hydrogen projects in the jurisdiction?

The United Nations Conference on Trade and Development (UNCTAD) website states that Kenya is a signatory to 21 bilateral investment treaties (BITs). Out of these, 10 are currently in force, 2 have been terminated, and the remaining 9 have been signed but are not yet in force. In addition, Kenya is party to several other international agreements, such as free trade agreements (FTAs), regional investment protocols (like those under the African Continental Free Trade Area (AfCFTA) and COMESA), and multilateral treaties. These can be accessed from the Kenya Treaties online database maintained by UNCTAD's Investment Policy Hub.

Market developments and opportunities

13. Are there any government grants or other government funding available to hydrogen projects (including for research and development)?

We are not aware of any government funds set aside specifically for green Hydrogen. However, the Strategy recognises that blended financing and innovative financial instruments will play a crucial role in spurring green hydrogen investments in Kenya.

It further mentions the following facilities that have been set up globally to support the development of the green hydrogen sector: Hydrogen Bank facility, EU-EDFI facility and The European Fund for Sustainable Development Plus (EFSD+) guarantee facility.

The government of Kenya on Tuesday 05 September 2023, signed an understanding with the European Union (EU), that will see the EU provide nearly KES 1.9 billion (€12 million) in grants for investment in Kenya's green hydrogen industry.[8]

14. Are there any notable pilot/demonstration projects in place or planned for the production or offtake of clean hydrogen?

While there are currently no government-initiated pilot/demonstration projects in place or planned for the production or offtake of clean hydrogen, through the Joint Declaration, the Government of Kenya plans to develop projects that will develop green hydrogen as part of the Kenya Energy Roadmap 2040.[9]

We are also aware of certain start-ups seeking to deploy various hydrogen projects as well as DAC/CCUS projects in Kenya.

In respect of Direct Air Capture (DAC) projects, Project Hummingbird, a partnership between Cella Mineral Storage and Octavia Carbon, has announced a carbon capture project in Kenya.[10] Octavia Carbon has also announced the deployment of machines designed to directly capture atmospheric carbon dioxide from the atmosphere using DAC technology.[11]

Climeworks and Great Carbon Valley are also exploring the development of large scale DAC + S projects in Kenya.[12]

According to the Green Hydrogen Organisation, below are some notable proposed green hydrogen projects in Kenya [13]:

- a proposed development by Fortescue of a green ammonia and fertiliser facility using the Olkaria geothermal resource in Naivasha;
- a proposed KenGen Green Hydrogen Ammonia to Green Fertilizer project; and
- a proposed hydrogen power plant by Renewstable Kenya/HDF Energy.

TalusAg has partnered with Kenya Nut Company to install a commercial modular green ammonia system to enable the production of fertilizer.[14]

15. Are there any commercial-scale clean hydrogen production projects in development or already operating?

There are currently no commercial-scale clean hydrogen production projects operating in Kenya. However, Maire Tecnimont S.p.A., an Italian group of 50 companies, through its subsidiaries MET Development, Stamicarbon and NextChem announced in 2021, their interest in a commercial scale renewable power–to-fertilizer (nitrate fertilizer) plant in Kenya.

Furthermore, the Government of Kenya, announced arrangements with Fortescue Future Industry (FFI) for the proposed development of green energy and green ammonia projects in Kenya.[15]

As noted above, we are also aware of several other projects being developed by private sector sponsors in areas such as green ammonia, fertilizer, and carbon removal / CCUS.

16. Have there been any hydrogen-related disputes in your jurisdiction?

We are not aware of any reported hydrogen-related disputes in Kenya as of April 2025.

Last updated May 2025

7 Ministry of Energy and Petroleum & GIZ, Baseline Study on the Potential for Power-to-X / Green Hydrogen in Kenya, January 2022, 143.
8 https://nation.africa/kenya/health/kenya-signs-sh1-9bn-green-hydrogen-pact-with-the-eu-4359542.
9 Kenya: EIB and Kenya strengthen green hydrogen cooperation, 1 March 2023.
10 https://carbonherald.com/octavia-carbon-cella-mineral-storage-pilot-direct-air-capture-plant-kenya/
11 https://climateinsider.com/2024/01/10/octavia-carbon-kenyan-climate-tech-startup-secures-funding-for-carbon-capture-technology/

12 https://climeworks.com/press-release/climeworks-and-great-carbon-valley-chart-path-to-large-scale-dac
13 https://gh2.org/countries/kenya#:~:text=Project%20Spotlight&text=Renewstable%C2%AE%20Kenya%20%E2%80%93%20HDF%20Energy,the%20project%20is%20%24500%20million
14 https://energynews.biz/kenya-nut-and-talus-renewables-to-manufacture-sustainable-fertilizer-with-hydrogen/#google_vignette
15 Fortescue.Com https://fortescue.com/news-and-media/news/2023/07/10/kenya-and-ffi-take-major-step-forward-on-green-energy-and-green-ammonia projects 15 March 2023.

Malaysia

Ashurst collaborated with **Zaid Ibrahim & Co**. in the preparation of this content. We are grateful for their input.

Policy and regulation

1. Is there a government hydrogen strategy or policy?

Malaysia is a federation and has Federal laws and policies which apply throughout the country, and State laws and policies which only apply to individual states.

On the Federal government level, the Government of Malaysia (**"the Government"**) launched the Malaysia National Energy Policy (2022-2040) (**"NEP"**) in 2022 to outline action plans for the development of a national hydrogen economy. The National Energy Transition Roadmap (**"NETR"**) was also announced by the Federal Government in 2023 to expedite Malaysia's transition to a more sustainable energy landscape. Later in the same year, the Government launched the Hydrogen Economy and Technology Roadmap (**"HETR"**), setting out the pathway for the development of a hydrogen economy in Malaysia.

At the State government level, the Sarawak Government through its Economic Planning Unit presented Sarawak's Hydrogen Economy Framework (**"Sarawak Hydrogen Framework"**) in 2021, charting the development of the Sarawak hydrogen economy from 2020 to 2030 and beyond.

2. What are the key goals and commitments included in the strategy/policy?

The HETR recognises the need to develop infrastructure for the adoption of hydrogen to support the decarbonisation of Malaysia's industrial and electricity sectors. It is the stated aim of Malaysia to be a leading hydrogen economy country by 2050 through accelerated technological advancement leading to the development of a robust and competitive ecosystem across the hydrogen value chain.

Among others, the HETR also lays down the following goals:

a) Hydrogen to be the cornerstone for a new energy economy in Malaysia;

b) Malaysia to achieve a sustainable energy mix through the diversification of energy types or sources, including cleaner energy;

c) Malaysia to invest in hydrogen technologies to address domestic consumption, the stability and security of energy and to sustain efforts in international energy trading and the decarbonisation of emissions.

Meanwhile, under the Sarawak Hydrogen Framework, Sarawak's main goal is to enable the widespread use and commercialization of hydrogen and fuel cell technologies through the adoption of the following five Strategic Pillars:

a) Producing hydrogen via renewable energy sources at a competitive cost;

b) Optimising the transportation cost for hydrogen for domestic use and the export market;

c) Commercialising green hydrogen in potential markets both in the region and beyond;

d) Upscaling the usage of green hydrogen and hydrogen fuel cells in the transportation sector and other industries; and

e) Increasing research & development efforts relating to the green hydrogen economy.

3. Which industry sectors are most likely to be affected by hydrogen deployment?

Presently, most of Malaysia's hydrogen supply is used in the production process of heavy industries such as oil refining and the manufacturing of methanol, ammonia, iron, and steel. Grey hydrogen is the main type of hydrogen currently used in such processes[16]. The deployment of blue / green hydrogen for the purpose of being used as a resource has the potential to decarbonise these production processes.

The NETR focuses on delivering hydrogen to the transportation sector, with special reference to aviation, heavy and light vehicles, rail, buses and shipping. The HETR also aims to develop infrastructure for the adoption of hydrogen to support the decarbonisation of Malaysia's industrial and electricity sectors.

4. Who are the main regulators for the hydrogen market?

There are currently no specific regulators for the hydrogen market in Malaysia, and no new regulator is created by HETR. As of now, the hydrogen market and relevant policies are being shaped through the collaborative efforts of separate ministries of the Government.

16 "Hydrogen as an attractive new energy source/carrier", MIDA e-Newsletter (July 2021)

5. Does the government hydrogen strategy or policy support the development of both low-carbon (blue) hydrogen and renewable (green) hydrogen?

Yes.

The existing mix of policies and frameworks discussed above prioritise the development of blue and **green** hydrogen. This is demonstrated as follows –

- The NEP states that the adoption of **green** hydrogen will be a key technology focus area for Malaysia. It also states that Malaysia has the potential to be an export hub for **green** hydrogen in the long-term and sets out the Government's intention to position Sarawak as a **green** hydrogen production hub.
- The NETR outlines the reshaping of Malaysia's energy landscape with **blue hydrogen** serving as a crucial stepping stone towards a fully green hydrogen economy.
- The HETR will enable Malaysia to tap into the global **green** hydrogen market[17]. The long-term strategic approach outlined in HETR is to facilitate the transition to **green** hydrogen use by focusing on new technologies and increasing the targeted conversion efficiency of hydrogen-related technologies across the hydrogen value chain. **Blue** hydrogen can serve as a supplement, given the limitation of green hydrogen due to finite renewable energy resources[18].
- The Sarawak Hydrogen Framework concerns the development of green hydrogen as Sarawak aims to be the front-runner for the green hydrogen economy in Southeast Asia by 2030.

6. If the government hydrogen strategy or policy supports the development of low-carbon hydrogen, to what extent is carbon capture and storage being taken forward?

The **NETR** underscores the importance of carbon capture and storage (**"CCS"**) and carbon capture, utilisation, and storage (**"CCUS"**) in helping Malaysia achieve its net-zero emissions goals. The use of captured CO_2 is seen as a catalyst for the emergence of new industries, contributing to Malaysia's sustainable growth and climate resilience.

The NETR sets forth specific targets related to CCS/CCUS[19]:

- The development of three CCU hubs, with two located in Peninsular Malaysia and one in Sarawak with a total storage capacity of up to 15 Mtpa by 2030
- The development of three CCU hubs with a total storage capacity ranging from 40 to 80 Mtpa by 2050 Additionally, the NETR outlines several key initiatives for CCS/CCUS, which are[20]:
  a) The development of CCUS specific policies and regulations;
  b) Strengthening CCUS adoption through provisions of incentives across various sectors;
  c) Facilitating CCUS hub infrastructure development;
  d) Establishing transboundary CO_2 agreements; and
  e) Promoting CO_2 utilization in industries

It is also a stated Action Plan of the HETR that the Government would study the economic feasibility of developing a blue hydrogen production plant with CCS/CCUS facilities, with the target being to develop clean industrial clusters that use low-carbon sources including hydrogen, complete with CCS/CCUS facilities[21].

The development of the Kasawari and Lang Lebah high-CO_2 gas fields for CCS in collaboration with the Sarawak Government is one the ten flagship catalyst projects outlined in the NETR. These projects are expected to become operational by 2026 and 2028, respectively. The CCS technology will capture CO^2 emissions from gas production fields and store them in depleted fields[22].

On 25 March 2025, the Malaysian Parliament passed the Carbon Capture, Utilization and Storage Bill 2025 (**"CCUS Act"**), introducing a comprehensive legislative framework to regulate CO_2 capture, transportation, utilization, and permanent storage in Malaysia[23]. Upon coming into force, the CCUS Act will be applicable solely to Peninsular Malaysia and the Federal Territory of Labuan, and will not extend to the states of Sabah and Sarawak.

Ahead of this legislative development, the Government had, since 2022, implemented various tax incentives for companies engaged in in-house CCS activities, as well as those using CCS services.

At the state level, Sarawak has introduced key legislative measures to support the growth of CCS in the state. The Land (Carbon Storage) Rules 2022 regulate the use of land for the capture, retention, storage, and sequestration of carbon dioxide and other

17 Fadillah: M'sia set to become regional renewable energy industry leader with launch of Hydrogen Economy and Technology Roadmap – Malaysian Green Technology and Climate Change Corporation (mgtc.gov.my)
18 Hydrogen Economy & Technology Roadmap | Malaysian Science and Technology Information Centre (mosti.gov.my), page 5
19 NETR, page 50.
20 NETR, page 51.
21 HETR, page 132.
22 NETR, page 55.
23 "Dewan Negara passes CCUS Bill 2025, paving way for carbon capture and green growth", The Malay Mail (25 March 2025)

greenhouse gases[24], while the Forests (Forest Carbon Activity) Rules 2022 govern carbon-related activities involving forest resources. Both sets of rules have been in force since 1 January 2023. Complementing these, the Environment (Reduction of Greenhouse Gases Emission) Ordinance 2023, which came into force on 1 March 2024, regulates industrial emissions and promotes the adoption of low-carbon technologies[25].

7. Are there targets for the production of hydrogen?

Yes.

The NETR prioritises the development of blue and green hydrogen and proposes the following key targets[26]:

a) Blue Hydrogen: To completely phase out the use of grey hydrogen as a feedstock by 2050

b) Green Hydrogen: To produce up to 2.5 Mtpa of green hydrogen by 2050 from RE such as hydroelectric power and solar

c) Low-carbon Hydrogen Hubs: To establish one low-carbon hydrogen hub by 2030, and an additional two hubs by 2050, bringing the total to three hubs.

More detailed targets are set forth in the HETR, covering the five strategic thrusts of –

a) strengthening the governance system, institutional frameworks and regulatory mechanisms[27];

b) facilitating an enabling environment and economic instruments[28];

c) accelerating the commercialisation of technology to enable export and domestic uptake[29];

d) developing capacity and enhancing capability[30]

e) improving communication, education and public awareness[31]

8. Are there any incentive mechanisms/business models in place to support the production of hydrogen?

Yes.

The NETR provides key initiatives on financing and investment which are designed to support various aspects of the energy transition, including hydrogen production. The relevant key initiatives are as follows[32]:

a) Establishment of a National Energy Transition Facility ("NETF")

- Launch an initial seed fund with a value of RM2 billion;
- Explore the use of a catalytic blended finance platform, aimed at accelerating the mobilization and allocation of capital. This platform is intended to make funds more accessible, simplify the investment process, and ensure a smooth flow of financial resources towards energy transition projects;

b) Mobilization and attraction of private capital for energy transition

- Attract private capital from sources such as green foreign direct investments (FDI), international and domestic capital markets, venture capital (VC), and private equity (PE)
- Speed up the adoption of innovative sustainable finance instruments
- Develop a capacity-building programme to enhance the skills of financial institutions (FI) and fund managers, in collaboration with Joint Committee on Climate Change (JC3) and financial industry training institutes
- Scale-up sustainable finance literacy, awareness programmes and technical capacity building targeting small and medium-sized enterprises (SMEs) by JC3 including through pilot programmes such as Greening the Value Chain
- Expedite venture capital investments in high-risk, early-stage energy ventures in suitable areas

c) Implementation of a carbon pricing mechanism

- Implement a phased and meticulously calibrated carbon pricing mechanism that provides clear market signals on decarbonisation while simultaneously creating an additional capital pool for investments in energy transition
- Implement a communication strategy to gain support from businesses and the public for this carbon pricing approach

24 Ling, "Sarawak first state to legislate carbon storage regulation, says deputy minister", The Star (18 May 2022)
25 Demies et. al, "Forest Carbon Initiatives in Sarawak: A Milestone for Sustainable Forest Management and Climate Mitigation", Forest Department Sarawak (October 2024)
26 NETR, page 37.
27 HETR, page 122.
28 HETR, page 130.
29 HETR, page 138.
30 HETR, page 147.
31 HETR, page 150.
32 NETR, page 59.

To accelerate the growth of the hydrogen sector, the Government introduced a series of targeted fiscal incentives under the 2024 National Budget to encourage greater private investment. The scope of the Green Investment Tax Allowance (GITA) was extended to include green hydrogen-related assets and projects.

According to the updated **Guidelines for GITA** published in April 2024, eligible companies investing in approved green technology assets or implementing qualifying green technology projects may offset a portion of the GITA against a percentage of their statutory income over a 10-year period (structured as five years plus a five-year extension). The the Malaysian Green Technology and Climate Change Corporation ("MGTC") is in charge of applications for GITA assets, while applications for GITA projects is under the purview of the Malaysian Investment Development Authority ("MIDA").

9. Are there any standards in place for the classification and/or certification of low-carbon or renewable hydrogen?

No.

There are currently no specific standards in place for the classification and/or certification of blue and green hydrogen.

10. Does the regulatory framework clearly define the regulatory requirements relating to the production, storage, transportation or supply of hydrogen?

Malaysia does not yet have a regulatory framework which specifically concerns hydrogen. However, under the NEP and the NETR, the Government commits to developing regulations to ensure the safe, secure and equitable roll-out of hydrogen production, transport and end-use applications[33].

It is also recognized in the NETR that there is a deficiency in policy support, defined standards and regulations governing hydrogen from a policy and regulatory standpoint. It has been noted that determining the suitable primary legislation to govern hydrogen could involve a division of responsibilities between the existing Gas Supply Act 1993 and the Renewable Energy Act 2011[34].

In addition, the following regulations currently in place may be relevant for the production, storage, transportation, or supply of hydrogen before any hydrogen-specific regulations are rolled-out in the future[35]:

The Environmental Quality Act 1974, in particular, Section 22 (which sets out restrictions on pollution of the atmosphere), the Environmental Quality (Clean Air) Regulations 2014 and the Environmental Quality (Control of Solid Waste Transfer Stations and Landfill) Regulations 2009 set out environmental regulations that businesses and industries must comply with.

The National Land Code, Industrial Co-ordination Act 1957 and Occupational Safety and Health Act 1994 may be applicable in governing the storage and production of hydrogen in facilities situated in industrial zones or in approved standalone areas.

The Technical Code for Hydrogen Storage and Safety with Fuel Cell as Power Generator for ICT Infrastructure developed pursuant to the Communications and Multimedia Act 1998 specifies requirements for the handling, labelling and storage of hydrogen by ICT industries utilising hydrogen-powered fuel cells as a power supply.

Currently, hydrogen transportation in Malaysia is governed by the Road Transport Act 1987 for road transportation and the Railways Act 1991 for rail transportation. Although the Gas Supply Act 1993 regulates the transportation of gas via pipeline, it is worth noting that the definition of "gas" under the Act may not expressly include hydrogen.

This regulatory gap is less of an issue in Sarawak as the state has passed the Distribution of Gas (Amendment) Bill 2024, which amended the Distribution of Gas Ordinance 2016 to expressly include hydrogen within the definition of "gas". The amendment also establishes a comprehensive regulatory framework for the generation, storage, distribution, and use of hydrogen across Sarawak[36].

11. Are there any foreign investment restrictions related to energy and infrastructure sectors?

The Government allows foreign investors to hold up to 49% equity ownership in Malaysian incorporated companies that own power generating facilities utilising either renewable energy or non-renewable energy[37].

For the oil and gas industry, upstream activities require a licence from PETRONAS, and depending on the specific type of activity, the foreign equity limit falls between 30% and 100%[38].

33 NEP page 64.
34 NETR, page 38..
35 Abdullah, "The Use of Hydrogen in the Energy System in Malaysia and the Relevant Laws and Regulations" (10 January 2023)
36 "Sarawak Legislative Assembly unanimously passes Distribution of Gas (Amendment) Bill 2024", Dayak Daily (11 November 2024)
37 "Renewable energy regulations in Malaysia", Asia Business Law Journal (15 December 2021)
38 Looi et. al, "Doing Business in Malaysia: Overview", Practical Law (1 September 2021)

12. What international treaties are in place that may offer protection to international investors in hydrogen projects in the jurisdiction?

Malaysia is a signatory to 56 bilateral investment treaties (BITs) and 26 treaties with investment provisions (TIPs) in force that can offer protection to international investors in Malaysia.

Furthermore, Malaysia is currently a party to Investment Guarantee Agreements (**"IGAs"**) with 62 countries which are in force. A table of the countries that are parties to these IGAs can be found here. Additionally, Malaysia has ratified the Comprehensive and Progressive Agreement for Trans-Pacific Partnership ("CPTPP") on 30 September 2022 to bolster foreign investments. CPTPP is a free-trade agreement between 11 countries around the Pacific Rim which are Canada, Mexico, Peru, Chile, New Zealand, Australia, Brunei, Singapore, Malaysia, Vietnam and Japan[39].

IGAs and CPTPP will protect against nationalization and expropriation, ensure prompt and adequate compensation in the event of nationalization or expropriation, provide free transfer of profits, capital and other fees and ensure settlement of investment disputes under the Convention on the Settlement of Investment Disputes of which Malaysia has been a member since 1966.

Market developments and opportunities

13. Are there any government grants or other government funding available to hydrogen projects (including for research and development)?

One of the NETR's key initiatives in relation to hydrogen is to develop domestic green electrolyser manufacturing capabilities.

This entails funding research and development (**"R&D"**) projects related to electrolysers in local universities. These efforts are aimed at lowering manufacturing expenses and offering financial incentives to encourage private-sector involvement in electrolyser R&D activities[40].

Hydrogen projects in Malaysia in the past have also seen the Government providing financial support. The Malaysian hydrogen energy R&D community, which mainly constitutes local universities such as UKM, UTM, UM, UITM and UNITEN, have to date garnered research funding of over RM 40 million from the Ministry of Science, Technology and Innovation and Ministry of Higher Education[41].

The 2025 National Budget announced the introduction of a Carbon Tax, which is expected to take effect by 2026. The tax will initially target the iron and steel industries, as well as the energy sector, with the goal of incentivising the adoption of low-carbon and green technologies. Proceeds from the Carbon Tax will be channelled into R&D programmes focused on advancing green technology — a move that may also benefit hydrogen-related innovations, particularly those involving industrial decarbonisation[42].

14. Are there any notable pilot/demonstration projects in place or planned for the production or offtake of clean hydrogen?

Yes. They are as follows:

- **Southeast Asia's first integrated pilot hydrogen production plant and refuelling station in Kuching, Sarawak**. This pilot project was officially launched by the Sarawak Government on 27 May 2019. Construction and operation of the pilot project was undertaken by Sarawak Energy in collaboration with Linde EOX Sdn. Bhd., a subsidiary of Linde Malaysia. The production plant produces green hydrogen through electrolysis and is able to produce 130kg of hydrogen per day at a purity of 99.999%. The station is capable of fully refuelling up to 5 fuel cell buses and 10 fuel cell cars per day[43].
- **Pilot project to use vehicles powered by hydrogen in Sarawak's public transport system**. Sarawak introduced Southeast Asia's first hydrogen-powered buses in Kuching in 2019 under a pilot project closely tied to the pilot project above. Hydrogen fuel cell buses, imported by the Sarawak Economic Development Corporation (**"SEDC"**), are currently undergoing trial operations in Kuching as part of a free city transport initiative[44]. Malaysia's first hydrogen-powered smart tram, known locally as the Autonomous Rapid Transit (**"ART"**) system, arrived in Sarawak in August 2023. Since then, the Sarawak government has confirmed the purchase of 38 hydrogen-powered trams from China, which are intended to operate across three ART lines within Kuching[45]. Sarawak Metro Sdn Bhd, a wholly-owned subsidiary of SEDC, is also in the process of procuring 55 single-deck hydrogen fuel cell feeder buses to further support the ART system and enhance last-mile connectivity[46].

39 Malaysia's Ratification of CPTPP to Help Increase Trade (2 November 2022)
40 See footnote no.4.
41 Position Paper on Hydrogen Economy by Academy of Sciences Malaysia, page 44.
42 Malaysia 2025 National Budget. page 80
43 Sarawak Energy Media Release on 27 May 2019
44 Toyat, "Sarawak Metro's hydrogen buses back in action after maintenance works", Borneo Post (20 February 2025)
45 Sarawak Metro Media Release on 8 October 2024
46 Sarawak Metro Media Release on 25 October 2024

15. Are there any commercial-scale clean hydrogen production projects in development or already operating?

Yes. Some commercial-scale clean hydrogen production projects include the following:

a) On 26 January 2022, Samsung Engineering Co., Lotte Chemical Corp. and POSCO signed a MoU with SEDC to develop green hydrogen and ammonia at a plant to be built in Bintulu, Sarawak. Under this Sarawak H2biscus Project, a plant with the annual capacity to produce 7,000mt of green hydrogen will be built[47].

b) On 25 October 2023, SEDC Energy Sdn Bhd, a wholly-owned subsidiary of SEDC entered into a Joint Development Agreement (JDA) with Japan's ENEOS Corporation and Sumitomo Corporation Group to advance a clean hydrogen supply chain initiative known as the H2ornbill Project. The project aims to leverage Sarawak's hydropower resources to produce 90,000 tonnes of green hydrogen annually, with the hydrogen to be converted into methylcyclohexane (MCH) for export to Japan. Production is targeted to commence by 2028[48].

c) On 14 November 2024, Malaysian LBS Bina Group Berhad, Invest Sabah Berhad, Sabah Forestry Development Authority (SAFODA) and Midwest Green signed a memorandum of understanding (MoU) for the development and construction of a 10 GW green hydrogen production facility powered by solar and wind energy in the state of Sabah[49]. The project aims to generate over 250,000 tonnes of green hydrogen annually and the project site's proximity to nearby seaports is expected to facilitate export logistics and international market access[50].

d) On 17 January 2025, PowerChina's subsidiary China Hydropower (Malaysia) Co Ltd and Semarak Renewable Energy Sdn Bhd signed a deal to develop Malaysia's first large-scale green hydrogen production project utilizing floating photovoltaic power generation. The initiatives in the state of Perak will focus on designing, procuring, and constructing photovoltaic, hydrogen production units, and hydrogen storage units[51].

As part of the NETR's flagship catalyst projects three integrated projects to produce green hydrogen are planned to establish Sarawak as a regional green hydrogen hub. These projects include the development of a green hydrogen plant in Kuching by 2025 for domestic use and two plants in Bintulu by 2027, primarily for export purposes. Sarawak State Government through SEDC Energy is collaborating with strategic partners to develop Sarawak into a green hydrogen hub.

16. Have there been any hydrogen-related disputes in your jurisdiction?

There have to date been no hydrogen-related disputes in Malaysia.

Last updated June 2025

47 Kang, "Samsung, Lotte, POSCO to build hydrogen plant in Malaysia", The Korea Economic Daily (26 January 2022)
48 "SEDC Energy inks Joint Development Agreement with Japanese corps for establishment of clean hydrogen supply chain", Asia Pacific Green Hydrogen (19 December 2023)
49 "Groups Sign Development Agreement for Malaysia Hydrogen Hub", Hydrogen Central (19 November 2024)
50 Čučuk, "Plans unveiled for 10 GW hydrogen production facility in Malaysia", Offshore Energy (15 November 2024)
51 Kamaruddin, "Semarak RE and PowerChina sign RM1.88b deal for Malaysia's first large-scale green hydrogen production project" New Straits Times (17 January 2024)

Mexico

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Policy and regulation

1. Is there a government hydrogen strategy or policy?

The Mexican Government does not yet have a specific strategy or policy exclusively regulating the hydrogen market. However, it has adopted various regulatory instruments aimed at promoting clean energy and decarbonization strategies, including but not limited to, the Law on the Energy Sector and the General Law on Climate Change. Likewise, on March 19th, 2024, the Ministry of Energy published the Hydrogen Guidelines, outlining 11 key actions for the promotion, development, and use of hydrogen.

Furthermore, several initiatives involving the development of hydrogen technologies have been published. Earlier this year, the government enacted 8 new laws and the reform of three existing laws in the energy sector (the **"Reform"**) supporting the transition towards renewable energy and a more sustainable energy model. Key goals of this Reform include:

- The development of new energy projects.
- An expansion plan led by the Federal Electricity Commission.
- New distribution and transmission infrastructure.
- Energy justice, aimed at ensuring universal access to energy for all people living in Mexico.
- Promotion of the use of renewable energy sources in order to reduce environmental pollution.

2. What are the key goals and commitments included in the strategy/policy?[52]

As Mexico does not have a formal strategy or policy in place for the hydrogen market, there are no binding goals or commitments currently established. Despite this, the Hydrogen Guidelines published by the Ministry of Energy offer direction for the development of hydrogen, outlining objectives and aspirations for the sector. Among these objectives and aspirations, the following stand out:

- Development of a roadmap to serve as the basis for the creation of a national low-emission hydrogen strategy.
- Promoting the implementation of a culture of hydrogen generation, use, and consumption.
- Coordinating the conditions for the development of a national hydrogen industry, with the government taking a leading role.
- Development of the regulatory and normative framework for the production, commercialization, and export of hydrogen.
- Establishing the foundations for Mexico to produce low-emission hydrogen at an internationally competitive price.
- Identifying existing and future infrastructure for hydrogen integration.

3. Which industry sectors are most likely to be affected by hydrogen deployment?[53]

The following industry sectors are most likely to be affected by hydrogen deployment:

- Mining;
- Oil refinery;
- Transport;
- Metal;
- Natural gas grid; and
- Chemical industries.

4. Who are the main regulators for the hydrogen market?

The Ministry of Energy is part of the Centralized Federal Public Administration and is responsible for establishing, conducting and coordinating Mexico's energy policy. For this reason, it is considered the main regulator for the hydrogen market in Mexico.

52 Please see: LinHidrogeno.pdf
53 Please see: PowerPoint Presentation

Another potential regulator is the National Energy Commission, which was established under the Reform. While the regulation establishing full the scope of its responsibilities has not yet been clearly defined, in accordance with the new National Energy Commission Law some of its functions include:

Granting, modifying, and revoking permits for electricity generation and marketing; natural gas processing, transport, storage, distribution, and retail; petroleum products transportation, storage, distribution, and retail; and petrochemical transport, storage, and marketing.

- Establishing the methodology for tariff regulation for hydrocarbons and electricity.
- Overseeing the electricity market and monitoring prices and subsidies.
- Regulation, supervision and enforcement of penalties in activities related to the electricity and hydrocarbons sectors.

5. Does the government hydrogen strategy or policy support the development of both low carbon (blue) hydrogen and renewable (green) hydrogen?[54]

Since Mexico does not have a formal strategy or policy in place for the hydrogen market, it is unclear whether it will support the development of both low-carbon (blue) and renewable (green) hydrogen. The objectives outlined in the Reform indicate a strong focus on transitioning Mexico's energy matrix towards cleaner sources, with particular emphasis on renewable (green) hydrogen.

6.If the government hydrogen strategy or policy supports the development of low-carbon hydrogen, to what extent is carbon capture and storage being taken forward?

No specifics.

7. Are there targets for the production of hydrogen?

Chapter Four of the National Electricity System Development Program 2023-2037 establishes the projects included in the "Indicative Program for the Installation and Retirement of Power Plants." For the first time, a gradual reduction in the use of natural gas is proposed, promoting its progressive replacement by hydrogen. The goal is that, by 2036, power plants will operate with a mix of 70% natural gas and 30% hydrogen, instead of operating exclusively with natural gas.

8. Are there any incentive mechanisms/business models in place to support the production of hydrogen?[55]

Currently, the hydrogen market in Mexico is small; however, with the government's emphasis on clean energy, the market is beginning to grow. Renewable (green) hydrogen production in Mexico can be seen as being in the pilot phase. Consequently, Mexico has not yet implemented a specific fiscal policy aimed at promoting the investment, production, or use of low carbon (blue) hydrogen and renewable (green) hydrogen. However, existing legislation does offer incentives for individuals and entities that undertake actions to protect, preserve, or restore ecological balance.

As of 2024, most of the hydrogen produced in Mexico is grey hydrogen, mainly used in industrial applications such as refining and ammonia production.

9. Are there any standards in place for the classification and/or certification of low-carbon or renewable hydrogen?[56]

There are currently no specific standards in place for the classification of low-carbon or renewable hydrogen in Mexico. Nonetheless, the Electricity Sector Law establishes the issuance of clean energy certificates by the National Energy Commission. These certificates verify the generation of a specified amount of electricity from clean energy sources, including energy produced through the use of hydrogen.

10. Does the regulatory framework clearly define the regulatory requirements relating to the production, storage, transportation or supply of hydrogen?

Mexico does not yet have a specific regulatory framework for the production, storage, transportation, and supply of hydrogen. Nonetheless, various existing regulations can be directly applied to individual industrial activities related to hydrogen or used by analogy. For instance, there have been proposals to transport renewable (green) hydrogen in the form of natural gas, utilizing existing infrastructure and regulatory frameworks.

54 Please see: Mexico's Hydrogen Strategy: A Comprehensive Analysis
55 Please see: Mexico's Hydrogen Strategy: A Comprehensive Analysis
56 Please see: https://energypartnership.mx/fileadmin/mexico/media_elements/reports/Guide_for_the_Adoption_of_Guarantees_of_Origin_for_Green_Hydrogen_in_Mexico.pdf

11. Are there any foreign investment restrictions related to energy and infrastructure sectors?[57] [58]

There are no restrictions related to foreign investment in the energy and infrastructure sectors, however, in equity where foreign investors have 49% or more, they require approval from the National Commission of Foreign Investment.

As of March 2025, the Mexican government has announced Strengthening and Expansion Plan for the *National Electrical System 2025–2030* which include diverse projects to increase the access to energy for all people living in Mexico. According to the plan, Federal Energy Commission (now, National Energy Commission) will implement 51 new projects between 2025 and 2030, with the goal of expanding generation capacity by 22,674 MW, targeting a total installed capacity of 29,074 MW by 2030. Although, the Federal Electricity Commission is required to generate at least 54% of the electricity, it allows for the private sector to produce the remaining of the electricity in the country.

12. What international treaties are in place that may offer protection to international investors in hydrogen projects in the jurisdiction?

International treaties in place which help protect foreign investors in Mexico are:

- **United States – Mexico – Canada Agreement (USMCA)**: includes provisions that protects investments from Canada and the United States
- Mexico has entered numerous **"Bilateral Investment Treaties"** (**BITs**) with different countries, which typically offer protection against expropriation and adequate compensation.
- **Energy Charter Treaty** (**ECT**): extends its protection to a broad range of energy-related investments.

Market developments and opportunities

13. Are there any government grants or other government funding available to hydrogen projects (including for research and development)?[59]

In Mexico, there are several public and private financing options available for the development of hydrogen energy projects. On the public side, the Energy Planning and Transition Law establishes the Fund for Energy Transition and Sustainable Energy Use. This fund provides support to applicants who meet the necessary requirements, offering resources for initiatives focused on energy efficiency, clean technologies, distributed clean energy generation, the use of renewable sources, and efforts to combat energy poverty.

14. Are there any notable pilot/demonstration projects in place or planned for the production or offtake of clean hydrogen?[60]

There are notable pilot projects in place/planned to produce clean hydrogen. The *Strengthening and Expansion Plan for the National Electrical System 2025–2030* aims to increase the production of clean energy in Mexico, including through renewable (green) hydrogen projects. By 2030, some projects for the plan include: scaling electrolysis capacity, cost reduction, and market expansion.

Mexico currently has several renewable (green) hydrogen projects in the development phase, representing a total estimated investment of approximately USD 21.2 billion. It is estimated that these projects will produce approximately 196,707 tons of green hydrogen.

Pemex is planning to replace the grey hydrogen currently used in its refineries with green hydrogen and aims to participate in a market projected to reach USD 4 billion over the next decade. Meanwhile, the Federal Electricity Commission (CFE) is working to integrate green hydrogen into its combined-cycle power plants through blending with natural gas and the acquisition of new hydrogen-compatible turbines.

57 Please see: https://www.nortonrosefulbright.com/en-mx/knowledge/publications/9af0687a/mexico
58 Please see: https://www.whitecase.com/insight-alert/new-energy-laws
59 Please see: México impulsa el hidrógeno verde con 24 proyectos - Industry & Energy Magazine
60 Please see: Mexico's Hydrogen Strategy: A Comprehensive Analysis

15. Are there any commercial-scale clean hydrogen production projects in development or already operating?[61]

As of now, there are no commercial scale projects operating, but the Mexican Hydrogen Association keeps records of the following projects which are currently under development[62]:

- A green hydrogen production plant in Baja California targeting export to California, with an annual production capacity of 288 to 300 metric tons.
- A green hydrogen and green ammonia production facility in Hermosillo. Phase one is expected to produce approximately 600,000 metric tons of green ammonia.
- The "Power to Power" project in Los Cabos, which will supply between 15% to 20% of the local electricity demand, enabling the entry of US$2.5 billion in investment.
- A green hydrogen plant in Sinaloa with an estimated investment of US$1,172 million.
- A green methanol production facility in Mazatlán, with an approximate investment of US$2.2 billion.
- A green ammonia plant in Durango, projected to produce up to 200,000 metric tons annually.
- A green hydrogen facility in Nuevo León, aligned with Mexico's energy transition goals. The project focuses on blending hydrogen with natural gas.
- A hydrogen injection initiative for cement plants in Monterrey, aimed at decarbonizing cement production through hydrogen use.
- A green hydrogen production plant in Tamaulipas.
- A facility in San Luis Potosí with an estimated investment of MXN 3.93 billion (approximately US$230 million), expected to produce 18,263 metric tons of green hydrogen annually.
- A blending project in Guanajuato, with an estimated investment of MXN 3.93 billion.
- A green hydrogen plant in Michoacán, designed to serve the industrial, public transportation, and automotive sectors.
- A hydrogen fuel cell project in Mexico City, with an estimated investment of US$6 million.
- A large-scale green hydrogen facility in Oaxaca, projected to receive an investment of US$10 billion.
- A green ammonia production plant in Campeche, with a projected annual output of 170,000 metric tons and an estimated investment of US$1,100 million.

16. Have there been any hydrogen-related disputes in your jurisdiction?[63]

There have been some notable hydrogen-related disputes in Mexico. In December 2023, the Mexican Government, through the Ministry of Energy, issued a Decree for the expropriation of Air Liquide production plant, owned by the French company in the State of Hidalgo. The government's reasoning was the need to ensure efficiency and reliability of the national energy supply as primary reason of action.

Last updated April 2025

61 Please see: Hidrógeno Verde en México: Inversiones y Proyectos Clave – CUÉNTAME DEL UNICEL
62 Please see: https://h2mex.org/mapa-de-proyectos/
63 –-Please see: https://www.clydeco.com/en/insights/2024/01/mexican-government-carries-out-expropriation-of-hy

Morocco

Policy and regulation

1. Is there a government hydrogen strategy or policy?

Yes. For several years, the Kingdom of Morocco has been pioneering in its efforts to establish a green hydrogen economic and industrial sector to strengthen its energy transition.

The government's initiative was launched in 2019 with the creation of the Moroccan National Hydrogen Commission, which brings together all the stakeholders, including:

- the Minister of Energy Transition and Sustainable Development;
- the Minister of Economy and Finance;
- the Minister of Industry and Commerce;
- the Minister of National Education, Preschool and Sports;
- University Mohammed VI Polytechnic (UM6P);
- Moroccan National Office of Electricity and Drinking Water;
- Moroccan Agency for Sustainable Energy (MASEN);
- Moroccan Office of Hydrocarbons and Mines (ONHYM);
- Moroccan Research Institute for Solar Energy and New Energies (IRESEN);
- the Rabat School of Mines (ENSMR); and
- General Confederation of Moroccan Enterprises (CGEM).

In January 2021, the Moroccan Green Hydrogen Map (the H2 Roadmap) was published, followed by the publication on 11 March 2024 of Circular No. 03/2024 relating to the Moroccan offer for the development of the green hydrogen sector (the Morocco H2 Offer).

In addition to the H2 Roadmap and the Morocco H2 Offer, the EU–Morocco Green Partnership, launched in October 2022, established a strategic framework for cooperation on climate action, renewable energy and green hydrogen.

2. What are the key goals and commitments included in the strategy/policy?

2.1 The strategy

The H2 Roadmap identifies three core components of the government's strategy on green hydrogen:

1. Technologies	2. Investment and Procurement	3. Markets and Demand
Cost reduction: reducing costs across the entire value chain, including by testing new technologies, R&D and innovation activities and by deploying projects with a capacity of 1 GW in the medium term	**Industrial cluster and infrastructure**: organising the sector into industrial clusters and developing a master plan for the corresponding infrastructures. This will enable better management of the development of infrastructure required by the sector	**Exports**: developing the export industry for green hydrogen and its derivatives primarily through (i) maritime transport of synthetic liquid fuels, deployment of suitably adapted port infrastructure and production, storage and export infrastructure, and (ii) favourable taxation of green hydrogen products
Research and innovation: establishing a Moroccan research and innovation hub coordinated by the Ministry of Energy Transition and Sustainable Development in partnership with IRESEN and MASEN. The hub will support pilot projects	**Funding**: securing funding through public-private partnerships, direct financing, preferential tax treatment and risk-reducing financial instruments such as investment guarantees or export credit guarantees	**Storage**: preparing a national storage plan on the basis of a long-term techno-economic modelling of Morocco's energy system and that of interconnected countries
Local industrial integration: enabling private sector-led local industrial integration that will improve Morocco's capacity to participate in the sector's value chain and ensure knowledge transfer		**Domestic markets**: supporting market development by organising information exchanges and planning platforms, supporting R&D, creating niche markets (including encouraging the heavy-vehicle transport industry to use synthetic fuels) and introducing long-term carbon taxes as technological incentives

Using this strategy, Morocco aims to gradually implement the development of green hydrogen projects in the short, medium and long terms:

- Short term (2020–2030): The H2 Roadmap concentrates on its two pillars, which are (i) domestic use of green hydrogen for the production of green ammonia, and (ii) early exports of green hydrogen derivatives.
- Medium term (2030–2040): During this phase, falling costs and the implementation of environmental regulations are expected to unlock the first economically viable projects, especially for green ammonia and green hydrogen (both for domestic use and for export). Exports of synthetic fuels will also be feasible if importing regions – especially Europe – adopt favourable policies. In parallel, the use of green hydrogen for power storage and in transport will help to further expand the industry. In the energy sector, storage of green hydrogen is seen as a vector for reduced grid congestion and improved flexibility of the electricity system.
- Long term (2040–2050): Financial profitability analyses for ammonia, green hydrogen and synthetic fuels will accelerate and drive the scaling up of exports, as well as a broader domestic acceleration particularly in terms of industry, heat production, the residential sector, urban mobility and air transport.

2.2 Morocco H2 Offer

The Morocco H2 Offer for the development of the green hydrogen sector was implemented through Circular No. 03/2024 issued by the Head of Government on 11 March 2024. The Morocco H2 Offer covers the entire green hydrogen value chain and reflects Morocco's aim to capture over 4% of global green hydrogen demand by 2030 by leveraging Morocco's renewable energy potential, its strategic location, its infrastructure and its human capital.

The Morocco H2 Offer is aimed at investors or consortiums seeking to produce green hydrogen and its derivatives in Morocco for the domestic market or export, or both. It advocates a "holistic, transparent and pragmatic approach" based on the following five pillars:

1. Access to land

The government has dedicated approximately 1 000 000 hectares for the development of green hydrogen projects. Phase I will see the provision of 300 000 hectares, which will be divided into plots of between 10 000 and 30 000 hectares. This is a key component of the Morocco H2 Offer to unlock H2 projects, with the phasing in of land rights available to investors as the project progresses (see paragraph 4 below).

2. Competitive infrastructure

The Morocco H2 Offer recognises the need to develop additional infrastructure and to provide investors with visibility on the infrastructure needed for the development of green hydrogen projects. It seeks to develop a competitive infrastructure that will be planned, mutualised, developed and maintained in accordance with international standards: port infrastructure, hydrogen and gas pipelines to be connected to the European hydrogen/gas grid, desalination projects for green hydrogen purposes, salt caverns for the storage of green hydrogen, and the strengthening of the national electricity transmission network (see **Appendix 1**).

3. Investment, tax and customs incentives

The government has already adopted a clear incentive scheme for investment (across sectors) through the new investment charter adopted by Dahir No. 1-22-76, dated 9 December 2022, promulgating Law No. 03-22 (the Investment Charter). These incentives are detailed under question 8 below.

The investors will also be able to benefit from tax and customs incentives, including customs duty exemptions and VAT exemptions.

4. Investor selection process

Investors submit their bids to MASEN and must demonstrate, in particular, their financial strength and experience in the green hydrogen value chain.

i. Preliminary land reservation contracts

Once bids have been submitted, the government holds **initial negotiations** with selected investors, focusing in particular on the preliminary reservation of land.

If negotiations are successful, both parties sign a preliminary land reservation contract.

These preliminary contracts set out the parties' mutual commitments, including:

- **For the state**: it will reserve land for the exclusive use of the investor for up to **six months (extendable)**;
- **For the investor**: it will deliver a Preliminary Front End Engineering and Design (Pre-FEED) study (costs, schedule, content, expected results, etc), as well as an agreement on conditions of land use (duration, rent, etc).

ii. Advanced studies agreement

If both parties fulfil their commitments within the term of the preliminary land reservation contract, they will enter into final negotiations leading to an **advanced studies agreement**. This agreement specifies, among other things:

- **For the state**: it will allocate land for the exclusive use of the investor **for the duration of the advanced studies and until the conditions for the final allocation of land in respect of the investor have been met and a positive Final Investment Decision (FID) has been made**.
- **For the investor**: it will complete the Front End Engineering and Design study (costs, timeline, expected results, jobs, industrial integration, financial returns for the state, etc) within a maximum of **18 months (extendable by agreement between both parties**) and commitments regarding land use and project benefits for Morocco.

iii. Framework investment agreement

After the **advanced studies phase**:

- If the FID is positive and the investor meets all the conditions of the advanced studies agreement, the parties will enter into a framework investment agreement in accordance with the terms agreed in the advanced studies agreement.
- If the FID is positive but the investor does not meet all the conditions set out in the advanced studies agreement, the investor and the state will enter into negotiations with a view to possibly concluding an investment framework agreement.

This framework investment agreement sets out among other things:

- **For the state**: it will allocate land for the exclusive use of the investor for the entire duration of the development, construction and operation period.
- **For the investor**: it will implement an investment programme (costs, timetable, jobs, industrial integration, financial returns for the state, etc) and specify land-use terms.

See the diagram of the selection process for investors in **Appendix 2**.

5. Governance of the green hydrogen sector

The governance framework of the green hydrogen sector is structured as follows:

- The **Steering Committee**, which is chaired by the Head of Government, is responsible for the implementation of the Morocco H2 Offer and for defining its key missions. The Steering Committee consists of representatives from the government authorities in charge of the Interior, Finance, Equipment, Water, Industry, Energy, Investment and the Budget.
- **The Investment Committee** assists the Steering Committee in carrying out its responsibilities. The Investment Committee includes a Moroccan Government representative; representatives from the government authorities in charge of the Interior, Finance, Equipment, Water, Industry, Energy and the Budget; and a representative from MASEN.

Alongside these two committees, MASEN serves as the **focal point and preliminary and privileged contact for investors** who would like to develop green hydrogen projects.

MASEN is therefore responsible for receiving, informing and guiding companies seeking to invest in green hydrogen and putting potential investors in contact with the relevant ministerial departments, public institutions and companies.

2.3 EU–Morocco Green Partnership

The EU–Morocco Green Partnership, signed in October 2022, establishes a strategic framework for cooperation focusing on:

- energy transition and decarbonisation of the Moroccan economy;
- climate change mitigation and adaptation;
- protection of the environment; and
- development of the green and blue economies.

As part of this partnership, a series of workshops have been organised to harmonise the Moroccan certification system with European requirements.

This regulatory harmonisation is intended to support the recognition of Moroccan green hydrogen on the European market, subject to compliance with applicable EU criteria.

3. Which industry sectors are most likely to be affected by hydrogen deployment?

The sectors most likely to be affected by hydrogen development include:

- **Desalination**: Green hydrogen projects will increase demand for desalinated water; therefore, many desalination plants are expected to be developed in Morocco in the coming years.
- **Energy**: Green hydrogen projects require significant renewable energy capacity. Further development of solar and wind projects, related supply chains, and reinforcement of the national electricity transmission network will be necessary.
- **Ports and logistics**: In the light of Morocco's ambitions for green hydrogen exports, major developments in the ports sector are expected.
- **Fertiliser industry**: The introduction of green hydrogen into Morocco's fertiliser industry has the potential to completely transform the sector, enabling the production of low-carbon fertilisers, reducing dependence on fossil fuels and opening up new export opportunities in European and African markets.
- **Green ammonia industry**: Green hydrogen is an important raw material for the production of green ammonia – a key product for the chemical and agricultural industries. Green ammonia is therefore central to Morocco's energy and industrial strategy and it is at the heart of several huge projects.
- **Green steel industry**: Green hydrogen is central to the production of green steel. Given Morocco's ambitions to position itself as a future green steel hub, the Kingdom is set to play a key role in meeting Europe's decarbonisation needs.

4. Who are the main regulators for the hydrogen market?

In accordance with royal instructions, the Moroccan National Electricity Regulatory Authority (ANRE) is in the process of expanding its mission to include other strategic energy sectors, such as natural gas, hydrogen and its derivatives, as well as the entire energy value chain. This reform is ongoing.

5. Does the government hydrogen strategy or policy support the development of both low-carbon (blue) hydrogen and renewable (green) hydrogen?

No. Morocco is focusing primarily on green hydrogen.

6. If the government hydrogen strategy or policy supports the development of low-carbon hydrogen, to what extent is carbon capture and storage being taken forward?

For now, there is no specific policy supporting the development of low-carbon hydrogen.

7. Are there targets for the production of hydrogen?

Yes. Morocco aims to capture approximately 4% of global green hydrogen production by 2030. The H2 Roadmap estimates that the green hydrogen and derivatives industry in Morocco could be facing demand of between 13.9 TWh and 30.1 TWh by 2030.

8. Are there any incentive mechanisms / business models in place to support the production of hydrogen?

Yes. Morocco has put in place several incentive mechanisms and economic models aimed at supporting foreign investment in Morocco (across sectors) through the Investment Charter.

The Investment Charter sets out two main incentive schemes applicable to green hydrogen projects (among others):

- **The main regime**

  A project is eligible for common incentives, territorial incentives and sectoral incentives if it meets one of the following conditions:

  - the investment amount is equal to or greater than 50 million dirhams; or
  - the project creates a minimum of 150 permanent jobs.

  Depending on eligibility (common, territorial and sectoral components), the total support may amount to 30% of eligible investment expenditure.

- **The specific regime**

  The Investment Charter introduces specific incentives for major strategic investment projects. Specific measures may include special negotiations with the government on tax, financial, or administrative incentives tailored to the strategic nature of the project.

  For these purposes, a major strategic investment project is a project which is worth MAD 2 billion (approx. EUR 200 million) or more and which satisfies at least one of the following conditions:

  - It effectively contributes to ensuring Morocco's security in terms of water, energy, food or health.
  - It directly or indirectly creates a significant number of jobs.

- It has a considerable impact on Morocco's economic influence and strategic positioning at regional, continental or international level.
- It has a knock-on effect on the development of sectoral ecosystems or sectoral activities.
- It contributes significantly to the development and use of cutting-edge technologies.

Green hydrogen-related projects could be classified as strategic under the Investment Charter if they satisfy one of the above conditions and could therefore be eligible for the specific measures mentioned above.

9. Are there any standards in place for the classification and/or certification of low-carbon or renewable hydrogen?

No. That being said, workshops are currently being organised in Morocco to bring the classification and certification of green hydrogen in Morocco closer towards convergence with European regulatory standards, namely the RFNBO (Renewable Fuels of Non-Biological Origin) standards under the European RED II / RED III Directives.

10. Does the regulatory framework clearly define the regulatory requirements relating to the production, storage, transportation or supply of hydrogen?

No. Morocco does not yet have a specific regulatory framework that clearly defines the regulatory requirements relating to the production, storage, transportation or supply of hydrogen.

11. Are there any foreign investment restrictions related to the energy and infrastructure sectors?

There are no foreign investment restrictions specific to the renewable energy sector in Morocco; foreign companies may own renewable energy projects without a local-partner requirement.

However, mandatory state participation applies in the hydrocarbons sector: the National Office of Hydrocarbons and Mines (ONHYM) holds a mandatory 25% stake in hydrocarbon projects.

12. What international treaties are in place that may offer protection to international investors in hydrogen projects in the jurisdiction?

The following international treaties currently in force may offer legal protection to international investors, including in relation to hydrogen projects in Morocco.

12.1. Multilateral investment conventions and dispute settlement mechanisms

- **ICSID Convention**

  This convention established the International Centre for Settlement of Investment Disputes (ICSID), a multilateral mechanism allowing foreign investors to submit disputes with host states to an independent international arbitration tribunal.

  It allows investors to take dispute resolution outside the Moroccan judicial system alone and to initiate international arbitration proceedings.

- **New York Convention**

  The United Nations Convention on the Recognition and Enforcement of Foreign Arbitral Awards facilitates the recognition and enforcement of international arbitral awards in signatory states. It enables arbitral decisions to be enforced against states or local entities and is essential for ensuring the practical effect of the protections offered (eg ICSID, UNCITRAL, ICC).

- **Convention establishing the Multilateral Investment Guarantee Agency (MIGA)**

  MIGA is a World Bank Group organisation that provides guarantees against political and non-commercial risks (expropriation, transfer restrictions, political violence). Morocco is a member, so foreign investors can obtain multilateral guarantees for their projects, including in the energy sector.

12.2 Bilateral investment treaties (BITs)

Morocco has signed numerous BITs with other countries. The BITs currently in force typically contain protections such as fair and equitable treatment, most-favoured-nation clause, access to international arbitration, protection against expropriation without fair compensation, etc.

For foreign investors, a BIT in force between their country of origin and Morocco provides a solid basis for recourse in the event of unfavourable measures.

Market developments and opportunities

13. Are there any government grants or other government funding available to hydrogen projects (including for research and development)?

No. The only incentives are those provided by the Investment Charter and the Morocco H2 Offer mentioned above (VAT exemptions on imports, customs duty exemptions, investment grants). There are no other government grants or other government funding available for hydrogen projects.

14. Are there any notable pilot/demonstration projects in place or planned for the production or offtake of clean hydrogen?

Yes. Morocco is very active in green hydrogen pilot projects. In particular, the flagship Power to Hydrogen (PtX) project, developed by MASEN, is expected to begin operations in 2026. It aims to produce 10 000 tonnes of green hydrogen per year from a solar/wind power plant and a desalination unit.

It should be noted that the Morocco H2 Offer explicitly states that MASEN is not permitted to develop green hydrogen projects on an industrial scale.

Also, the partnership between UM6P, Chariot Green Hydrogen (a subsidiary of Chariot Limited) and Oort Energy is developing a pilot project using a PEM electrolyser of approximately 1 MW to produce green hydrogen from renewable energies.

15. Are there any commercial-scale clean hydrogen production projects in development or already operating?

Yes. Morocco has several commercial-scale clean hydrogen production projects in development, though they are not yet operational.

On 6 March 2025, the Steering Committee preselected the following projects, as part of the Morocco H2 Offer:

- a consortium of Ortus, Acciona and Nordex for the development of a large-scale green ammonia project;
- a consortium of Taqa and Moeve (formerly Cepsa) for the development of a green ammonia and synthetic fuel project;
- Acwa Power for the development of a green steel production project;
- Nareva for the development of a green ammonia, synthetic fuel and green steel project; and
- a consortium of UEG and China Three Gorges for the development of a green ammonia project.

On 2 February 2026, the Government signed with these consortiums preliminary contracts of land reservation under the Morocco H2 Offer.

The Chbika project is another example of a flagship project currently under way in Morocco. Co-developed by TE H2 (a joint venture between TotalEnergies and EREN Groupe), Copenhagen Infrastructure Partners and A.P. Moller Capital, this project aims to produce annually approximately 200 000 tonnes of green ammonia. The preliminary contract of land reservation was signed on 28 October 2024, under the presidency of His Majesty King Mohammed VI and the President of the French Republic, Emmanuel Macron. This agreement authorises the consortium to launch pre-FEED and preliminary design studies and marks the first phase of a broader development programme intended to establish a world-class green hydrogen production hub in the Guelmim-Oued Noun region.

16. Have there been any hydrogen-related disputes in your jurisdiction?

No. We are not aware of any hydrogen-related disputes in our jurisdiction.

Namibia

Ashurst collaborated with **Koep & Partners** in the preparation of this content. We are grateful for their input.

Policy and regulation

1. Is there a government hydrogen strategy or policy?

There is currently no Government hydrogen strategy or policy that outlines key goals, establishes a regulatory framework or provides policy support and incentives. However, the Government of Namibia has issued a Request For Proposals inviting experts to develop a strategy and roadmap for the production and use of hydrogen (with particular application to synthetic fuels) in Namibia. This strategy and roadmap will be the foundation for an "energy plan" for the country.

2. What are the key goals and commitments included in the strategy/policy?

Not applicable.

3. Which industry sectors are most likely to be affected by hydrogen deployment?

The **SYSTEMIQ Impact Presentation**, developed in collaboration with the Government of Namibia, highlights the following sectors as the first to be impacted by the deployment of hydrogen:

- long-haul trucking;
- mining trucking;
- fertiliser; and
- rail.

Hydrogen does not yet form part of any existing energy infrastructure in Namibia.

4. Who are the main regulators for the hydrogen market?

Not applicable.

5. Does the government hydrogen strategy or policy support the development of both low-carbon (blue) hydrogen and renewable (clean) hydrogen?

Not applicable.

6. If the government hydrogen strategy or policy supports the development of low-carbon hydrogen, to what extent is carbon capture and storage being taken forward?

Not applicable.

7. Are there targets for the production of hydrogen?

Not applicable.

8. Are there any incentive mechanisms/business models in place to support the production of hydrogen?

Not applicable.

9. Are there any standards in place for the classification and/or certification of low-carbon or renewable hydrogen?

Not applicable.

10. Does the regulatory framework clearly define the regulatory requirements relating to the production, storage, transportation or supply of hydrogen?

Not applicable.

11. Are there any foreign investment restrictions related to energy and infrastructure sectors?

There are currently no foreign investment restrictions specifically related to investment in the energy and infrastructure sectors.

However, there are standard regulations regarding foreign investments i.e. exchange control restrictions.

12. What international treaties are in place that may offer protection to international investors in hydrogen projects in the jurisdiction?

Namibia is not a signatory to any international treaties that offer specific protection for international investors in the energy sector. Only the standard investor protections provided to all foreign investors are applicable. For instance, the Government of Namibia has entered into double taxation agreements with the Governments of the following countries:

- Republic of Botswana;
- French Republic;
- Federal Republic of Germany;
- Republic of India;
- Malaysia;
- Republic of Mauritius;
- Romania;
- Russian Federation;
- Republic of South Africa;
- Kingdom of Sweden; and
- United Kingdom of Great Britain and Northern Ireland.

Market developments and opportunities

13. Are there any government grants or other government funding available to hydrogen projects (including for research and development)?

Yes, the **PTX Pilot Project Programme** provides grants for pilot projects. The grants provided by the Government are aimed at promoting international collaboration in the field of clean hydrogen and its derivatives with a specific focus on storage, transport, and the use of integrated application technologies. The funding arrangement will comprise of two modules:

- Module 1: Projects - Module 1 will fund companies/institutions that are systematically developing and promoting the sustainable production of clean hydrogen and its derivatives. This includes projects dealing with the production, storage, transport and the integrated use of clean hydrogen and its derivatives. Funding will be provided for technologies that make a contribution to an early market ramp-up as well as preparatory or accompanying development, where applicable.
- Module 2: Research Projects - Module 2 will fund research projects that are designed to accompany projects funded in Module 1. This includes preparatory or accompanying research like material development, simulations, modelling, scientific analyses, and studies.

14. Are there any notable pilot/demonstration projects in place or planned for the production or offtake of clean hydrogen?

There are currently no notable pilot projects in place or planned. Any future pilot projects are likely to be commissioned through the **PTX Pilot Project Programme**.

15. Are there any commercial-scale clean hydrogen production projects in development or already operating?

There are currently no existing commercial-scale clean hydrogen production projects in Namibia but the **Hyphen Southern Corridor Development Initiative Project** is in development.

The Hyphen Southern Corridor Development Initiative Project has passed the pre-feasibility stage. The key figures on this project include an installed capacity of 5GW of renewable energy, 3GW of electrolysis, 300,000 tonnes of clean hydrogen per annum and a total investment of USD 9.4 billion. The project timeline is set up as follows:

- Development of this project commenced in 2021 and is expected to proceed until 2024.
- Phase one - construction on phase one is set to commence in 2025 and operations are set to commence in 2027.
- Phase two - construction of phase two is set to commence in 2027 and operations are set to commence in 2029.

16. Have there been any hydrogen-related disputes in your jurisdiction?

No response provided.

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Netherlands

Ashurst collaborated with **NautaDutilh** in the preparation of this content. We are grateful for their input.

Policy and regulation

1. Is there a government hydrogen strategy or policy?

The Dutch hydrogen targets are set forth in the **Climate Agreement** (*Klimaatakkoord*, described below under 7). In addition, the Government published a **Government Strategy on Hydrogen** (*Kabinetsvisie waterstof*) on 30 March 2020 (the **Strategy**). The Strategy presents the government's vision on hydrogen and the associated policy agenda. It serves as a prelude to establishing and implementing a hydrogen programme in collaboration with stakeholders, aligning with the ambitions for hydrogen set out in the Climate Agreement.

Furthermore, the **National Hydrogen Programme** (*Nationaal Waterstof Programma*, the **NWP**) was established in February 2022. This programme is a public-private partnership aimed at collectively achieving the ambitions and agreements related to hydrogen. The NWP focuses on connecting, facilitating, accelerating, and monitoring efforts to realise these goals. It serves as an umbrella under which all developments related to hydrogen are monitored and interconnected where necessary. However, it is important to note that the NWP itself is not a decision-making body; actual decisions are made through regular policy processes.

On 7 July 2021, a cross-sectoral hydrogen working group comprising 19 organisations (including government ministries, branch organisations, TSOs, and the Port of Rotterdam) drafted and adopted a **National Hydrogen Programme Work Plan 2022-2025** (*Werkplan Nationaal Waterstof Programma 2022-2025*). This work plan contains an outlook towards 2030 and recommends collaborative efforts towards developing a **Hydrogen Roadmap** (*Routekaart Waterstof,* the **Roadmap**). The Roadmap, which was published in November 2022, focuses on the ambitions set out in the Climate Agreement; linking production, import, infrastructure, applications, and all necessary preconditions for hydrogen development.

In the **Climate and Green Growth National Budget 2025** (*Klimaat en Groene Groei Rijksbegroting*) a decision was made to cut €1.2 billion from Climate Fund resources, including those designated for green hydrogen and batteries. Despite this, the government has allocated €354 million for 2025 to stimulate hydrogen production and import, insisting it is deeply committed to the energy transition.

On 22 November 2024, the Minister of Climate Policy and Green Growth and the State Secretary for Infrastructure and Water Management presented the Cabinet's vision on hydrogen carriers as part of the broader Cabinet Strategy on Climate Policy (*Kabinetsaanpak Klimaatbeleid*). In the short term, the Cabinet wants to support a wide use of various hydrogen carriers to facilitate the energy and feedstock transition. This includes liquid hydrogen (LH_2), methanol, liquid organic hydrogen carriers (LOHCs), and liquid synthetic methane (LSM). In the medium and long term, the Cabinet intends to take a more directive role in shaping the hydrogen carrier mix, prioritising those carriers that offer the best long-term societal value. Conversion and end-use are ideally concentrated in seaports, and the Cabinet favours direct use of carriers to reduce energy loss and environmental risk. Ammonia is recognised as a viable hydrogen carrier in the short term due to its global availability and cost-effectiveness. However, the Cabinet expresses concerns about its safety and environmental risks, especially in inland transport and distribution. Its use or conversion is therefore preferred in port areas or via pipeline infrastructure. The Cabinet discourages widespread distribution via road or rail, though temporary and fallback use remains possible where alternatives are unavailable. The Cabinet prioritises hydrogen carrier transport by pipeline, followed by inland waterways, rail, and road, in that order. This sequence reflects the Cabinet's aim to balance efficiency, spatial use, and public safety.

2. What are the key goals and commitments included in the strategy/policy?

The Strategy acknowledges the Netherlands' advantageous position for further developing and integrating hydrogen into its energy system. The country has significant potential to increase renewable power generatione, necessary for producing CO2-free hydrogen, through offshore wind farms in the North Sea. This supply is conveniently located near industrial clusters with substantial demand as they aim to enhance their sustainability. The Netherlands' ports, including the major Port of Rotterdam, offer opportunities for importing hydrogen. Additionally, its well-developed gas infrastructure can be repurposed for transporting renewable hydrogen. The country also possesses the requisite knowledge institutions to conduct both fundamental and applied research essential for advancing the hydrogen economy through innovation.

The Strategy outlines an initial phase focused on reducing costs and scaling up renewable hydrogen production. It also emphasises preparing for a subsequent phase involving the development of transport and storage infrastructure. In this context, the Strategy sets forth a policy agenda with four main elements: legislative development; cost reduction and scaling up green hydrogen; sustainable end-use; and supporting policies.

- Legislative development: establishing preconditions necessary for further integrating hydrogen into the energy system. Key areas include identifying conditions under which existing gas infrastructure can be repurposed for hydrogen transport and distribution, general market regulation and assigning temporary tasks to grid operators to initiate the hydrogen market, developing guarantees of origin and certification schemes in compliance with EU legislation, ensuring safety, and coordinating energy infrastructure development, particularly electricity and hydrogen grids.
- Cost reduction and scaling up green hydrogen: scaling up electrolysis capacity to approximately 500 megawatts (**MW**) by 2025 and 3-4 gigawatts (**GW**) by 2030, with a goal of reducing costs by over 50% within the next decade. The government plans to achieve this through financial instruments supporting research, scaling up, and implementation; potentially linking offshore wind energy development to hydrogen production via integrated tenders; and possibly imposing a blending obligation for green hydrogen in the gas grid to boost demand.
- Sustainable end-use: increasing demand for CO_2-free hydrogen across various sectors including ports and industrial clusters; the transport sector (e.g., establishing 50 hydrogen filling stations by 2025); the built environment; the electricity sector; and agriculture.
- Supporting policies: continuing international strategy aimed at global and European cooperation; regional policies aimed at stimulating regional development and improving cooperation; as well as supporting both fundamental and applied research by companies and knowledge institutions.

The National Hydrogen Programme Work Plan 2022-2025 identifies two key goals: upscaling offshore production of renewable electricity linked to increased electrolysis capacity to benefit sustainable end-use in five main industrial clusters (Rotterdam-Moerdijk, Chemelot, Noordzeekanaalgebied, Schelde-Delta, Noord-Nederland), heavy transport logistics in Dutch port areas, as well as demonstrating decentralised hydrogen production.

The Roadmap outlines a comprehensive strategy for advancing the Dutch hydrogen market, aligning with national climate targets and broader energy transition goals. It adopts a holistic approach to integrate various aspects of the hydrogen value chain, including supply, transport, distribution, storage, application, and necessary preconditions. The Roadmap's primary goals include setting national targets for hydrogen production and use, supported by annual interim targets to ensure progress. It emphasises the importance of scaling up renewable hydrogen production in tandem with offshore wind energy development. This linkage is crucial as it leverages the Netherlands' potential for renewable power generation from North Sea wind farms. Additionally, the Roadmap highlights the need for developing suitable infrastructure for hydrogen transport and storage, repurposing existing gas infrastructure where feasible.

Key commitments within the Roadmap focus on legislative development to create a conducive regulatory environment for hydrogen integration into the energy system. This includes establishing conditions for repurposing gas infrastructure, market regulation adjustments, safety standards, and certification schemes compliant with EU legislation. Cost reduction strategies aim to scale up electrolysis capacity significantly by 2030 while reducing costs through financial instruments supporting research and implementation. Another critical area addressed in the Roadmap is sustainable end-use across various sectors (as set out below under 3). Supporting policies are also outlined to foster international cooperation, regional development initiatives, and continuous support for fundamental and applied research by companies and knowledge institutions. Large industrial clusters connected to regional gas networks will need access to hydrogen to achieve sustainability targets by 2030. A transport network providing access to storage facilities and connecting all large industrial clusters within the Netherlands and neighbouring countries will be ready for use in Rotterdam no later than 2026. However, the completion of the network around the coast has been delayed to 2033. The reason for the delay is the hydrogen market's slow development, affecting the infrastructure market.

The **Main Energy Structure Programme** (*Programma Energiehoofdstructuur,* the **PEH**) is a strategic government policy aimed at developing essential energy infrastructure necessary for achieving a climate-neutral energy system by 2050. It encompasses crucial components such as national pipelines, large-scale energy production sites, energy storage (including batteries and hydrogen), electrolysis facilities, and controllable power sources. Overall, it serves as a foundational framework ensuring the infrastructure is in place to meet both current and future energy demands sustainably.

The PEH aims to secure adequate space for the development of essential national energy infrastructure necessary for achieving a climate-neutral energy system by 2050. Its primary goals include facilitating the transition from a centralised, fossil-fuel-based energy system to a decentralised model that relies on renewable energy sources. The PEH also focuses on promoting a coherent spatial arrangement of the energy system, ensuring effective integration of various energy sources while maintaining a high quality of living environment. Additionally, it aligns with national climate objectives, aiming for a 55% reduction in greenhouse gas emissions by 2030. Recognising the evolving nature of technology and policy, the PEH is designed to be adaptable, allowing for updates based on new insights and decisions emerging from the **National Energy System Plan** (NPE).

A hydrogen-based energy system cannot function effectively without large-scale hydrogen storage, which is essential for ensuring supply reliability and facilitating the decarbonisation of various sectors. The development of a hydrogen supply chain also presents numerous economic opportunities. As part of this initiative, the government will begin exploring options to expand underground hydrogen storage capacity in the coming years. Initially, the focus will be on increasing onshore hydrogen storage capacity in salt caverns. Simultaneously, the technical feasibility of alternatives in depleted gas fields, both onshore and offshore, will be assessed. In future salt extraction operations, the government aims to align new salt extraction sites with potential underground energy storage locations as much as possible. The exploration of new sites will occur within the framework of the national programme for the sustainable use of the subsurface, and decisions regarding which mining activities can take place under what conditions will be made through public dialogue. The use of deep subsurface resources will not be permitted unless mining activities occur in designated suitable areas and comply with safety and responsible usage requirements.

The **Hystock** project reflects the government's commitment to developing essential hydrogen storage capabilities. With a total investment of €162 million (including the recently reserved €37 million for 2025), the Hystock project focuses on storing hydrogen in four underground caverns, thereby enhancing the capacity for safe and reliable hydrogen storage crucial for a hydrogen-based energy system. The Hystock project directly addresses the need for large-scale hydrogen storage, which is vital for ensuring supply reliability and supporting the decarbonization of various sectors. This aligns with the government's broader goals to explore options for increasing underground storage capacity, particularly in salt caverns, as part of its hydrogen strategy. Furthermore, the planned vision on safe underground hydrogen storage was planned to be released in early 2025 to provide essential guidelines and safety standards, helping to shape the future of hydrogen storage projects, including Hystock. This has not been published, but remains highly anticipated given the strategic importance of underground hydrogen storage.

At the European level, the Renewable Energy Directive (RED III, as also described under 9 below) aims to provide targets for renewable energy production and transport, including a new binding target of 42% of renewable hydrogen in total hydrogen consumption in industry by 2030. Additionally, RED III requires EU member states to achieve a minimum share of Renewable Fuels of Non-Biological Origin (RFNBOs) in the mobility sector by 2030.

The Dutch Government has decided to obligate the use of RFNBOs by fuel suppliers across the land, maritime, inland shipping, and aviation sectors. This obligation can be met by purchasing tradable units or by directly supplying RFNBOs, either by direct use of renewable RFBNOs in transport, the production of e-fuels or deployment via the refinery route. Initially, the Ministry of Infrastructure and Water Management proposed a correction factor of 0.4 for hydrogen deployed via refineries, rendering it less economically attractive compared with direct use of RFNBOs. However, on 25 April 2025, the Dutch government announced that it will instead apply a correction factor of 1.0 to the refinery route. Consequently, renewable hydrogen used in refineries will count equally toward meeting European targets as hydrogen used directly in transport. Furthermore, to mitigate potential adverse effects on the business case for hydrogen refuelling stations, the government has reserved up to €24 million in compensation.

3. Which industry sectors are most likely to be affected by hydrogen deployment?

As described in the Roadmap, the deployment of hydrogen is set to have a profound impact on several key industry sectors in the Netherlands. The production sector, for instance, is expected to undergo a significant transformation. Currently, a large portion of hydrogen in the Netherlands is produced from natural gas. However, future production will increasingly rely on renewable hydrogen generated through electrolysis. This shift is driven by (anticipated) binding targets for the use of renewable hydrogen in both industrial applications and mobility. Electrolysers will play a crucial role not only in producing hydrogen but also in energy storage and alleviating congestion on energy grids.

In the industrial sector, which currently consumes approximately 180 PJ of hydrogen annually, there will be a gradual transition from hydrogen derived from natural gas to renewable and low-carbon alternatives. This change is essential for reducing CO2 emissions and achieving sustainability goals within high-temperature processes. Industrial clusters have already incorporated renewable hydrogen into their long-term strategies for decarbonisation. However, the current pace of electrolyser project rollouts and the need for extensive infrastructure modifications poses a challenge for a complete transition by 2030. A national transport network for hydrogen is being developed to connect major industrial clusters along the coast with inland regions like Chemelot (a large cluster of chemical plants in the south-eastern part of the Netherlands). This network aims to support both domestic production and import of hydrogen while ensuring adequate storage capabilities through underground caverns or tanks.

The mobility sector stands to benefit greatly from hydrogen deployment across road transport, shipping, and aviation. Hydrogen can power long-distance heavy transport where battery-electric solutions may not be feasible. By 2025, a basic network of at least 50 hydrogen refuelling stations is planned to support this transition. For maritime applications hydrogen offers a viable alternative besides electrification and other clean fuels, as the government aims for 150 zero-emission inland ships by 2030 and to achieve virtually emission-free and climate-neutral inland navigation by 2025. In aviation, sustainable fuels derived from renewable hydrogen are key to reducing emissions. The Netherlands targets a blend of 14% sustainable fuels by 2030 with ambitions for fossil-free flying by 2050.

Lastly, in electricity generation, flexible CO2-free power generation using hydrogen can complement intermittent renewables like wind and solar power. However, large-scale use in power plants may not occur until post-2030 due to current limited availability and competing demands from other sectors.

The role of hydrogen in residential heating remains uncertain until after 2030 due to ongoing research into various applications within buildings using existing gas networks or waste heat from electrolysers.

On 24 October 2024, the PBL Environmental Assessment Agency published its **Climate and Energy Outlook 2024** (*Klimaat- en Energieverkenning 2024* (KEV)). In the industrial sector, the expected growth of green hydrogen production until 2030 has been reduced. There are several factors contributing to this reduction. The growing cost of electrolysers, the sharp increase in net tariffs for electricity and the overall uncertainty surrounding the demand for green hydrogen have caused the projections for production to drop. In addition, the implementation of tailored agreements with energy-intensive industries has progressed less rapidly than anticipated, and the available time frame to realise new hydrogen projects before 2030 is described as limited.

4. Who are the main regulators for the hydrogen market?

The Netherlands Authority for Consumers and Markets (**ACM**) is the regulatory authority in the energy sector in the Netherlands. HyNetwork Services, a 100% subsidiary of Gasunie, has been assigned by the Dutch Government to develop and manage the hydrogen transmission infrastructure in the Netherlands, set to begin operations in 2025. The ACM is expected to become the regulator for this network from 2031 onwards and will have an advisory role from 2025 until 2031.

Hydrogen production, transportation, supply and storage are regulated as industrial activities, and are therefore subject to environmental and health and safety regulations. The regulators would include local, provincial and/or national environmental authorities, as well as health and safety regulators. For example, provincial executives are the competent authorities to grant environmental permits for environmentally harmful activities with hydrogen, such as the realisation and operation of a hydrogen production facility. The underground storage of hydrogen is subject to mining regulations. Therefore, the Dutch State Supervision of Mines oversees the safety of underground hydrogen storage. The Ministry of Climate Policy and Green Growth (*Ministerie Klimaat en Groene Groei*) is responsible for setting the overall national hydrogen policy and strategy.

5. Does the government hydrogen strategy or policy support the development of both low carbon (blue) hydrogen and renewable (green) hydrogen?

The government's strategy aims to prioritise green hydrogen, which is primarily produced through electrolysis using renewable electricity, as well as from biogenic feedstocks, provided they are sustainably sourced. The production of green hydrogen is expected to experience significant growth in the coming years. The Dutch Government plans to drive this transition, in part, by linking hydrogen production facilities to offshore wind farms.

Simultaneously, the strategy acknowledges the role of blue hydrogen – produced from natural gas with carbon capture and storage (**CCS**) – in contributing to the overall hydrogen system and functioning as a key transitional solution. The objective is to ensure that blue hydrogen supports the development of a broader hydrogen infrastructure without impeding the growth of green hydrogen, with safety and environmental considerations guiding decisions around the transport and use of hydrogen carriers (the policy with respect to such carriers described under 1 above).

6. If the government hydrogen strategy or policy supports the development of low-carbon hydrogen, to what extent is carbon capture and storage being taken forward?

In the Climate Agreement, the deployment of CCS is addressed as a cost-effective measure to achieve Dutch climate goals. Notably, its role in blue hydrogen is highlighted as an area where the Netherlands can distinguish itself internationally. CCS in the Netherlands is supported by various government measures, including pricing mechanisms for CO_2 emissions and subsidy schemes that help reduce the financial risks associated with CCS-projects. The government also actively participates in state-owned entities like Energie Beheer Nederland (**EBN**), Gasunie, and the Port of Rotterdam Authority in key CCS-projects.

To complement the EU Emissions Trading System (EU ETS), the Dutch government has implemented additional pricing mechanisms under the Environmental Taxes Act (Wet belastingen op milieugrondslag) to encourage companies to invest in CO_2 reduction measures:

- Minimum CO_2 price for electricity generation: sets a minimum price for CO_2 emissions from electricity generation by EU ETS companies. The tax applies only if the EU ETS price falls below this minimum threshold; if the EU ETS price is higher, the tax is not applied.
- Carbon tax: applies to both EU ETS installations and some non-EU ETS installations. For EU ETS installations, the tax amount is reduced by the EU ETS price per ton of CO_2 emissions. If the EU ETS price exceeds the carbon tax base amount, tax is effectively zero for these installations. Non-EU ETS installations are required to pay the full carbon tax amount. The tax is calculated based on the total annual CO_2 emissions, minus any 'dispensation rights' for exempted emissions. These rights are gradually being reduced over time. The carbon tax is designed to be high enough to ensure that the Netherlands achieves its CO_2 reduction targets for 2030 with a 75% certainty.
- Energy tax: taxes the use of electricity and natural gas. With effect from 2026, a separate (lower) rate will be introduced for hydrogen to encourage companies to transition from natural gas to hydrogen.

CCS is supported by various financial assistance programmes, including the Stimulation of Sustainable Energy Production and Climate Transition (**SDE++**) (as described under 8 and 13 below).

Gasunie, a 100% state-owned entity responsible for the transport and storage of gas, announced in its 2024 annual report that it will invest approximately €12 billion in energy infrastructure through 2030. Two-thirds of this investment is allocated for infrastructure related to sustainable gases, including hydrogen and ongoing CCS projects.

On 14 March 2025 the Dutch Government published its Carbon Dioxide Removal Roadmap (*Routekaart Koolstofverwijdering*). The roadmap provides an overview of the necessity, demand and supply of carbon dioxide removal. It outlines key conditions and principles for the robust integration of carbon removal into climate policy and presents a policy agenda for the coming years, along with initiatives that can support further technological development and scaling up of carbon removal in the Netherlands.

Two prominent CCS-projects are currently running in the Netherlands: Aramis and Porthos.

- The **Aramis** project focuses on creating new infrastructure for CO_2 from land to platforms under the North Sea. The CO_2 will be stored in empty gas fields. The project is in the Front-End Engineering and Design (FEED) phase as of the 30th of November 2023. This means that the partners involved, Gasunie, TotalEnergies, Shell and EBN, have agreed on the development of key components of the required infrastructure, including the offshore transmission pipeline and the technical/operational integration of the source-to-sink CCS value chain.
- **Porthos** is a CO_2 transport and storage project based in the Port of Rotterdam. It is a collaborative project of EBN, Gasunie, and the Port of Rotterdam Authority. The project aims to capture CO_2 from industrial companies in the port and store it in empty gas fields under the North Sea as of 2026, with an annual capacity of 2.5 Mton. The construction of the infrastructure commenced on 15 April 2024.

Several cross-border CCS projects are currently in various stages of development. The **CO_2TransPorts** Project of Common Interest (PCI) aims to establish infrastructure to facilitate CO_2 capture, transport and storage from Rotterdam, Antwerp and the North Sea Port areas from 2026 onwards. Meanwhile, the **Delta Rhine Corridor** will connect industrial sites in Germany to the Port of Rotterdam through a CO_2 pipeline network, integrating with the Aramis transport system and associated carbon storage sinks, and is expected to begin operations in 2028. The Noordkaap project plans to store offshore biogenic CO_2 from a biomass facility in the Dutch North Sea via marine transport.

7. Are there targets for the production of hydrogen?

The Climate Agreement of 2019 sets an initial target to achieve 500 MW of electrolysis capacity by 2025, and subsequently, 3 to 4 GW by 2030. At the end of 2022, the government revised those targets, setting a new goal of achieving 8 GW of electrolysis capacity by 2032. While ambitious, this target faces challenges, such as the relatively slow development of offshore wind energy and the increasing demand for direct electrification. The government's efforts are supported by subsidies (as set out under 13 below), including nearly €1 billion dedicated to large-scale electrolyser projects. This updated goal reflects the growing importance of hydrogen in the energy transition. Additionally, the government is focusing on accelerating both domestic hydrogen production and the integration of imported hydrogen, in line with EU climate and energy policies. To support this ambition, significant subsidies are being allocated for large-scale electrolyser projects, and hydrogen production is increasingly linked with offshore wind farms. These efforts aim to meet both national and European targets for hydrogen use in industry and mobility.

8. Are there any incentive mechanisms/business models in place to support the production of hydrogen?

Hydrogen production in the Netherlands is supported through several subsidy schemes, most notably the SDE++ subsidy scheme (*Stimulering Duurzame Energieproductie en Klimaattransitie*). Under this scheme, the Minister of Climate Policy and Green Growth grants subsidies for a maximum period of 15 years to parties who produce hydrogen by electrolysis of water. Once the subsidy is granted, the production plant needs to be fully operational within four years. This installation must be either connected to the electricity grid or directly connected to an installation generating electricity from wind or solar energy. On 7 October 2025, a new round of the SDE++ scheme will open, with a budget of €8 billion available. Through this scheme, the Dutch Government aims to provide more certainty to companies investing in sustainable energy projects.

The Dutch Government has not yet released the final documentation for the 2025 SDE++ application round. However, there are no signs of significant changes to the core criteria used in the 2024 round. Starting in 2025, projects that help reduce pressure on the electricity grid will receive additional support. The government is also setting aside dedicated funding for key technologies with lower profits, such as renewable fuels. In addition, hydrogen produced from waste will be introduced as a new category eligible for subsidy under the scheme.

An extensive overview of potentially applicable subsidy schemes and government funding is included under 13 below.

9. Are there any standards in place for the classification and/or certification of low-carbon or renewable hydrogen?

Dutch standards for the classification and/or certification of low-carbon or renewable hydrogen are primarily based on European regulations.

The establishment of a system for Guarantees of Origin (**GoO**) pertaining to renewable hydrogen is mandated by article 19 of RED III. This regulatory framework has been incorporated into Dutch law through the Act Implementing the EU Renewable Energy Directive for Guarantees of Origin (*Wet implementatie EU-richtlijn hernieuwbare energie voor garanties van oorsprong*). The provisions of this Act are further detailed in the existing Regulations that govern GoOs and Certificates of Origin (*Regeling garanties van oorsprong en certificaten van oorsprong*). GoOs serve as a certification mechanism for renewable hydrogen.

The RED III contains standards for RFNBOs, which includes hydrogen produced by electrolysis from renewable electricity and its derivatives. The term renewable hydrogen is often used as a simplification for hydrogen that qualifies as an RFNBO under the RED III. In order to comply with the standards of RFNBOs, the hydrogen must meet a number of cumulative requirements, as set out in articles 27(6), 29a and 30(1 and 2) of the RED III.

While a GoO does not confirm that the hydrogen complies with all the criteria for RFNBO, the GoO can be utilised as partial evidence to support claims of compliance with such standards. Ongoing discussions within the European Commission continue to explore the interplay between GoOs and voluntary certification schemes.

RED III only addresses GoOs for gas from renewable sources, but the European Commission also expressed its intention in its hydrogen strategy (COM 2020, 301) to enable certification for hydrogen from non-renewable sources (low-carbon hydrogen or 'blue' hydrogen). The European Commission still needs to develop this further. The introduction of certificates/guarantees for low-carbon hydrogen in the Netherlands will need to take place via legislative amendments.

10. Does the regulatory framework clearly define the regulatory requirements relating to the production, storage, transportation or supply of hydrogen?

Currently, there is no comprehensive regulatory framework in the Netherlands regarding the production, storage, transportation or supply of hydrogen. The production, storage, transportation and supply of natural gas is regulated in the Dutch Gas Act (*Gaswet*). Hydrogen is not considered 'gas' as defined in the Gas Act, therefore the majority of the provisions in the Gas Act are not applicable.

In November 2022, the Roadmap (as described under 1 and 2) was published. The Roadmap takes a total approach on the development of the Dutch hydrogen market, by connecting supply, transport, distribution, storage, application and preconditions. The Dutch legislator plans to implement European legislation regarding market regulation and the transport, storage and import of infrastructure of hydrogen in Dutch legislation in early 2026, by including provisions in a new Dutch Energy Act (*Energiewet*). A full Dutch regulatory framework on hydrogen is to be expected in 2033.

The new Dutch Energy Act has been introduced to amend and consolidate the current Dutch Gas Act and the Dutch Electricity Act 1998 (*Elektriciteitswet 1998*) into one new Act, without the emphasis being on the regulation of hydrogen. Although the regulation of hydrogen infrastructure will largely be shaped by the evolving European regulatory framework, the Dutch legislator has seized the opportunity of this new Act to include 'hydrogen gas' to the new definition of 'gas' and has initiated the regulation of hydrogen in a limited number of respects (set out below) in the new Dutch Energy Act (the **Energy Act**). The Energy Act was adopted by the Senate on 10 December 2024 and will overall enter into force on 1 January 2026 with several articles within the Act entering into force on an earlier or later date. A general framework for hydrogen has not yet been included in the current Energy Act.

As anticipated at the outset of the legislative process, the Energy Act will be followed by new 'tranches' or phases of legislative amendments. In the context of the European Union, the recently adopted 'Hydrogen and Gas Decarbonisation Package' (Directive 2024/1788 and Regulation (EU) 2024/1789) (the **Decarbonisation Package**) is particularly relevant for the regulation of hydrogen. This package contains a recast of Directive (EU) 2009/73 (the Gas Directive) and of Regulation (EU) 715/2009 (the Gas Regulation) and provides regulatory frameworks for the development, construction and management of hydrogen networks both onshore and offshore, to which the established principles of network management (*netbeheer*) for natural gas, such as third-party access, apply. It includes that EU member states must ensure, by 1 January 2033 at the latest, the implementation of a system for regulated third-party access to hydrogen networks based on published tariffs, which are applied objectively and without discrimination among hydrogen network users. Regulated third-party access means, among other things, that users pay regulated fixed tariffs for the services. Until 1 January 2033, EU member states may also operate a system of negotiated access to hydrogen networks based on objective, transparent and non-discriminatory criteria. Negotiated access means that tariffs are negotiated bilaterally, but access requirements are supervised by regulatory authorities. These provisions regarding network management, including the (final) designation of a Dutch hydrogen network operator, and third-party access have not yet been included in the Energy Act. The Decarbonisation Package (and potentially other relevant EU legislation) will eventually result in a new implementation round and amendment of the Energy Act; it is likely that the regulation of the hydrogen market will then be incorporated into the Energy Act.

The adopted Energy Act includes the below noteworthy provisions and/or amendments relating to the production, storage, transportation or supply of hydrogen.

- The expanded role of infrastructure companies in energy transition: in the Energy Act, the role of infrastructure companies has been expanded, including with respect to hydrogen. An infrastructure company (not being a transmission system operator (**TSO**) or a distribution system operator (**DSO**)) is a state enterprise that forms part of an infrastructure group, which includes one or more TSOs or DSOs. Infrastructure companies do not perform statutory system operator tasks but engage in various infrastructure-related activities. Unlike TSOs and DSOs, they operate in competition with market entities and have no legal monopoly. However, their affiliation with a TSO or DSO and status as state enterprises often grant them undue competitive advantages. These advantages can deter market participants from undertaking new activities in the energy market. Unrestricted market activities by infrastructure companies could also pose risks to TSOs and DSOs within their group and affect the state as a shareholder. Since the Act of 9 April 2018 amending the Electricity Act 1998 and the Gas Act, their permissible actions and activities have been legally framed. Simultaneously, infrastructure companies possess extensive knowledge and tools that should be utilised to support the energy transition. As acknowledged by the Dutch legislator, an

infrastructure group or infrastructure company may also play a significant role regarding hydrogen (including the import of hydrogen, hydrogen derivatives, and hydrogen carriers), particularly in facilitating and initiating the market. Although private parties are currently preparing investments for e.g. hydrogen terminals, this is particularly important, as private parties often hesitate to fulfil these roles in this uncertain market phase. In the Energy Act, it has been specified that infrastructure companies (of all TSOs and DSOs) are permitted in the Netherlands to (i) establish, maintain and manage pipelines and associated facilities for the transport of hydrogen gas, (ii) establish, maintain and provide (parts of) hydrogen gas installations on behalf of third parties, (iii) establish, maintain and provide measuring devices and services for hydrogen gas, and (iv) carry out activities and operations related to hydrogen exchanges (*waterstofbeurzen*), under similar rationales applied to electricity and gas. In addition, it is proposed to allow infrastructure companies of the TSO for gas to establish, maintain, manage, and operate hydrogen gas storage facilities, hydrogen gas terminals (i.e. facilities used for converting liquid hydrogen or liquid derivatives of hydrogen into hydrogen gas, or for converting hydrogen gas into liquid hydrogen) and other infrastructure for the import, export, transit, conversion or transshipment of hydrogen gas or hydrogen carriers.

- Dutch gas TSO (i.e. Gasunie Transport Services (**GTS**)) under conditions bound to accept injection of hydrogen gas into the gas transmission system: the Energy Act provides that a gas TSO (i.e. GTS) shall accept the injection (*invoeding*) of hydrogen gas upon request, provided that the TSO can reasonably mix it using the system and comply with the delivery specifications established by ministerial regulation. In connection with this amendment, the Energy Act further stipulates to extend the already existing group prohibition (i.e. that an infrastructure group shall not be under common ownership with a production, supply, and/or trading company, which ensures that the TSOs/DSOs are independent from companies that produce, supply, or trade energy) to include the production of hydrogen gas (which is an implementation of the current Gas Directive), as a result of which a TSO or DSO may no longer be part of a group that also includes a legal entity that produces, supplies or trades in electricity, gas or hydrogen gas.
- Possibility of project decisions for construction of hydrogen gas production facilities: there is a preliminary European agreement on binding European targets for the use of hydrogen (and hydrogen carriers) in industry and mobility. Achieving these targets will require a serious effort from the Netherlands. In order to achieve those targets, it is expected that approximately 4-8 GW of electrolysis capacity will be required domestically or abroad. This is largely in line with the national target of 8 GW of electrolysis capacity by 2032. To realise these ambitions in a timely manner and streamline procedures, the Dutch legislator proposes to apply the project procedure for large-scale electrolysis within the meaning of the Environment and Planning Act (*Omgevingswet*). This procedure allows projects of national importance to be authorised through a project decision (*projectbesluit*). The national interest, besides realising the above-mentioned ambitions, lies in the impact of large-scale electrolysis projects on the systems for the transport of hydrogen gas and the transmission or distribution systems for electricity. The Dutch Minister of Climate Policy and Green Growth will adopt a project decision for the construction of hydrogen gas production facilities using electrolysis with a certain minimum capacity. As capacities expand, it may be necessary to increase this minimum. The minimum capacity will therefore be determined by ministerial regulation.

11. Are there any foreign investment restrictions related to energy and infrastructure sectors?

Yes, there are foreign investment restrictions related to energy and infrastructure sectors. These are, however, currently not directly applicable to hydrogen projects.

The Dutch Electricity Act and the Dutch Gas Act provide that the Minister of Climate Policy and Green Growth may, for reasons of public safety or security of supply, prohibit or attach conditions to a change of control in (i) an electricity generating facility with a nominal electrical capacity exceeding 250 MW or a company managing such a generation facility or (ii) a liquefied natural gas (**LNG**) facility or an LNG company irrespective of capacity or size, respectively. A change of control in companies operating such facilities also needs to be notified to the Minister. Furthermore, electricity and gas grids and their operators are publicly owned by law.

The Dutch Energy Act will replace both the Electricity Act and the Gas Act. The Energy Act will slightly lower the threshold for electricity generating facilities to those with a nominal electrical capacity exceeding 100 MW. The new Energy Act will enter into force in several phases. The new thresholds for notification will enter into force on 1 July 2026. On 1 June 2023 the Investment, Mergers and Acquisitions Screening Act (*Wet veiligheidstoets investeringen, fusies en overnames*) entered into force. This Act and the Decree on the scope of application of sensitive technology trigger a notification obligation for investments that could pose a threat to national security through the acquisition of control over, amongst others: (i) vital providers, (ii) managers of corporate campuses; and (iii) companies active in (highly) sensitive technology. The notification obligation also applies when acquiring or increasing significant influence over companies operating in the field of certain (highly) sensitive technologies (photonics, high-assurance identification, quantum mechanics and semiconductors).

An extension of the sectors covered by the Mergers and Acquisition Screening Act was open for public consultation until 31 January 2025. Proposed additions to the list of highly sensitive technologies include advanced materials, artificial intelligence, biotechnology, nanotechnology, sensor and navigation technology, nuclear technology for medical purposes, and certain goods listed under the EU Dual-Use Regulation (Regulation 2021/821). This expansion reflects a shift in the Netherlands' national security considerations, moving beyond the traditional focus on dual-use or military-related technologies. The hydrogen sector is not on the list of sectors for which in the near future a notification obligation may be introduced.

12. What international treaties are in place that may offer protection to international investors in hydrogen projects in the jurisdiction?

The Netherlands is a signatory to 79 bilateral investment treaties (BITs), of which 74 are currently in force, according to the website of the United Nations Conference on Trade and Development (UNCTAD). As per 28 June 2025, the Netherlands will no longer be a party to the Energy Charter Treaty (**ECT**). Practically, this means that the ECT will not be applicable to investments made on or after 28 June 2025 (which is one year after the formal notification of withdrawal). Due to the sunset clause, qualifying existing investments should continue to benefit from ECT protection for twenty years after the effective withdrawal date. Furthermore, in 2023 and in 2024, the Netherlands entered into several hydrogen related Declarations of Intent and Memoranda of Understanding (MoU) with other states, mainly to promote cooperation in the field of hydrogen. For instance, on 12 and 13 November 2024, the Netherlands reinforced collaboration with Denmark and Norway through an MoU, aimed at establishing a regional hydrogen network, including cross-border transport infrastructure and underground storage solutions.

Market developments and opportunities

13. Are there any government grants or other government funding available to hydrogen projects (including for research and development)?

To support hydrogen projects, the Dutch Government has established the **SDE++ subsidy scheme**, as detailed under question 8. In addition to the SDE++ subsidy scheme, various other subsidies and funding options are available for hydrogen (related) projects. The applicability of these schemes depends on the specific type of project, and some schemes may require that no other subsidy or fund has been granted for the same project.

- **Subsidy scheme for large-scale hydrogen production using an electrolyser** (**OWE**): This subsidy scheme is designed to provide financial support for both investment and operational costs associated with large-scale hydrogen production through electrolysis, starting from a minimum input capacity of 0.5 MW up to a maximum of 50 MW. Subsidy is given for the investment costs of the power generation facility (i.e. the investment part) and for producing the hydrogen using the facility for at least 5 and a maximum of 10 years (i.e. the operating part). This subsidy is being put out to tender. That means that the companies compete for the available subsidy. Projects that have already been given subsidies under the SDE++ scheme or the OWE scheme of 2023 are not eligible for the subsidy.
- **Subsidy for Hydrogen in Mobility** (**SWIM**): The Hydrogen in Mobility subsidy program is designed for businesses that are engaged in collaborative investments in hydrogen technology. This partnership, referred to as a consortium, must include a minimum of one operator of hydrogen fuelling stations and at least one company involved in transportation services. The primary beneficiaries of this initiative encompass the transport and distribution sectors, including small and medium-sized enterprises (**SMEs**), operators of hydrogen refuelling stations, shippers who are manufacturers moving their products, and passenger transport services, specifically those providing buses and wheelchair-accessible transport with a capacity of at least five seats.
- **Subsidy for Clean and Zero-Emission Construction Equipment** (**SSEB**): This subsidy scheme is designed to support construction companies in acquiring and converting to emission-free (zero-emission) construction machinery and vessels. Additionally, the SSEB provides funding for the retrofitting of existing construction equipment and vessels to reduce emissions. Innovative proposals aimed at enhancing emission-free construction machinery and charging infrastructure may also qualify for subsidies under the SSEB.
- **Dutch Research Council** (NWO): The funding provided by the Dutch Research Council is designated for fundamental research initiatives.
- **Energy & Climate Research and Development** (EKOO): subsidy scheme for research and development aimed at SMEs to create more affordable, climate-neutral, and/or circular products, services, and processes, with the goal of initial market introduction by 2034.
- **Subsidy Mission-driven Research, Development and Innovation** (**MOOI**): The MOOI subsidy scheme aims to fulfil the objectives outlined in the Climate Agreement through collaboration with other parties. This program encompasses several categories, including electricity, the built environment, industry, and biobased circular initiatives.
- **Subsidy Demonstration Energy Innovation (DEI+)**: As of 28 January 2025, the DEI+ Energy and Climate Innovation subsidy scheme aims to support innovative projects in the industry, electricity sector and built environment. This initiative is particularly focused on supporting entrepreneurs who are working on innovative solutions for hydrogen production, transport, storage, and the use of hydrogen (carriers) and green electrons.
- **TSE Industrie Studies**: This subsidy supports entrepreneurs who are investigating the feasibility of innovative projects aimed at significantly reducing carbon emissions within ten years. Applying for subsidies is possible for three types of studies: a feasibility study to prepare for a pilot project, an environmental study to evaluate the investments needed for higher environmental protection in a demonstration project or a comparable study to investigate an environmental investment in a demonstration project.

- **HER+ Renewable Energy Transition**: The objective of the innovation initiative is to lower CO_2 emissions by leveraging renewable energy sources, including solar, wind, or hydropower. Alternatively, it may focus on minimizing the expenses associated with CO_2 reduction through advanced techniques such as CSS, hydrogen production, or the utilisation of waste heat. This initiative can encompass various forms of research, including industrial studies, experimental development, or energy demonstration projects, or a combination of these approaches.
- **GroenvermogenNL**: focuses on innovation and scaling up hydrogen projects for the energy transition and green chemistry by investing in R&D, pilot projects, demonstration projects, and human capital, including education and training.
- **SME Innovation Stimulus for Regional and Top Sectors** (**MIT**): The MIT subsidy is designed for SMEs seeking to partner with other SMEs on innovative initiatives within the Netherlands' leading sectors. The Netherlands has recognised ten specific sectors as top priorities, where companies can contribute to addressing global challenges. This funding opportunity aims to foster collaboration and innovation among SMEs in these critical areas.
- **Accelerating climate investment industry** (VEKI): this subsidy scheme is designed to support investments in industrial devices, systems, or techniques that have a payback period exceeding five years, aimed at achieving a cost-effective reduction of CO_2 emissions within the Dutch industrial sector by 2030.
- **Investment subsidy manufacturing climate neutral economy** (**IMKE**): IMKE is a financial assistance program designed to support investments in manufacturing facilities that produce key components for electrolysers, batteries, and solar panels.

In addition, hydrogen projects may be able to make use of more general instruments supporting innovation, including:

- Favourable financing: **Innovation credit** (*Innovatiekrediet*), **Growth facility** (*Groeifaciliteit*) and **Early Stage Financing** (*Vroegfasefinanciering* (VFF));
- Guarantees for bank loans: **Guarantee Financing Entrepreneurs (GO) for (medium) sized and large companies** and the **Guarantee for SME Credit** (*Borgstelling MKB kredieten* (BMKB)); and
- Investments: **Seed capital funds for techno starters** and **Regional development companies** (*Regionale ontwikkelingsmaatschappijen*).

There are also several tax incentives available, such as:

- **Innovation scheme Promotion of Research and Development Act** (WBSO) (R&D Tax Credit): offers a tax incentive scheme to stimulate R&D activities by reducing wage costs for Dutch R&D companies involved in innovative projects, subject to certain conditions. It offers a tax credit for payroll taxes that are withheld by the Dutch R&D company and other costs and expenditures related to research and technological development;
- **Innovation Box** (IP Box): profits derived from qualifying intangible assets generated by R&D activities may be subject to a reduced corporate income tax rate; the IP Box effectively taxes certain qualifying income at a reduced rate (9% in 2025) instead of the general Dutch corporate income tax rate (up to 25.8% in 2025);
- **Energy Investment Allowance** (EIA): allows for a tax deduction of a percentage of the investment costs for investments in energy-efficient technologies and renewable energy;
- **Environmental Investment Deduction** (MIA): allows for a tax deduction of a percentage of the investment costs of certain environmentally friendly assets; and
- **Random Depreciation for Environmental Investments** (Vamil): allows for the arbitrary depreciation of certain environmentally friendly investments.

14. Are there any notable pilot/demonstration projects in place or planned for the production or offtake of clean hydrogen?

- **Djewels**, a project developed by HyCC, is advancing an innovative renewable hydrogen production technology. The project aims to demonstrate the feasibility of producing renewable hydrogen using an alkaline electrolyser featuring high current density electrodes, high-pressure hydrogen output, and a compact spatial footprint. With a planned capacity of 20 MW, Djewels marks a significant step towards the large-scale deployment of renewable hydrogen production in alignment with EU objectives. The project is scheduled to become operational in 2027.
- **Groene Hart Waterstof** (GH2) is a collaborative initiative by Vermeulen Groep, NettEnergy and Delphy focused on producing hydrogen, thermal energy, and biochar from organic waste streams such as verge grass and wood waste. Launched in October 2022 and set to run for three years, this pilot aims to produce 500 kg/day of hydrogen by gasifying 10 tonnes of biomass daily. The objective is to determine the technology's efficacy and quantify how much hydrogen and electricity can be generated from a kilogram of grass.
- **H2 Hollandia** is a demonstration project initiated by Avitec and Novar at the Vloeivelden solar farm. By installing an electrolyser, the project aims to halve the curtailment of solar power generation. The otherwise curtailed energy can be converted into 300 tonnes of hydrogen annually, enabling 3,500 full-load hours due to the high ratio of solar farm power (110 MWp) to electrolyser power (5 MW). Whilst this project aims to demonstrate technical feasibility and commercial viability, it will also avoid the emission of 2.7 kilotonnes of CO2 annually compared to steam methane reforming (SMR). The project is expected to be completed in the summer of 2026.
- **H2opZee**, led by RWE and Neptune Energy, aims to establish a 500 MW offshore green hydrogen demonstration site in the Dutch North Sea by the end of 2030, showcasing the potential for large-scale hydrogen production and supporting the Netherlands' renewable energy and hydrogen infrastructure goals.
- **HyNoCa Alkmaar** is a subproject within the InVesta green molecules initiative focused on converting various biomass streams into hydrogen through an innovative thermal process suitable for use in transportation. In addition to producing hydrogen, this process generates biochar from the carbon component of biomass. Biochar can significantly contribute to climate change mitigation as it serves as a soil improver, helps circularise fertilisers, and acts as a raw material for bio-composites. Construction is scheduled to commence in the summer of 2025.
- **LIFE NEW HYTS** is a demonstration project in the Utrecht region, showcasing local production, distribution, and use of green hydrogen for road transport. Green hydrogen is produced from solar energy, transported via pipeline, and supplied at a public refuelling station for light and heavy vehicles. The project addresses the deadlock between hydrogen vehicle adoption and refuelling infrastructure. It is a collaboration between research institutes, businesses, and government, co-financed by the European Union. On 4 October 2024, a new electrolyser developed by Hysolar and KWR Water Research Institute was inaugurated, capable of producing 300,000 kg of green hydrogen annually – enough to power around sixty buses or trucks.
- Ohmium and HYGRO are collaborating on a **pilot project** scheduled to commence in 2025 in Wieringerwerf. The project will deploy 5.4 MW of PEM electrolysers in combination with HYGRO wind turbines at the EWEF Wind Park. It aims to produce green hydrogen for regional distribution and will demonstrate the feasibility of scaling up hydrogen production to support a variety of sectors.
- **PosHYdon** is a pilot project led by a fifteen-member consortium, representing the first offshore production of green hydrogen. It integrates offshore wind, gas, and hydrogen systems on Neptune Energy's Q13a-A platform in the North Sea. The project will use a 1 MW electrolyser to convert seawater into demineralised water and then into hydrogen. PosHYdon aims to explore the integration of offshore energy systems and assess the impact of offshore conditions on hydrogen production. Following the successful completion of onshore testing, it was announced on 2 October 2024 that the project equipment, including the electrolyser, had been transported to the offshore platform.

15. Are there any commercial-scale clean hydrogen production projects in development or already operating?

- **Eemshydrogen** is a project led by RWE, focused on building a 50 MW electrolyser at Eemshaven. Powered by renewable electricity from the nearby Westereems wind farm, the facility is supported by €124.9 million in government funding. It aims to supply clean hydrogen to the transport sector and chemical industries in the Groningen region. Eemshydrogen will be connected to the national hydrogen backbone and contribute to reducing industrial CO_2 emissions. In addition to the 50 MW facility, RWE announced it has secured the necessary permits which will enable it to develop a 100MW electrolyser on a plot adjacent to the Magnum Power Station at Eemshaven. Both projects are subject to final investment decisions.
- **ELYgator** is a large-scale water electrolyser project being developed by Air Liquide in Terneuzen. With a planned capacity of 200 MW powered entirely by renewable energy, it aims to produce up to 23,000 tonnes of renewable and low-carbon hydrogen annually. The hydrogen will be injected into Air Liquide's European cross-border hydrogen network for use in mobility and industrial applications, including TotalEnergies' industrial platform. The project is expected to be operational at the end of 2027. Following this project, Air Liquide plans to develop an additional 200 MW electrolyser, known as CurtHyl as part of the Hydrogen Conversion Park in Rotterdam (see below).
- **H2ermes** aims to establish a facility with a capacity of up to 100 MW capable of producing up to 15,500 tonnes of green hydrogen annually using only renewable electricity from nearby offshore wind farms in the North Sea. Port of Amsterdam and Gasunie will manage regional distribution as part of the Hydrogen Hub Amsterdam/Noordzeekanaalgebied plans. The produced hydrogen will be used for green steel production, sustainable fuels, mobility solutions, and circular chemistry applications.
- **Holland Hydrogen I** involves the construction of a 200 MW electrolyser at the Tweede Maasvlakte in Rotterdam. This facility will produce 60,000 kilograms of renewable hydrogen per day using electricity from the offshore wind farm Hollandse Kust (noord). The project, developed by Shell and over 150 contractors and suppliers, aims to provide a sustainable hydrogen solution for heavy transport and industrial sectors. The plant is expected to be operational in the second half of this decade.
- **Hydrogen Conversion Park** is a large-scale green hydrogen production initiative being developed at the Port of Rotterdam. The project aims to deliver 2-4 GW of electrolysis capacity by around 2030 with plans to scale up to over 10 GW by 2040, potentially reducing CO_2 emissions by 8-10 megatonnes annually. The site will house multiple hydrogen plants, including Shell's Holland Hydrogen I. It has attracted other major partners such as Eneco, RWE and Equinor. The full park is expected to be operational by 2030.

- **Hydrogen Delta focuses** on producing and utilising green and low-carbon hydrogen in the Zeeland border region as part of an ambitious programme aimed at phasing out grey hydrogen through clean alternatives. Several electrolyser projects totalling more than 2 GW are currently under advanced planning stages alongside significant blue hydrogen and CCU initiatives.
- **NortH2** is a consortium project by Eneco, RWE, Equinor, and Shell aimed at producing large-scale green hydrogen to decarbonise industry. The goal is to supply 2-4 GW of green hydrogen by around 2030, with ambitions to expand to over 10 GW by 2040. This would equate to approximately 750,000 tonnes of green hydrogen annually, significantly reducing CO_2 emissions by 8-10 megatonnes per year. Having completed feasibility studies in late 2022, the project is now preparing for the Front-End Engineering Design (FEED) phase.
- **SeaH2Land** is a large-scale project led by Ørsted, aiming to develop a 1 GW electrolyser powered by 2 GW of new offshore wind capacity in the North Sea Port industrial cluster. The project includes 45 kilometres of regional hydrogen pipelines between the Netherlands and Belgium to connect industrial producers and users. It is supported by major industrial partners, including Yara, ArcelorMittal, Dow, Zeeland Refinery, and the provinces of Zeeland and East Flanders. SeaH2Land will be developed in two phases, with the first 500 MW targeted once regulatory and network conditions are met, and full expansion expected by 2030. The project will contribute to replacing up to 20% of the cluster's current fossil-based hydrogen consumption, helping to achieve regional and national climate goals.

16. Have there been any hydrogen-related disputes in your jurisdiction?

N/A.

Last updated April 2025

New Zealand

Ashurst collaborated with **Anderson Lloyd** in the preparation of this content. We are grateful for their input.

Policy and regulation

1. Is there a government hydrogen strategy or policy?

The Hydrogen Action Plan was published by the Government in November 2024, driven by both energy system challenges and opportunities. The plan sets out the Government's commitment to enabling the hydrogen sector through the removal of regulatory barriers, with a focus on unlocking market-led private investment in hydrogen and supporting international trade and investment.[64]

The Government released the second Emissions Reduction Plan in December 2024. This plan outlines how New Zealand will deliver on its climate change commitments whilst fostering economic growth between 2026 and 2030.[65]

The New Zealand Energy Strategy was expected to be finalised by the end of 2024, but has not yet been released at the time of writing.

2. What are the key goals and commitments included in the strategy/policy?

The primary goal of the Government's Hydrogen Action Plan is to attract investment in low-emissions hydrogen through industry-led innovation, delineating the pathway to establishing a hydrogen industry that will support New Zealand's transition to net-zero emissions by 2050. This is supported by the Government's focus on developing long-term infrastructure investments, as highlighted in the 2025 Budget.[66] Notable priorities and commitments of the Hydrogen Action Plan include:

Key policy priorities:

- create an enabling regulatory environment which allow markets to choose the best technology for their needs, while keeping workers and the public safe;
- reduce barriers for consenting hydrogen projects in order to make hydrogen projects cheaper and faster to implement;
- promote a cost-effective and market-led transition to a low emissions economy; and
- support access to international investment and markets by demonstrating our products and their supply chains are low-emissions.

Commitments:

- review and update key electricity and gas health and safety regulations to ensure their scope will effectively accommodate the emerging use of hydrogen;
- support the doubling of renewable energy generation by 2050 through the Government's Electrify NZ work programme;
- provide streamlined pathways for large infrastructure projects (including hydrogen-related) via the new Fast-track Approvals legislation;
- amend the Resource Management Act 1991 (**RMA**) to strengthen the national direction for renewable electricity generation and transmission before fully replacing the RMA by 2026;
- strengthen the emissions trading scheme (**ETS**);
- establish a hydrogen industry leadership group to engage with the private hydrogen sector; and
- use country-to-country relationships to attract foreign direct investment in hydrogen.

64 Hydrogen Action Plan (November 2024). Ministry of Business, Innovation and Employment. Accessed at https://www.mbie.govt.nz/building-and-energy/energy-and-natural-resources/energy-generation-and-markets/hydrogen/hydrogen-action-plan

65 New Zealand's second emissions reduction plan 2026–30 (11 December 2024). Ministry for the Environment. Accessed at https://environment.govt.nz/publications/new-zealands-second-emissions-reduction-plan/#message-from-the-minister-of-climate-change-he-karere-mai-i-te-minita-mo-nga-take-panoni-ahuarangi

66 Budget Policy Statement (17 December 2024). Hon. Nicola Willis: Minister of Finance. Accessed at https://budget.govt.nz/budget/pdfs/bps/bps25.pdf

3. Which industry sectors are most likely to be affected by hydrogen deployment?

Hydrogen will likely play a pivotal role in New Zealand's energy transition with industries that are impractical or challenging to electrify. These include:

- industrial feedstocks;
- heavy road transport;
- the marine/maritime sector;
- some high temperature process heat; and
- aviation.

It also has potential to impact specialty vehicles, power backup, green peaking, light-duty vehicles and the rail sector.

4. Who are the main regulators for the hydrogen market?

Currently, there are no sector-specific regulators for the hydrogen market in New Zealand. The main regulators for the hydrogen market, and their roles include:

- Ministry of Business, Innovation and Employment (**MBIE**): oversees energy policy and regulation, including the development and implementation of policies related to hydrogen as an energy carrier.
- WorkSafe: alongside MBIE, will review and update key electricity safety regulations to enable safe production, storage, and use.
- Energy Efficiency and Conservation Authority: promotes energy efficiency and the use of renewables, including hydrogen.
- Environmental Protection Authority: is responsible for regulating activities that may impact the environment, including any environmental considerations related to the production, storage, and use of hydrogen.
- Electricity Authority: regulates integration into the electricity system.

Under the Hydrogen Action Plan, the Government is prioritising the development of a supportive and adaptive regulatory environment. For example:

- the Regulatory Systems (Immigration and WorkForce) Amendment Bill will allow WorkSafe to make electricity and gas safety instruments, negating the need for regulatory change;
- MBIE will consult on proposed regulatory amendments mid-way through 2025;
- removing barriers to getting hydrogen heavy vehicles on the roads; and
- reviewing the regulatory settings for exploration of natural hydrogen and development of orange hydrogen.

The Government has also initiated the Hydrogen Regulatory Settings Project and formed a cross-agency working group to identify regulatory barriers and prioritise the development of appropriate regulatory settings to the deployment of hydrogen. Collectively, these agencies will play a part in enabling the growth of the hydrogen market in New Zealand while ensuring safety, environmental sustainability, and economic efficiency. It is anticipated that as the Government continues to develop policy and invest in hydrogen energy initiatives, that the regulatory responsibilities will be clarified and authority delegated to specific agencies.

5. Does the government hydrogen strategy or policy support the development of both low-carbon (blue) hydrogen and renewable (green) hydrogen?

Both blue hydrogen and green hydrogen are addressed in the Hydrogen Action Plan. The Government is focused on reducing regulatory barriers to carbon capture, utilisation and storage (**CCUS**), and in turn, creating a clear framework that enables the creation of blue hydrogen. Moreover, by focusing on increasing the renewable energy supply by reducing consenting barriers, green hydrogen production is expected to become more accessible. The replacement of the Resource Management Act 1991 (**RMA**) in 2026 and the interim amendments are also expected to support these actions.

6. If the government hydrogen strategy or policy supports the development of low-carbon hydrogen, to what extent is carbon capture and storage being taken forward?

The New Zealand Government's Hydrogen Action Plan primarily focuses on the development of green hydrogen. Currently, existing legislation is not equipped to deal with the inherent complexities of CCUS. These regulatory deficiencies can act as a barrier to the uptake of these technologies, however the impending RMA reforms may cover carbon capture and storage.

7. Are there targets for the production of hydrogen?

The capacity target for hydrogen production in New Zealand includes 1.5GW of electrolyser capacity by 2035, increasing to 4.5GW by 2050.[67] However, the main incentive for developing a hydrogen industry in New Zealand is to support New Zealand's statutory target of net-zero emissions of greenhouse gases by 2050. Hydrogen provides a sustainable alternative to diversify New Zealand's renewable energy production and increases the resilience of the energy system to mitigate the impacts of a dry year (given that over 50% of New Zealand's electricity is produced by hydro power).

8. Are there any incentive mechanisms/business models in place to support the production of hydrogen?

In the 2023 budget, the Government established the Regional Hydrogen Transition Initiative which provided a rebate to early hydrogen adopters. The Government pledged NZD$100,000,000 in total subsidies until 2033 to encourage hydrogen uptake. This was one of the key actions contributing to building a market for hydrogen. However, upon the election of a new Government in 2024, this scheme was abandoned.[68]

Similarly, large market player, Meridian Energy, also paused its Southern Green Hydrogen Project. Meridian Energy cited economic challenges as responsible for the stalled production of green hydrogen at scale in the south of New Zealand.[69]

9. Are there any standards in place for the classification and/or certification of low-carbon or renewable hydrogen?

New Zealand has not committed to the singular use of a classification or certification model for the categorisation of hydrogen. However, the Hydrogen Action Plan states that the Government will review and streamline how standards relating to hydrogen are updated in legislation.

On behalf of WorkSafe New Zealand, Standards NZ reviewed international technical standards in relation to the production, distribution, and use of hydrogen. A report was produced in May 2023, containing a standards development implementation strategy for adopting international hydrogen standards. These standards focus on three stages – centralised stationary production and storage, mobile application of hydrogen, and large-scale decentralised distribution. These standards are expected to be finished by mid-2025.[70]

10. Does the regulatory framework clearly define the regulatory requirements relating to the production, storage, transportation or supply of hydrogen?

The Government has made it a priority to develop appropriate regulatory settings and standards to facilitate the uptake of hydrogen, by:

- initiating the "Hydrogen Regulatory Settings Project" and forming a cross-agency working group to identify and prioritise regulatory barriers to the deployment of hydrogen;
- identifying a potential regulatory landscape that could interact with hydrogen, which covers 90 Acts, regulations and technical standards;
- Standards NZ completing a standards development implementation strategy that outlines a suite of standards adoption recommendations to enable the use of hydrogen across NZ's energy landscape; and
- WorkSafe establishing a working group to ensure the risks to health and safety in adopting new hydrogen technologies are adequately managed.

11. Are there any foreign investment restrictions related to energy and infrastructure sectors?

Renewable energy projects that have more than 25 per cent ownership or control by overseas persons, and involve investment in "sensitive land" or "significant business assets", may require a consent from the Overseas Investment Office (**OIO**) under the Overseas Investment Act 2005 (**OIA**) before the investment can proceed.

Whether land is sensitive land under the OIA will depend on the area of land being acquired and the land type. For example, all non-urban land larger than five hectares is considered sensitive land. Temporary interests in sensitive land may also require consent, for example, where a lease has a term of 10 years or more (or three years or more in the case of residential land). Leases of rural land with a term of less than 10 years and true easements will generally not be captured under the OIA and will accordingly not require OIO consent.

67 Green Hydrogen Vision: New Zealand. Green Hydrogen Organisation. Accessed at https://gh2.org/countries/new-zealand

68 Louisa Steyl (7 September 2024) $450,000 spent before green hydrogen scheme ditched. Stuff New Zealand. Accessed at https://www.stuff.co.nz/nz-news/350404591/450000-spent-green-hydrogen-scheme-ditched

69 Louisa Steyl (29 August 2024) Meridian pushes pause on Southern Green Hydrogen. Stuff New Zealand. Accessed at https://www.stuff.co.nz/business/350394421/meridian-pushes-pause-southern-green-hydrogen

70 Hydrogen report guiding the way for hydrogen integration across New Zealand (29 May 2023) Standards New Zealand. Accessed at https://www.standards.govt.nz/news-and-updates/hydrogen-report-guiding-the-way-for-hydrogen-integration-across-new-zealand#:~:text=The%20report%20also%20recommends%20progressive,%2Dspecific%20standards%20(NZS).

Where the investment involves farm land, the landowner will be required to advertise the farm land, or interests in farm land, on the open market (to allow New Zealanders an opportunity to acquire the land or the relevant interests in farm land) before entering into an agreement with the overseas person. However, exemptions to this advertising requirement may be obtained from the OIO and such exemptions are now fairly common for renewable energy projects.

Overseas investment in "significant business assets", being acquisitions in assets exceeding NZ$100 million (or a higher threshold for investors from certain jurisdictions), will also require consent from the OIO.

Certain OIO applications can also trigger the "National Interest Assessment". This can be the case (among other things) where a non-New Zealand government investor is involved or where the investment involves over 250MW, including where an investor's installed capacity will exceed 250MW as a result of the investment. Where the National Interest Assessment is triggered, the OIO application will be subject to closer scrutiny and the relevant Ministers will need to confirm that the transaction is not contrary to New Zealand's national interest.

Additionally, investments in "strategically important businesses" may need to be notified to the OIO. Strategically important businesses include businesses involved in electricity generation, distribution, metering, or aggregation if the business is a generator with a total nominal capacity in a financial year exceeding 250MW. These transactions may be blocked, or have conditions imposed, if it is considered necessary to manage significant national security and public order risks.

The OIO has recently provided guidance that:

- easements used for wind farms are generally considered true easements and accordingly no OIO consent is required for these; and
- solar farms that are structured as easements (as opposed to leasehold interests) will generally be considered by the OIO to be more extensive / invasive than typical easements and will accordingly be considered to be more akin to leasehold interests and will require OIO consent (assuming the term is 10 years or more).

12. What international treaties are in place that may offer protection to international investors in hydrogen projects in the jurisdiction?

New Zealand is party to:

- five bilateral investment treaties;
- twenty-two treaties with investment provisions; and
- twenty-nine investment-related instruments

which protect investors' interests in investments in projects in New Zealand generally (found here). New Zealand is also party to sixteen free trade agreements that do not impose any specific tariffs on renewable energy equipment (including hydrogen equipment) from its trading partners. Details of the free trade agreements can be accessed **here**.

The Government has also pursued a range of international accords and understandings related to hydrogen. These include international projects and forums dedicated to country coordination on common hydrogen challenges, including the:

- IEA Clean Energy Ministerial Hydrogen Initiative;
- Asia-Pacific Economic Corporation (APEC);
- COP27 Breakthrough Agenda and the Hydrogen Energy Ministerial Meeting;
- bilateral cooperation arrangements on hydrogen;
- Japan (memorandum of cooperation signed in 2018);
- Singapore (arrangement of cooperation signed in 2021); and
- the establishment of three collaborative projects under the Germany New Zealand Green Hydrogen Research Programme with the University of Canterbury and the University of Otago, valued at NZD$6,000,000 in total.[71]

71 Strategic – New Zealand – Germany Green Hydrogen Research Programme. Ministry of Business, Innovation and Employment. Accessed at https://www.mbie.govt.nz/science-and-technology/science-and-innovation/funding-information-and-opportunities/investment-funds/catalyst-fund/funded-projects/catalyst-strategic-new-zealand-germany-green-hydrogen-research-partnerships

Market developments and opportunities

13. Are there any government grants or other government funding available to hydrogen projects (including for research and development)?

The Government has financially supported the development of many projects and research initiatives. Prior to the 2023 budget, the Government contributed:

- $35 million to support capital investment in key supply chain focused projects;
- $45.5 million in research and development initiatives;
- $7.5 million in pilot and demonstration projects;
- $19.9 million from the Provincial Growth Fund to support the joint venture between Ballance Agri-Nutrients and Hiringa Energy to develop a green hydrogen production facility in Taranaki.
- $6 million from the EECA and COVID-19 Response and Recovery Fund to support TR Group in purchasing 20 heavy freight hydrogen trucks, which will be leased to customers and use Hiringa's hydrogen refuelling network.
- A further $100 million for the Regional Hydrogen Transition consumption rebate and $30million for the Clean Heavy Vehicles grant was announced in the 2023 budget. $16 million was invested from the COVID-19 Recovery Fund in Hiringa Refuelling's heavy vehicle refuelling network, with four stations in the North Island.

Furthermore, in the 2024 budget, the Government committed $30 million over 3 years to a Low Emissions Heavy Vehicles Fund.

New Zealand Green Investment Finance Limited (NZGIF) was originally established in 2019 to invest in New Zealand's low carbon future, had a pool of capital of $700m after receiving a $300 million injection from the 2023 budget, and was the largest climate focused investor in the country. However, the Climate Change Minister for New Zealand, Simon Watts, announced in April 2025 that NZGIF would stop making new green investments, and would instead start to wind down their portfolio due to "very limited results".[72]

14. Are there any notable pilot/demonstration projects in place or planned for the production or offtake of clean hydrogen?

Despite the current lack of a regulatory framework, there has been national and international interest in testing the viability and feasibility of the production and offtake of clean hydrogen. Notable projects include:

- **Firstgas New Zealand Hydrogen Pipeline Feasibility study**: In 2020, Firstgas commenced a comprehensive feasibility study targeting how it can deliver hydrogen most cost-effectively to decarbonise energy and transport demands, and how hydrogen can be introduced into New Zealand's gas network. In 2022, following its study, Firstgas announced it had shortlisted three locations to pilot blending hydrogen with natural gas, with the ultimate aim to distribute a blended gas into its network by 2030. A blended gas product will prevent the need to build expensive new gas pipelines. Firstgas is working with regulators at WorkSafe and MBIE to ensure its study and project complies with the distribution network and regulatory framework.
- **Tuaropaki Trust and Obayashi green hydrogen plant**: The partnership's pilot project commenced in 2018 and now produces 1.5MW of green hydrogen using electricity generated from the Mokai geothermal power plant. The pilot project was used to assess the feasibility of developing a commercial-scale hydrogen supply chain.
- **Hyundai Xcient Fuel Cell truck**: Hyundai has partnered with NZ Post to distribute its first hydrogen-powered fuel-cell electric truck. The truck is currently refuelled by green hydrogen supplied by BOC Limited, but aims to utilise Hiringa's refuelling network when the network becomes operational in 2023.
- **Toyota NZ's car sharing project**: Toyota NZ has partnered with eight companies to create New Zealand's first commercial fleet of hydrogen powered cars which will be shared between the eight companies in the partnership.
- **Air New Zealand and Airbus hydrogen research project**: Air New Zealand and Airbus signed an agreement in September 2021 to research how hydrogen-powered aircraft could help the airlines reach their zero-emission target by 2050. Air New Zealand then announced an accelerator programme, with one goal being to replace its Q300 fleet with more sustainable aircrafts through the use of green hydrogen from 2030.

72 Government's green investment bank to be shut down (8 April 2025) Radio New Zealand. Accessed at https://www.rnz.co.nz/news/political/557556/government-s-green-investment-bank-to-be-shut-down

15. Are there any commercial-scale clean hydrogen production projects in development or already operating?

There are currently no commercial-scale hydrogen production projects in operation in New Zealand, however there are an increasing number of projects in development and planning stages. Notable projects in development include:

- **Hiringa Energy's hydrogen refuelling stations**: Hiringa Refuelling achieved financial close in September 2021 to develop New Zealand's first national wide refuelling network for New Zealand's heavy transport industry. The first substations were commissioned in 2024, and the company has a plan to roll out a number of stations throughout the country that will produce and supply clean hydrogen fuel.
- **Ports of Auckland production and refuelling facility**: In 2021, Ports of Auckland partnered with Obayashi to develop a hydrogen production and refuelling facility. The port plans on developing an electrolyser in Auckland City that will supply green hydrogen to the port's transport infrastructure and assist the Ports of Auckland in reaching their target of being a zero-emission port by 2040.
- **Hiringa Energy and Ballance Agri-Nutrients green hydrogen JV**: The JV was granted resource consent in December 2021 to construct New Zealand's first hydrogen production facility, but an appeal by a local iwi group and Greenpeace stalled progress for two years (see further below). The project is planned to construct a 24MW wind farm to generate electricity for the production of green hydrogen in Kapuni, Taranaki. The project is expected to reach financial close in Q2 2025. The electricity generated from the wind turbines is intended to power an electrolysis plant to produce hydrogen and ammonia, which will be used to decarbonise the agriculture, horticulture and transport industries.
- **HW Richardson's dual-fuel hydrogen diesel truck**: HW Richardson has purchased 10 retrofitted diesel vehicles that will use hydrogen and diesel fuel. The company is working towards commissioning its first hydrogen production and refuelling facility that will include a 1.1MW containerised hydrogen production and storage system.

16. Have there been any hydrogen-related disputes in your jurisdiction?

In December 2023, the Court of Appeal of New Zealand dismissed an appeal and upheld a consent for Hiringa Energy and Ballance Agri-Nutrients' proposed $70 million Kapuni Green Hydrogen Project.73 The resource consent was granted on the basis that the hydrogen produced would be initially used for the production of synthetic nitrogen fertiliser, and over a five-year period, transition to supplying hydrogen fuel for commercial and heavy transport. This intended transition underpinned the consenting decision. Greenpeace appealed the decision claiming that the High Court erred in failing to include any condition requiring the transition to actually occur. The Court of Appeal dismissed the appeal, citing that the conditions of the consent, requiring Ballance and Hiringa to report to the Taranaki District Council on the progress of the transition, reflected the justification for fast-tracking the consent.

Last updated June 2025

73 Greenpeace Aotearoa Incorporated v Hiringa Energy Limited and Ballance Agri-Nutrients Limited [2023] NZCA 672.

Nigeria

Ashurst collaborated with **Banwo & Ighodalo** in the preparation of this content. We are grateful for their input.

Policy and Regulation

1. Is there a government hydrogen strategy or policy?

Nigeria does not currently have a stand-alone hydrogen strategy or policy. Whilst the Federal Government of Nigeria (FGN) has consistently echoed its interest in facilitating a green and sustainable transition in the energy sector, this interest is yet to morph into a comprehensive hydrogen strategy or policy.

However, the FGN has introduced some renewable energy policies where hydrogen has been identified as an energy source in the energy mix of the country. These policies/plans are:

- Renewable Energy Masterplan 2006
- National Renewable Energy and Energy Efficiency Policy 2015
- Energy Transition Plan 2022
- National Energy Masterplan 2022
- National Energy Policy 2022[74]
- Nigeria's Long-Term Low Emission Development Strategy 2023

It is noteworthy that the National Energy Masterplan introduces a significant step towards entrenching a hydrogen policy by providing for a Hydrogen Development Plan which consists of an action plan that delineates strategies, activities, implementing agencies, funding sources and timeframes for hydrogen development. However, this Hydrogen Development Plan does not provide a comprehensive roadmap for hydrogen infrastructure development.

Additionally, the Electricity Act 2023 emphasizes the importance of renewable energy in electricity generation and mandates the Nigerian Electricity Regulatory Commission (NERC) to promote the development and utilisation of renewable energy by making regulations, standards and issuing licences relating to the generation and distribution of renewable energy. The reasonable expectation is that States within the Federation of Nigeria will, following the empowerment by the Electricity Act, 2023 to create their own electricity markets, will now embrace the generation of electricity with hydrogen as an energy source and to this end, will actively seek **foreign investment in hydrogen infrastructure** development.

Moreso, the Nigeria's Long-Term Low Emission Development Strategy (LT-LEDS) identifies hydrogen as an integral part of the renewable energy alternatives through the development of a good roadmap to secure its inclusion in the Nigeria's energy mix. The LT-LEDS also lays a foundation for policy, investment and support in research and development for hydrogen.

It is also important to note that Nigeria recently took a major step in its clean energy journey by launching the development of a National Hydrogen Policy. The kick-off meeting for the hydrogen policy development was held in Abuja on February 21, 2025. It was jointly led by the Minister of State for Petroleum (Gas), the Minister of Budget and Economic Planning. Representatives from key ministries and agencies, including Environment, Science and Technology, Water Resources, and the Nigerian Midstream and Downstream Petroleum Regulatory Authority (**"NMDPRA"**), were present at the meeting. The goal is to establish a strong hydrogen policy that aligns with the country's development objectives. The kick-off meeting emphasized hydrogen's crucial role in driving sustainable economic growth and advancing Nigeria's energy transition, and we shall continue to monitor the development in relation to the development of the National Hydrogen Policy.

2. What are the key goals and commitments included in the strategy/policy?

Whilst Nigeria does not currently have a formalized and stand-alone hydrogen strategy or policy, some key goals and commitments towards hydrogen deployment, use and infrastructure development, can be gleaned from some of the renewable energy policies identified above. Some of these goals and commitments include:

- Integrating hydrogen as an energy source in the Nigerian energy mix.
- Keeping abreast of international trends in hydrogen production and application.
- Developing local production capacity for hydrogen.
- Ensuring hydrogen utilization as a preferred energy source, where possible, on account of its high environmental friendliness.

74 The National Energy Policy was first approved in 2003, there have been many changes in the national and international energy scenes that have necessitated its review. The 2022 Policy now expressly highlights hydrogen as a key component of the Nigerian energy industry.

- Encouraging research and development in hydrogen energy-related technologies.
- Developing domestic capacity in hydrogen production and application technologies.
- Providing incentives to popularize the use of hydrogen as an energy source.
- Intensive awareness and sensitisation campaigns.
- Building indigenous capacity.
- Promoting automation and standardization requirement to scale up hydrogen systems.

3. Which industry sectors are most likely to be affected by hydrogen deployment?

Hydrogen has the potential to impact nearly all sectors of the Nigerian economy where successfully deployed in the country. The industries that are likely to be impacted by hydrogen deployment are:

- Electricity.
- Manufacturing.
- Transportation.
- Agriculture.
- Shipping.
- Export and Trade.
- Oil and Gas.

4. Who are the main regulators for the hydrogen market?

Due to the absence of a comprehensive hydrogen policy, the hydrogen market is currently not fully developed. However, going by the Hydrogen Development Plan in the National Energy Masterplan, and the existing powers/functions of some of the subsisting regulators in Nigeria, the regulators that will most likely regulate the deployment, use and development of the hydrogen market in Nigeria are:

- The Energy Commission of Nigeria (ECN), which has the statutory mandate for the strategic planning and co-ordination of national policies in the field of energy in all its ramifications.
- The Federal Ministry of Innovation, Science and Technology, which is expected to facilitate the development and deployment of science and technology apparatus to enhance the pace of socio-economic development of Nigeria through appropriate technological inputs into product activities in Nigeria.
- The Nigerian Electricity Regulatory Commission (NERC), which is the primary regulator of the electricity market in Nigeria and formulates and implements regulations, and standards that govern the generation, transmission, distribution, and supply of electricity.
- The Nigerian Upstream Petroleum Regulatory Commission (NUPRC), which is the primary regulator of the upstream sector of the Nigerian petroleum industry and the NMDPRA, which is the primary regulator of the midstream and downstream sector of the petroleum industry in Nigeria.

  We note that the Petroleum Industry Act, 2021 (the "PIA") defines petroleum products as materials derived from crude oil and natural gas processing such transportation fuels. **Therefore, to the extent that any form of hydrogen is derived from crude oil and natural gas processing, such hydrogen will be classified as a petroleum products which will come within the purview of the PIA**.
- The Federal Ministry of Power, which is the ministry in charge of formulating policies related to electricity in Nigeria. In relation to renewable energy, which includes hydrogen, the Ministry has issued policies such as: the National Renewable Energy and Energy Efficiency Policy; the National Renewable Energy Action Plan; the National Energy Efficiency Action Plan; the Sustainable Energy for All Action Agenda, among others. These plans and policies provide for a pathway or strategy for the adoption of hydrogen as a source of energy and the integration of same in the country's energy mix.
- The Federal Ministry of Environment, which oversees and executes programmes and policies that safeguard and manage the environment. It establishes rules for conducting Environmental and Social Impact Assessments (ESIAs) and oversees the conduct of ESIAs for all renewable projects.
- The Rural Electrification Agency, which is responsible for providing electricity through renewable energy projects, specifically to rural areas.

5. Does the government hydrogen strategy or policy support the development of both low carbon (blue) hydrogen and renewable (green) hydrogen?

The National Energy Transition Plan aims to attain a 33% blue hydrogen milestone in ammonia production by 2030, and subsequently progress to 100% hydrogen (both blue and green) by 2060. By virtue of the capital-intensive nature of green hydrogen projects, the FGN is focused on supporting the development of both blue hydrogen and green hydrogen before progressively shifting its focus to the development of green hydrogen, being the more desirable variant of hydrogen.

6. If the government hydrogen strategy or policy supports the development of low-carbon hydrogen, to what extent is carbon capture and storage being taken forward?

The absence of a stand-alone hydrogen policy limits the extent of the development of carbon capture and storage (CCS) in Nigeria. However, the National Energy Transition Plan and the Long-Term Low Emission Development Strategy both identify CCS as a required enabler for achieving net-zero and enabling blue hydrogen.

Since States have been given power to create their own electricity markets, it has been observed that carbon capture and storage is now part of the key conversations for the development of the power sector in many States in Nigeria. Further to this, it is expected that a legal framework would be enacted by NERC or State regulatory agencies, to commercially incentivize carbon capture and storage in Nigeria.

Additionally, the Petroleum Industry Act, 2021 envisages the need for decarbonisation, and therefore requires every concessionaire of a petroleum licence or lease to include an environmental management plan in its field development plan, and this clearly exhibits the intention to mitigate the negative environmental impacts of petroleum operations. To the extent that carbon capture and storage mechanisms are to be applied in such a plan, concessionaires may include such carbon capture and storage mechanisms in their environmental management plan, as one of the mitigating measures to be implemented in their operations.

The Nigerian Upstream Petroleum Regulatory Commission (**"NUPRC"**) which regulates upstream operations in Nigeria has sought to recognise carbon capture and storage, by providing in its Acreage Management and Petroleum (Drilling and Production) Regulations[75] that *"with the consent of the Commission, the lessee may provide carbon capture and storage services with respect to reservoirs contained in the lease area."*[76]

7. Are there targets for the production of hydrogen?

No. We are not aware of any targets for the production of hydrogen in Nigeria.

8. Are there any incentive mechanisms/business models in place to support the production of hydrogen?

There are currently no specific incentives or business models applicable to the production of hydrogen. However, the production of hydrogen, being a renewable energy source, benefits from existing incentive mechanisms available to all renewable energy projects in the electricity sector.

These include:

- **Customs duty exemptions**: Equipment and materials used in renewable energy projects benefit from a two-year exemption from customs duties.
- **Tax Holiday for Manufacturers**: Renewable energy manufacturers enjoy a five-year tax holiday from the commencement of their manufacturing activities.
- **Tax Holiday on Dividend Incomes**: Investors in domestic renewable energy sources also enjoy a five-year income tax holiday on the dividend they receive from the renewable energy business.
- **Pioneer Status Incentive**: This incentive grants relief from income tax for a minimum of three (3) years and a maximum of five (5) years for companies that operate power generation, transmission, and distribution systems.
- **Soft Loans**: Investors in the power sector also enjoy the availability of soft loans and special low interest loans from the power sector development fund for renewable energy supply and energy efficiency projects.

75 This has now been issued as of April 12, 2024.
76 Regulation 37(2) (b) of the Acreage Management and Petroleum (Drilling and Production) Regulations 2024.

9. Are there any standards in place for the classification and/or certification of low-carbon or renewable hydrogen?

Whilst Nigeria does not have local certification schemes or technical standards for the classification of low-carbon hydrogen, it is and remains one of the fifty (50) countries (as at April 2025) that have endorsed **the COP28 Declaration of Intent on the Mutual Recognition of Certification Schemes for Renewable and Low-carbon Hydrogen and Hydrogen Derivatives**. The countries which have endorsed the declaration will work towards mutual recognition of hydrogen certification schemes to help facilitate a global market. Other African countries who have endorsed the declaration include South Africa, Sierra Leone, Namibia, Morocco, Mauritania, Ethiopia, Kenya, Angola, Ghana and Egypt.

10. Does the regulatory framework clearly define the regulatory requirements relating to the production, storage, transportation or supply of hydrogen?

As earlier stated, Nigeria currently has no standalone policy or regulatory framework dedicated to green hydrogen. However, to the extent that hydrogen is a petroleum product, the PIA and the Midstream and Downstream Petroleum Operations Regulations, 2023 (**"MDPRO"**) issued by the NMDPRA pursuant to the PIA, which govern the production, storage, transportation, and distribution of petroleum products, would also be applicable to the regulation of hydrogen. The MDPRO clearly provides for the licences and permits required for these activities, including the applicable fees and the duration of the licences.

Additionally, Nigeria's Energy Transition Plan makes provision for hydrogen as part of Nigeria's renewable energy sources towards attaining Nigeria's net zero emission goals. Specifically, provisions are made for hydrogen in the revised Nigerian Energy Policy,2022, the National Energy Masterplan, 2022 and the Nigeria's Long-Term Low-Emission Development Strategy, 2023. However, these policies and plans majorly provide a proposed policy objectives for Nigeria and a development framework for adopting and deploying the same. However, these different polices are yet to be further developed into detailed regulations, guidelines or other statutory instrument with requirements for the production, transportation, and supply of hydrogen.

11. Are there any foreign investment restrictions related to energy and infrastructure sectors?

There are no foreign investment restrictions targeted at the energy and infrastructure sectors in Nigeria.

Instructively, Nigeria's national policy on foreign investment, permits foreign investments in all sectors of the economy except specified industries or enterprises designated as being on the "negative list" in the Nigeria Investment Promotion Commission ("NIPC") Act. Specifically, Section 17 of the NIPC Act provides *that except as provided in section 18 of the Act and subject to this Act, a non-Nigerian may invest and participate in the operation of any enterprise in Nigeria. Section 18 thereafter provides that the provisions of this NIPC Act shall not apply to the "negative list" as defined in Section 31 of the Act*.

The prohibited sectors of investment under the negative list as provided in section 31 of the NIPC Act are: (a) production of arms, ammunition, etc.; (b) production of and dealing in narcotic drugs and psychotropic substances; (c) production of military and para-military wears and accoutrement, including those of the Police and the Customs, Immigration and Prison Services; and (d) such other items as the Federal Executive Council (**"FEC"**) may from time to time determine. It is important to note that negative list is not exhaustive as the FEC has the discretionary to determine other enterprises that may be added to the investment prohibition list. However, the nature of business activities in the sectors which are listed under the investment prohibition list are enterprises involved in products or services that touch on national security.

Section 24 of the NIPC Act guarantees the unconditional transfer of funds through any licensed bank or licensed specialist bank in freely convertible currency, of dividends or profits (net taxes) attributable to the investment. This also covers payments towards loan servicing where a foreign loan has been obtained, remittance of proceeds (net of all taxes), and other obligations in the event of either a sale or liquidation of the enterprise or any interest attributable to the investment.

Additionally, Section 25 of the Nigerian Investment Promotion Commission (NIPC) Act guarantees that there will be no nationalization or expropriation of foreign investments by the Nigerian Government.

12. What international treaties are in place that may offer protection to international investors in hydrogen projects in the jurisdiction?

Although there are no specific international treaties offering protection to international investors in hydrogen projects, Nigeria is a signatory to multiple Bilateral Investment Treaties with several countries, which guarantee investment protection and provide for obligations of the state towards such investors.

Indeed, Section 26(2) of the NIPC Act provides some protection, especially in relation to dispute resolution, by providing that any disputes which are not amicably settled through mutual discussions, may be submitted at the option of the aggrieved party to arbitration, in the case of a foreign investor, within the framework of any bilateral or multilateral agreement on investment protection to which the Federal Government and the country of which the investor is a national are parties.

However, it is important to note that treaties between Nigeria and other subjects of international law do not automatically become domestic laws unless they are specifically domesticated (this requires these treaties to enacted into laws by the Nigeria's legislative arm, known as the National Assembly).

Market developments and opportunities

13. Are there any government grants or other government funding available to hydrogen projects (including for research and development)?

We are not aware of any government grants or funding that are available to hydrogen projects in Nigeria. Nigeria's Energy Transition Office however, reports that it is working with public and private partners to facilitate financing commitments for Nigeria's Energy Transition Plan.

Further, Nigeria also enjoys support from foreign governments for hydrogen research as we are aware of the Nigeria4H2 Project which was launched in January 2024 and funded by the German Federal Ministry of Education and Research and seeks to investigate the potential for green hydrogen whilst defining a path for an acceptable transition in Nigeria. With a budget of €342,700 Euros, (circa N417 million converted at the exchange rate applicable when the fund was granted), the study is expected to last four months and cuts across participants from the academia, research organisations, government, among others.

14. Are there any notable pilot/demonstration projects in place or planned for the production or offtake of clean hydrogen?

In June 2023, **Impact Hydrogen**, a leading organizer of green hydrogen projects located in the Netherlands, partnered with local parties like **Technologic** in the development of a **Hydrogen** Valley in Nigeria. This partnership focuses on maximizing community engagement, ensuring that the project is sustainable and beneficial to the local population.

Additionally, in December 2023, the German DWS Group signed a $500 Million Memorandum of Understanding with Union Bank of Nigeria to **invest in renewable energy projects** in rural communities across Nigeria, with green hydrogen being a key focus.

Further, FuelCell Energy, Inc. (Nasdaq: FCEL) and Oando Clean Energy Limited (OCEL), the renewable energy subsidiary of Oando Energy Resources (OER), have **announced** the signing of a memorandum of understanding to collaborate on the development of large-scale green hydrogen production and a 5MW - 15-MW low-carbon power plant.

In March 2024, CGK Global, a waste management company based in Qatar, **announced plans** to establish a state-of-the-art hydrogen plant in Kaduna State, Nigeria, with a possible total investment of $350 Million.

In March 2025, Nigeria's Energy Commission partnered with Noretek Energy to launch a groundbreaking 20,000 tons per annum green hydrogen project. This project is located in Kogi State and is promised to revolutionize the country's energy landscape.

Also in March 2025, Nigeria signed a 2,600 megawatt (MW) solar deal with LONGi Green Energy Technology Company Limited (**"LONGi"**) to power a green hydrogen economy. The solar modules will power Nigeria's Green Hydrogen Hub Project, located in the Liberty Oil and Gas Free Trade Zone in Akwa Ibom State.

15. Are there any commercial-scale clean hydrogen production projects in development or already operating?

We are aware that the Memorandum of Understanding, signed by and between FuelCell Energy and Oando Clean Energy Limited (OCEL) relates to the development of a large-scale green hydrogen and low-carbon energy production in Nigeria. The project will include a 5MW - 15MW power plant with FuelCell Energy providing its fuel-cell and electrolyzer technology.

Additionally, in February 2025, The Chinese electrolyser and solar panel manufacturer, LONGi also entered into a preliminary agreement worth €7.6 billion ($7.98 billion) with a Nigerian developer, APPL Hydrogen Ltd ("AHL") to develop a major green hydrogen project on Nigeria's southern coast. The proposed AHL Hydrogen Plant, set to be located within the Liberty Free Trade Zone near Atabrikang village located in Ibeno Local Government Area of Akwa Ibom State. The project is expected to produce 1.2 million tonnes of green methanol from green hydrogen annually, for export. The facility will also generate 1.1GW of clean electricity, along with food-grade CO2 and green oxygen.

16. Have there been any hydrogen-related disputes in your jurisdiction?

We are not aware of any hydrogen-related disputes in Nigeria.

Last updated May 2025

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Norway

Ashurst collaborated with **Schjødt** in the preparation of this content. We are grateful for their input.

Policy and regulation

1. Is there a government hydrogen strategy or policy?

Yes, Norwegian Governments have launched both a **hydrogen strategy** and a **roadmap**.

The present Government, being a single Social Democratic Party government after the Centre Party coalition partner left the government in January 2025, continues its basic mission statement (**"the Hurdal Platform"**) where it is expressed that Norway shall develop a value chain for production, distribution and use of hydrogen produced with none or low emissions and contribute to the development of the hydrogen market in Europe.

In its 2023 "Roadmap 2.0 for Green Industrial Lift", the Government has pointed to the market possibilities that Norway's availability of renewable electric power for electrolysis of water to hydrogen (**"green hydrogen"**) and of natural gas for production of hydrogen with carbon capture and storage (**"CCS"**) (**"blue hydrogen"**). Several challenges are addressed: The present global low level of clean hydrogen production, the lack of a market for such hydrogen, and the needs for technological development, cost reductions and for energy. However, the Government will analyse the European market potential and contribute to a development of this market with the aim of Norwegian exports of clean hydrogen. with the ambition of a coherent value chain including production, distribution and use. For instance, in November 2024, Norway signed a Memorandum of Understanding with the Netherlands to strengthen cooperation in market development, policy frameworks, regulation, standardization, technology, and innovation related to hydrogen and CCS.

The Government's further ambition is to facilitate the production with no or low level of emissions to cover the national demand in 2030.

The Government will also facilitate the establishment of production of blue hydrogen in a socio-economic beneficial manner, and, including with the offshore gas network operator Gassco, to award offshore areas for CO2 storage.

EU's Directive 2024/1788 and Regulation 2024/1789 on the internal markets for renewable gas, natural gas and hydrogen, adopted in June 2024 and being part of EU's "Fit for 55" package, were sent on hearing by the Government in August 2024 for implementation in Norway. The hearing is completed, and the Ministry of Energy is currently (April 2025) considering the hearing comments. It is not communicated by the Ministry how the further process will be.

2. What are the key goals and commitments included in the strategy/policy?

Clean hydrogen is a key part of the Norwegian Government's decarbonisation strategy.

Norway is presently the fourth largest exporter of natural gas in the world behind the US, Russia and Qatar. Norway also supplies between 25 and 30% of the EU gas demand, making it the largest supplier to the EU. Due to its significant resources of gas and hydropower, Norway is a country which can provide the primary energy required for production of hydrogen from existing accessible energy resources in a cost-effective way and with competitive prices.

Since Norway's electricity production is nearly 100% renewable, the The Road Map 2.0 provides that hydrogen is to be used for the hard to abate sectors such as the maritime sector, heavy transport, and general industry.

Hydrogen will be produced by electrolysis and from natural gas combined with CCS. Ammonia will also be a key product in this regard.

There are, however, no established targets for green or blue hydrogen even though the Hurdal Platform has envisaged that such targets will be established by 2030.

Nevertheless, climate targets regarding the cutting of emissions have been set to a general reduction of 55% by 2030 compared to 1990 and climate sub-targets for certain sectors such as maritime have also been set. For example, all ferries and charter boats in coastal waters in Norway will be required to be zero emission vessels by 2026.

It is also worth noting that the current Norwegian Government issued a new export strategy on 10 March 2022 stating that offshore wind and green shipping are some of the key initiatives where hydrogen is expected to be an important contributor.

3. Which industry sectors are most likely to be affected by hydrogen deployment?

The power sector in Norway is nearly 100% fuelled by renewable energy due to the hydropower resources. As such, Norway does not have a downstream gas market but is a net exporter of gas. Heating is either covered by district heating or through direct electrification. Power and heating sectors are therefore already decarbonised in Norway.

Consequently, the industry sectors likely to be affected by hydrogen deployment are the hard to abate sectors, including:

- road transport;
- shipping and aviation; and
- general industry.

4. Who are the main regulators for the hydrogen market?

N/A

5. Does the government hydrogen strategy or policy support the development of both low-carbon (blue) hydrogen and renewable (green) hydrogen?

The Roadmap 2.0 supports both low-carbon (blue) hydrogen and renewable (green) hydrogen. This can be explained by Norway's significant resources i.e. hydropower and natural gas. In addition to the various green hydrogen initiatives, Norway promotes towards the EU the use of blue hydrogen with the use of CCS, at least as a transition low-carbon energy source for the expected quite long period before green hydrogen fully can supply the future hydrogen market. This is expected to continue beyond 2050.

6. If the government hydrogen strategy or policy supports the development of low-carbon hydrogen, to what extent is carbon capture and storage being taken forward?

In Norway, the Government has been providing substantial support for carbon capture and storage for more than a decade. Gassnova SF, a state-owned entity, was established in 2005 to promote technological development and build competence for cost-effective and future-oriented solutions for CCS. Gassnova shall facilitate the Norwegian State's participation in CCS projects to provide maximum benefit for the State or State-owned entities.

As of today, the Norwegian CCS initiative consists of three main elements:

1. the **CLIMIT programme**, which provides financial support for development of CCS technology;
2. the **Technology Centre Mongstad (TCM)**, which is the world's largest and most flexible test centre for developing CO2 capture technologies and a leading competence centre for carbon capture. The State (being the majority owner) owns TCM together with Equinor, Shell and Total; and
3. the **Longship project**.

Longship is one of the first industrial CCS projects to develop an open access infrastructure with the intent and the capacity to store significant volumes of CO_2 from across the European continent. It consists of two capture projects, Norcem (cement production) and Fortum Oslo Varme (waste to energy plant) and a transportation and storage project, Northern Lights. The Government provides substantial financial support to the Longship project, both for capital and operational expenditures. A large part of the project is expected to be completed in 2025.

On the regulatory side, Norway has implemented the CO_2 Storage Directive through separate CO2 Storage Regulations.

Several licenses have been awarded both for exploration and for exploitation of subsea reservoirs on the Norwegian Continental Shelf for injection and storage of CO_2.

7. Are there targets for the production of hydrogen?

No targets have yet been set beyond the high level target of a 55% emissions cut by 2030. However, in the Government's Hurdal Platform it is suggested that hydrogen production targets will be set.

8. Are there any incentive mechanisms/business models in place to support the production of hydrogen?

There are several incentive mechanisms already in place.

Significant state funding is granted through Enova, the Norwegian Research Council, and Innovation Norway.

Moreover, two Research Centres for hydrogen have been established in Trondheim and in Bergen. These are connected to several other academic and industrial clusters in Norway: **HYDROGENi** and **HyValue**.

Norway has also joined Europe's IPCEI (Important Project for Common Interest) initiative for hydrogen.

9. Are there any standards in place for the classification and/or certification of low-carbon or renewable hydrogen?

There are no existing standards in place for the classification of hydrogen, however in the Roadmap 2.0, the Government states that green hydrogen will be produced from electricity from the grid, which is already fully renewable energy. The Roadmap 2.0 also refers to production from natural gas with carbon capture and storage.

10. Does the regulatory framework clearly define the regulatory requirements relating to the production, storage, transportation or supply of hydrogen?

The existing regulatory framework defines safety standards for hydrogen referring to the regulation for dangerous substances.

Norway is also linked to the European internal market by the EEA Agreement. The European Commission presented its Hydrogen and Decarbonisation Package on 15 December 2021. Given the third liberalisation package incorporates both the power and gas market into the EEA Agreement, this Hydrogen and Decarbonisation Package is expected to be EEA relevant.

However, it is worth noting that the Renewable Energy Directive (RED II and III) in the Clean Energy Package is still not incorporated into the EEA Agreement.. The EU has been putting political pressure on the Norwegian Government to implement RED II, but this is a contentious matter between the largest parties in the Parliament. but this is a contentious matter between the two political parties in the Government. The current Norwegian Government has proposed that the Parliament to vote in favour of the incorporation of a slightly amended REDII.

11. Are there any foreign investment restrictions related to energy and infrastructure sectors?

There are no limitations to foreign investment in hydrogen production or infrastructure. However, the hydropower installations are publicly owned, whilst the exploitation of oil and gas resources are open to qualified private investments.

12. What international treaties are in place that may offer protection to international investors in hydrogen projects in the jurisdiction?

Norway is part of the European Internal Market and is recognised for its stability, democratic rule and its openness and transparent protection of foreign investments, particularly at the Norwegian Continental Shelf.

The Energy Charter Treaty (ECT) is a multilateral investment treaty which entered into force in April 1998. Itspecifically addresses energy trade, transit, and investment between its contracting parties, which include the UK and all EU states (except Italy). The ECT has been undergoing a modernisation process to align it with contemporary energy and climate goals, including the Paris Agreement. The modernised ECT was adopted on 3 December 2024 and is set to be provisionally applied from 3 September 2025. Full entry into force will occur 90 days after ratification by at least three-fourths of the parties to the treaty.

Norway has however, not ratified this treaty. The modernisation of the ECT, although not directly applicable to Norway, reflects broader trends in aligning energy investment treaties with global climate goals, which may influence Norway's policy environment.

Market developments and opportunities

13. Are there any government grants or other government funding available to hydrogen projects (including for research and development)?

There has been a number of different funding initiatives targeted at different parts of the hydrogen value chain. Funds are channelled through Enova, Innovation Norway, and the Norwegian Research Council.

14. Are there any notable pilot/demonstration projects in place or planned for the production or offtake of clean hydrogen?

There are a number of different pilot projects being deployed in Norway to examine and test the feasibility of clean hydrogen production and use in different sectors.

The Norwegian hydrogen industry is under a rather rapid development with a large number of projects over the whole of Norway. The Norwegian industry association Norsk Hydrogenforum has on its website a map of the Norwegian hydrogen landscape (**https://www.hydrogen.no/faktabank/det-norske-hydrogenlandskapet**).

Enova has until the autumn of 2024 granted financial support with NOK 3 billion to projects within hydrogen and ammonia in the maritime sector and has recently established further support programs within this sector. The supported projects include five production plants for green hydrogen and a number of new vessels.

A number of production plants for green hydrogen are under construction or under planning. This includes projects for delivery to the maritime sector along the coast of Norway as well as projects for export to the European market.

On the other hand, the planned project by Equinor and RWE of an export pipeline for hydrogen from Norway to Germany has been abandoned.

15. Are there any commercial-scale clean hydrogen production projects in development or already operating?

Five new production facilities for hydrogen started production during 2024.

The Norwegian based international leading fertilizer producer Yara opened its renewable hydrogen plant at Herøya, Norway in June 2024. It produces renewable hydrogen and ammonia for fertilizers. This is the largest of its kind in operation in Europe. As the world's second largest ammonia producer Yara is broadly engaged in developing blue and green ammonia projects within shipping fuel, power production, ammonia as hydrogen carrier and clean fertilizer for food segments.

In addition, production facilities in Eigersund, Hellesylt, Rørvik and Kårstø came into production. Furthermore, investment decisions for three production plants have been taken that will come into production in 2025-2027.

16. Have there been any hydrogen-related disputes in your jurisdiction?

None generally known to the public.

Last updated April 2025

Oman

Policy and regulation

1. Is there a government hydrogen strategy or policy?

Oman is actively pursuing a transition from relying on energy derived from hydrocarbons to renewable energy and is establishing a green economy as part of its national objectives (which are set out in Oman Vision 2040) and its recent commitment to reach net-zero emissions by 2050 (in line with the Paris Agreement).

Green Hydrogen Strategy

In 2024, Oman officially published its Green Hydrogen Strategy, outlining ambitious production targets of over 1 million tonnes per annum (mtpa) by 2030, scaling up to 3.75 mtpa by 2040 and 8.5 mtpa by 2050. The strategy includes the allocation of approximately 50,000 km^2 of land for green hydrogen projects and emphasizes the development of shared infrastructure, such as hydrogen pipelines and desalination facilities.

Oman Vision 2040

In its national strategy document, Oman Vision 2040, Oman has identified "environment and natural resources" as a key focus area and has set out its key objectives. These include developing "a green and circular economy that addresses national needs and moves consistently with global trends". Oman Vision 2040 further provides that "new infrastructure projects will be geared towards a green economy, green strategies and renewable energy production". Oman has also set ambitious targets to meet 20% of its national energy demand by 2030 and, by 2040, to meet between 35% and 39% of its national energy demand.

Royal directives

In March 2022, Royal directives relating to the hydrogen sector were issued. The directives mandate the development of a legal framework and policies necessary for:

1. the growth of the hydrogen industry;
2. the allocation of sites for production of green hydrogen (focusing on attracting foreign investment);
3. the conduct of studies;
4. the establishment of new government structures within the Ministry of Energy and Minerals; and
5. the establishment of a new state entity.

The Oman government recently announced the establishment of a new state-owned entity called Hydrogen Oman (**"Hydrom"**) in line with the directives.

The Ministry of Energy and Mines has also been instructed to write supporting guidelines to back and nurture the hydrogen industry's sustainable growth in line with Oman's Vision 2040 priorities.

2. What are the key goals and commitments included in the strategy/policy?

The strategy aims to position Oman as a leading global exporter of green hydrogen, targeting the creation of approximately 70,000 new jobs by 2050. It also focuses on integrating green hydrogen into various industries, including green steel, shipping, and aviation, and emphasizes the importance of international partnerships to develop a robust hydrogen economy.

3. Which industry sectors are most likely to be affected by hydrogen deployment?

Given that the hydrogen sector in Oman is still an emerging industry, it is difficult to predict which industry sectors are likely to be affected. The Oman Government has stated that projects are being developed to meet local demands, including from the electricity and heavy industry (such as iron and aluminium) sectors, as well as global demands.

4. Who are the main regulators for the hydrogen market?

There is currently no specific regulatory body governing the hydrogen sector in Oman. However, the Royal directives of March 2022 relating to the hydrogen sector mandate the development of a legal framework and policies necessary for the establishment of new government structures within the Ministry of Energy and Minerals.

Following the promulgation of the Royal directives, progress has been made with the inception of Hydrom. This independent entity, under the ownership of Energy Development Oman and under the regulatory oversight of the Ministry of Energy and Minerals, is tasked with implementing a comprehensive vision for Oman's green hydrogen industry. Hydrom assumes a wide-ranging role, encompassing strategic planning for the sector, allocation of government-owned land for green energy ventures, structuring large-scale projects, managing developer assignments, overseeing project execution, and fostering the development of requisite infrastructure and associated industries.

In furtherance of the Royal directives, Royal Decree No. 10/2023 has been enacted, specifically designating land for renewable energy and clean hydrogen projects. Since February 2023, the Ministry of Energy and Minerals has been vested with full authority to delineate and execute the scope of green energy projects and clean hydrogen initiatives on designated sites, with Hydrom appointed as the usufructuary of such land. Hydrom, in turn, possesses the authority to partition the land and allocate sub-usufructs via auction to developers of renewable energy and clean hydrogen projects.

In light of these developments, we anticipate that Hydrom and the Ministry of Energy and Minerals will play integral roles in regulatory engagements pertaining to all participants in Oman's evolving hydrogen market, with the Ministry of Commerce, Industry and Investment Promotion playing a likely role as regulator.

5. Does the government hydrogen strategy or policy support the development of both low-carbon (blue) hydrogen and renewable (green) hydrogen?

While the primary focus remains on green hydrogen, Oman is also exploring the development of blue hydrogen projects. Plans include the establishment of a CO_2 transport network to support blue ammonia production, indicating a broader approach to hydrogen development.

6. If the government hydrogen strategy or policy supports the development of low-carbon hydrogen, to what extent is carbon capture and storage being taken forward?

Oman is planning to develop a CO_2 transport network by the early 2030s to facilitate carbon capture and storage (CCS) initiatives, particularly for blue ammonia production. This infrastructure will be crucial for the viability of low-carbon hydrogen projects.

7. Are there targets for the production of hydrogen?

The most recent targets, published in the 2024 Green Hydrogen Strategy, are over 1 million tonnes per annum (mtpa) by 2030, 3.75 mtpa by 2040 and 8.5 mtpa by 2050.

8. Are there any incentive mechanisms/business models in place to support the production of hydrogen?

Hydrom has initiated 26 key initiatives to support the hydrogen sector, including the development of incentive programmes, financing mechanisms, and the establishment of a National Green Hydrogen Centre for research and development.

9. Are there any standards in place for the classification and/or certification of low-carbon or renewable hydrogen?

Oman is formulating guidelines for hydrogen certification standards, collaborating with international partners to ensure compliance with global regulations. This includes pilot projects like Hyport Duqm, which is working towards certification in accordance with EU regulations.

10. Does the regulatory framework clearly define the regulatory requirements relating to the production, storage, transportation or supply of hydrogen?

There is currently no legal or regulatory framework which regulates hydrogen. Oman is currently in the process of developing such a framework.

The Law for the Regulation and Privatisation of the Electricity and Related Water Sector promulgated by Royal Decree 78/2004 (the Sector Law) regulates the generation, transmission and distribution of all electricity.

Oman is developing a comprehensive regulatory framework to support the hydrogen sector. This includes plans for a 300-400 km hydrogen pipeline network, with a final investment decision expected by 2027, and the development of shared infrastructure to facilitate hydrogen production and distribution.

11. Are there any foreign investment restrictions related to energy and infrastructure sectors?

At present there are no restrictions relating to foreign investments in the energy and infrastructure sectors in Oman. The Sector Law allows 100% foreign ownership of companies that generate electricity through renewable energy. However, publicly tendered IPPs (including for renewable energy projects) in Oman typically include an obligation to list a minority shareholding in the project company on the local securities exchange for a specified period following commencement of commercial operations.

12. What international treaties are in place that may offer protection to international investors in hydrogen projects in the jurisdiction?

Oman is a party to international treaties relating to the enforcement of foreign arbitral awards and judgments in Oman. While the Civil Procedure Law of Oman promulgated by Royal Decree 29/2002 does provide a framework for enforcement of foreign arbitral awards and judgments in Oman, the international treaties significantly enhance an international investor's ability to enforce (without the need to re-examine or re-litigate) where the arbitral awards or judgments are issued from other member states.

Enforcement of arbitration awards

Oman is a party to the New York Convention on the Recognition and Enforcement of Foreign Arbitral Awards of 1958 (the **New York Convention**) which it acceded to in 1998 and the Riyadh Arab Convention for Judicial Co-operation of 1983 (the **Riyadh Convention**) which it ratified in 1999. Where an arbitration award is issued from a member state of either the New York Convention or the Riyadh Convention, the courts of Oman should enforce such awards unless a party can raise valid grounds for refusing enforcement under the conventions or that the subject matter of the award is against Oman public policy.

International investors can therefore agree to dispute by arbitration outside of Oman. Member states of the New York Convention, in particular, include arbitration seats widely used in cross-border transactions such as the United Kingdom, Singapore, United States of America, Switzerland and the United Arab Emirates.

Enforcement of judgments

Oman is party to both the Riyadh Convention and the Gulf Cooperation Council Treaty for the Enforcement of Judgments, Judicial Delegation and Court Summons signed in 1996 (the **AGCC Protocol**) which, similar to the arbitration conventions, enhance the ability of investors to enforce foreign judgments issued from the courts of member states.

Market developments and opportunities

13. Are there any government grants or other government funding available to hydrogen projects (including for research and development)?

We are not aware of any funding programmes or government grants set up for hydrogen projects.

14. Are there any notable pilot/demonstration projects in place or planned for the production or offtake of clean hydrogen?

Sohar Industrial Port has announced its plans to turn the port into a hub for lower-cost hydrogen in place of traditional hydrocarbons, as well as plans to develop 3.5GW of solar power capacity.

State-owned OQ Alternative Energy has collaborated with Belgium's DEME Concessions to develop a **green hydrogen project in Duqm**.

ACME Group have announced a **second green hydrogen project** in partnership with the state-owned Tatweer. The project is expected to include a $3.5 billion green ammonia plant.

Hydrom has announced that agreements have been signed, awarding a number of blocks of land for the development of five hydrogen projects:

- The first project was signed with a consortium comprised of Copenhagen Infrastructure Partners, Blue Power Partners and Al Khadra, part of Oman's Hind Bahwan Group.
- The consortium will develop around 200,000 tonnes per annum of green hydrogen from 4.5 GW of installed renewable energy capacity for planned green steel plants located in Block Z1-01 and Block Z1-02 in the Port of Duqm, within the Special Economic Zone at Duqm.
- The second project was signed with BP Oman for the development of green hydrogen for ammonia production and export. The anticipated annual production for this project is 150,000 tonnes per annum of green hydrogen from 3.5 GW of installed renewables capacity in Block Z1-03.
- The third project was signed with the consortium of Green Energy Oman (GEO) for the development of green hydrogen and its derivatives. The consortium includes Oman's integrated Energy Company OQ, Oman Shell, Kuwait's energy investor EnerTech, InterContinental Energy and Golden Wellspring Wealth for Trading. This project is expected to produce up to 150,000 tonnes per annum of green hydrogen from 4 GW of installed renewables capacity in Block Z1-04.
- The fourth project was signed with the a consortium of POSCO-ENGIE consisting of POSCO Holdings, MESCAT Middle East DMCC, Samsung Engineering Co. Ltd., Futuretech Energy Ventures, Korea East-West Power Co. Ltd. and Korea Southern Power Co. Ltd. The consortium is expected to produce more than 200,000 tonnes per annum of green hydrogen by 2030, utilising over 5.2 GW of combined wind and solar energy to produce and export ammonia. The plant will be built in the Al Wusta Governorate.
- The fifth project was signed with a consortium of Hyport Duqum consisting of OQ Alternative Energy and DEME Concessions NV, to produce green hydrogen. The consortium aims to produce more than 50,000 tonnes per annum of green hydrogen by 2029 in the project's first phase.

Hydrom has announced the launch of Round 2 of its auction process and plans to award up to three land blocks in the Dhofar region in 2024.

OQ Alternative Energy has launched a 10–15 MW green hydrogen pilot project in Duqm's Special Economic Zone to gain operational experience and support Oman's national hydrogen strategy.

15. Are there any commercial-scale clean hydrogen production projects in development or already operating?

Oman has announced a number of sizeable plans and has entered into several MOUs and agreements for feasibility studies in relation to clean hydrogen projects. However, these are currently in their early stages.

Oman has awarded eight large-scale green hydrogen projects, securing over $49 billion in investments. Notable projects include the Hyport Duqm project and the ACME green hydrogen and ammonia project, which has secured over $500 million in funding and signed a long-term offtake agreement with Yara.

16. Have there been any hydrogen-related disputes in your jurisdiction?

N/A. We are not aware of any hydrogen-related disputes in Oman.

Poland

Ashurst collaborated with **SSW Spaczyński, Szczepaniak, Wickel, Goździowska sp. k.** in the preparation of this content. We are grateful for their input.

Policy and regulation

1. Is there a government hydrogen strategy or policy?

Yes. The National Hydrogen Strategy Until 2030 With An Outlook To 2040 ("**Strategy**"), published on 7 December 2021, is a strategic document which sets out the main objectives for developing a hydrogen economy in Poland and the kinds of activities required to achieve them. The geopolitical situation in Poland, Europe and the world has changed significantly since 2021. Accordingly, the Ministry of the Climate and the Environment has announced that it is preparing an updated Strategy. This will enable a review of the current state of development of the hydrogen economy in Poland and facilitate coordination with other strategic documents, such as the Energy Policy of Poland until 2040 ("**PEP2040**") and the National Energy and Climate Plan for the years 2021-2030 ("**NECP PL**"). In October 2024, a draft update of the 2019 NECP was published, the main points of which are described below. The NECP PL update continues to focus on the transition but sets out new, more ambitious targets and a series of actions to help achieve this, also through the use of hydrogen.

2. What are the key goals and commitments included in the strategy/policy?

The Strategy's overarching vision and objective is to create a Polish hydrogen economy which is developed so as to achieve climate neutrality and maintain the competitiveness of the Polish economy. The objectives formulated in the Strategy refer to three priority areas of hydrogen use (energy, transport and industry), to hydrogen production and distribution and to the need to create a stable regulatory environment.

The Strategy identifies 6 specific objectives:

Objective 1: Implementation of hydrogen technologies in the power and heating sector

By 2025, this objective assumes, among other things, the commissioning of a P2G class plant of at least 1 MW to help stabilise the operation of the distribution networks, as well as the co-firing of hydrogen in gas turbines (depending on technical feasibility) and the conversion of existing natural gas-fired power plants of hydrogen power plants. The Strategy envisages, among other things, the commissioning of cogeneration and polygeneration plants (e.g. CHP plants with a capacity of up to 50 MWt, using hydrogen as the main fuel) and beginning to use hydrogen as an energy carrier for energy storage processes. Additionally, it envisages the installation of cogeneration and polygeneration plants from 10 kW to 250 kW using hydrogen fuel cells for housing estates, office buildings, small housing estates and public buildings. As part of the integration of hydrogen technology with RES, it is planned to extend photovoltaic systems with electrolysers and rainwater purification stations to produce renewable hydrogen.

Objective 2: Use of hydrogen as an alternative fuel for transport

The second objective assumes the introduction of zero-emission hydrogen-powered buses. Between 100 and 250 new hydrogen buses are anticipated by the end of 2025, and between 800 and 1,000 hydrogen buses, including those manufactured in Poland by the end of 2030. The development of a network of hydrogen refuelling and bunkering stations assumes that at least 32 new stations will exist by the end of 2025 and that further development of Poland's hydrogen infrastructure will continue in subsequent years. The next step in terms of transport is to gradually replace trains and diesel locomotives with hydrogen equivalents and to develop floating vessels with a hydrogen-based propulsion system (e.g. ammonia, methanol). This section of the Strategy also discusses the development of synthetic fuels based on hydrogen.

Objective 3: Supporting the decarbonization of industry

As a starting point, the Strategy sets out a series of actions up to 2025 for acquiring and applying low-carbon hydrogen for petrochemical, chemical and fertiliser production processes based on green industrial energy. It also envisages developing strategies and launching the first pilot projects to implement low-carbon hydrogen technologies in the most energy-intensive industries. The Strategy envisages the creation of at least 5 hydrogen valleys as centres of excellence for implementing the hydrogen economy, sector integration, industrial climate change and infrastructure construction. Additionally, the Strategy implies that the resulting investments will be integrated into a common European infrastructure. The Strategy also includes plans to transfer knowledge and exchange experience at a national and international level on the best hydrogen industry solutions.

Objective 4: Hydrogen production in new installations

Objective 4 is to support research and development of low-carbon hydrogen technologies and the commissioning of installations to produce hydrogen from low-carbon sources, processes and technologies with a total capacity of at least 50 MW by the end of 2025. It is also planned to launch the production of synthetic gases by the methanation of hydrogen and the use of low-carbon hydrogen in the production of ammonia. The Strategy aims to ensure a 2 GW capacity of installations for producing hydrogen and its derivatives from low-carbon sources, processes and technologies, including in particular the installation of electrolysers.

Objective 5: Efficient and safe hydrogen transmission, distribution and storage

The Strategy envisages that, by the end of 2025 the following will be prepared: an analysis of the most optimal form of energy transmission for developing the hydrogen economy; a feasibility study for a dedicated hydrogen north-south pipeline; and an investigation of Poland's existing gas infrastructure to assess the viability of injecting hydrogen and transporting hydrogen-gas mixtures. The next step is to adapt selected sections of the gas network to enable the transmission and distribution of hydrogen doped into gas and to build dedicated pipelines to transmit and distribute hydrogen or to enhance the electricity grid for transmitting electricity. The Strategy also aims to support research and development into certain areas, including: lightweight hydrogen distribution tanks; rail, road and intermodal hydrogen transport; and developing the storage of large-scale salt caverns hydrogen.

Objective 6: Creating a stable regulatory environment

Among the most important actions is the development of a legislative hydrogen package. This includes legislative regulations which define how the market should operate, implement EU law in this area and implement an incentive scheme for the production of low-carbon hydrogen.

Moreover, the NCEP PL update proposes the following actions related to hydrogen production, storage and use:

Action 75: Financial Instrument – Contract for Difference for Hydrogen Production in Industry

- Provide public support through a predetermined subsidy for the price of 1 kg of hydrogen produced and used in Poland.
- Reduce the price gap between renewable hydrogen and grey hydrogen (from fossil fuels).
- Ensure that renewable hydrogen is competitively priced to reduce risks associated with early-stage technology and production.
- Facilitate the replacement of grey hydrogen with renewable hydrogen, primarily in the industry sector, to develop the renewable hydrogen market in Poland.

Action 76: Support Building Renewable and Low-Emission Hydrogen Production Capacity

- Provide financial support for building low-emission and renewable hydrogen production capacity in Poland.
- Funds will come from the Recovery and Resilience Facility.

Action 111: Establishing Legal Framework for Hydrogen Transport Infrastructure Development

- Develop and enact amendments to the Energy Law Act and other relevant laws, aligned with the revision of the Third Gas Package for hydrogen infrastructure.
- Adopt an executive regulation to supplement the Construction Law Act on issues regarding technical conditions and the location of hydrogen refuelling stations.
- Adopt an executive regulation to supplement the Construction Law Act on issues regarding technical conditions and the location of hydrogen networks, storage installations and associated facilities.

Action 112: Develop Hydrogen Infrastructure

Support investments to develop hydrogen infrastructure, including transmission, storage and production facilities such as electrolyzers, fuel cells and dispensers. Additionally, as part of the infrastructure development activities, it is planned to support the implementation of the Nordic-Baltic Hydrogen Corridor and other cross-border hydrogen transport infrastructures. Support will also be given to the Programme for the Development of Hydrogen Storage in Salt Caverns to Strengthen Poland's Critical Infrastructure ("PDHSSC") within the auspices of the Gospostrateg Programme commissioned by the National Centre for Research and Development.

3. Which industry sectors are most likely to be affected by hydrogen deployment?

In line with the Strategy's assumptions and the current directions of hydrogen technology development, it will have the greatest impact primarily in areas such as energy and heating, transport and the chemical, petrochemical, refining and steel industries.

In the energy and heating sector, hydrogen is expected to be used as a fuel for cogeneration and polygeneration plants and to provide storage capacity for energy produced from renewable sources.

In the transport sector, it is envisaged that hydrogen will be used primarily as an energy source for FCEV fuel cells used to power public transport vehicles and heavy and long-distance transport. Hydrogen could also potentially be used in rail, marine, river, air and intermodal transport.

The industrial sector is highly likely to be the largest consumer of low-carbon hydrogen, given the absence of alternative decarbonisation options. Currently, Poland's main producer of grey hydrogen is the nitrogen fertiliser industry, whereas the second largest producer of hydrogen (in terms of volume) is the refining and petrochemical industry, which uses hydrogen to produce liquid fuels and refinery raw materials. Low-carbon hydrogen represents an opportunity to reduce emissions from chemical raw materials and reactants (i.e. ammonia, methanol, iron reduction and petrochemical products) by producing and using low-emission hydrogen in technological processes; using hydrogen as a reducing agent in steel production; and blending hydrogen with natural gas in industrial processes.

4. Who are the main regulators of the hydrogen market?

The so-called *Constitution for Hydrogen* will enter into force following the adoption of the *Act amending the Energy Law Act* and certain other acts. Accordingly, the President of the Energy Regulatory Office (**"ERO"**) will be appointed to regulate the hydrogen market. The ERO is the regulator of the energy market pursuant to the Polish Energy Law Act.

The Energy Law Act empowers the ERO to issue the most important decisions concerning the hydrogen market, including the granting of licenses and the appointment of system operators. The adopted legislation regulates the hydrogen market similarly to the electricity and gas markets.

For a period of time, the hydrogen legislation was the responsibility of the Government Plenipotentiary for the Hydrogen Economy. This office has now been abolished. At present, the hydrogen legislation falls within the scope of responsibility of the Ministry of the Climate and the Environment (**"MCE"**).

The MCE's task is to develop a legal and organisational framework for implementing the hydrogen economy in Poland. The MCE aims to create a regulatory environment to remove barriers to the development of the hydrogen market and to stimulate demand for this energy carrier.

In contrast, the Ministry of Industry, which is not the main regulator of the hydrogen market, focuses on the industrial and economic aspects of hydrogen use.

5. Does the government hydrogen strategy or policy support the development of both low-carbon (blue) hydrogen and renewable (green) hydrogen?

Yes. The Strategy will support the introduction of both renewable (green) and low emission (blue) hydrogen production. The following sources, processes and technologies are envisaged:

- Electrolysis,
- Gasification, fermentation or pyrolysis of biomass
- Steam reforming of biogas and biomethane,
- Gasification, thermal treatment or pyrolysis of waste,
- Use of waste gases,
- Steam reforming of hydrocarbons with CCS/CCU,
- Coal gasification using CCS/CCU, IGCC and IGFC technologies,
- Other low-carbon hydrogen processes and technologies.

6. If the government hydrogen strategy or policy supports the development of low-carbon hydrogen, to what extent is carbon capture and storage being taken forward?

The Strategy states that an alternative, interim development pathway may be to use current technological potential and implement carbon capture, storage and utilisation methods (CCS and CCU methods).

In addition, the NECP PL plans to support research and scientific, educational and commercial projects in the field of CCS and CCUS as one of the measures to reduce GHG emissions in the energy and heating sector.

However, the final assessment of the potential for developing CCS technology in Poland will depend on a number of factors, such as the cost of emission allowances, fuel and electricity prices, as well as the availability of alternatives for reducing CO2 emissions and verifying estimates of CO2 storage capacity.

A Polish company, Orlen S.A., together with Lafarge Cement and Air Liquide Polska, plans to build a CO2 marine transshipment terminal in the coming years, as part of a strategy to reduce CO2 emissions. According to information announced in December 2023, these plans to have the potential to develop or sequester 3 million tonnes of CO2 per year between 2027 and 2030.

On 5 March 2025, at the headquarters of the Ministry of the Climate and Environment, stakeholders in the CCS/CCUS market in Poland, together with Deputy Minister (Krzysztof Bolesta), signed a Letter of Intent on the development of carbon capture, transport, storage and utilisation technologies in Poland. The aim of the initiative is to take joint action to develop the CCS/CCUS market in our country.

7. Are there targets for the production of hydrogen?

Yes. The Strategy's current provisions specify a target for the installed capacity of low-carbon hydrogen production facilities of 50 MW in 2025 and 2,000 MW in 2030.

According to the information contained in the NECP PL and calculated by the Ministry of Climate and Environment, Poland will need about 270,000 tonnes of RFNBO hydrogen in 2030, which will be used in industry (mainly as a target or intermediate raw materials for ammonia production) and about 91.7 thousand tonnes in transport (understood as a fuel and feedstock for conventional fuel production). The 2,000 MW of production capacity planned to be installed in 2030 will enable the production of 193,500 tonnes of renewable hydrogen per year. The installation of renewable hydrogen production capacity will be partly made possible by funding from the National Reconstruction and Resilience Plan under the National Recovery Plan. The remaining capacity will be realised through potential funding from the Hydrogen Differential Contract. However, this volume will not cover all of Poland's low-carbon and renewable hydrogen needs by 2030, so imported raw materials will be required to make up the shortfall.

In contrast, the latest update of NECP PL/PEP2040 estimates that the installed capacity could double to about 410 tonnes in 2040, but the demand for hydrogen in Poland could reach about 1.3 million tonnes, mainly for decarbonisation of industry and transport. Meeting this demand with domestic production will be possible if the installed capacity of electrolysers increases to around 10-12 GW.

8. Are there any incentive mechanisms/business models in place to support the production of hydrogen?

At present, no statutory operational support exists for producers. However, the proposed NECP PL aims to implement Contracts for Differences for industrial hydrogen production. A Contract for Differences is designed to provide public support in the form of a predetermined subsidy on the price of 1 kg of hydrogen produced by a producer and consumed by a customer in Poland. The premium is intended to reduce the difference between the price of renewable hydrogen and grey hydrogen.

9. Are there any standards in place for the classification and/or certification of low-carbon or renewable hydrogen?

The Electromobility and Alternative Fuels Act of 11 January 2018 introduced criteria to be fulfilled by hydrogen in order to be classified into the following three categories:

- **low-carbon hydrogen**: produced by electrolysis or other processes in a way that does not seriously harm environmental objectives and whose lifecycle greenhouse gas emissions do not exceed 3 tonnes of carbon dioxide equivalent per tonne of hydrogen;
- **electrolytic hydrogen**: low carbon hydrogen produced by the conversion of electricity by electrolysis;
- **renewable hydrogen**: renewable hydrogen within the meaning of Article 2(102c) of Commission Regulation (EU) No 651/2014 of 17 June 2014 declaring certain categories of aid compatible with the internal market in application of Articles 107 and 108 of the Treaty.

The Act of 21 November 2024 amending the Energy Law Act and certain other acts introduces definitions of low carbon hydrogen, renewable hydrogen and renewable hydrogen of non-biological origin.

According to the aforementioned Act, **low-carbon hydrogen** is hydrogen producing from non-renewable sources, in a way that does not cause serious harm to environmental objectives and that meets the emission reduction threshold requirement of 70% compared to the fossil equivalent value for renewable fuels of non-biological origin.

Renewable hydrogen is hydrogen produced from renewable energy sources, as defined in the Polish Renewable Energy Sources Act, *in a renewable energy facility*. Producers of renewable hydrogen can obtain guarantees of origin.

Renewable hydrogen of non-biological origin is hydrogen originating from renewable energy sources, produced in accordance with the methodologies laid down in Commission Delegated Regulation (EU) 2023/1184 of 10 February 2023, and Commission Delegated Regulation (EU) 2023/1185 of 10 February 2023.

10. Does the regulatory framework clearly define the regulatory requirements relating to the production, storage, transportation or supply of hydrogen?

Polish legislation defines the regulatory requirements for the production, storage, transport or supply of hydrogen. The proposed legislation would regulate the hydrogen market similarly to the electricity and gas markets. However, hydrogen issues are regulated in a fragmented way in various pieces of legislation.

The Energy Law Amendment Act, which was adopted at the end of 2024, enables the implementation of PHS Objective 6 - 'Creating of a stable regulatory environment'. The Act forms part of a legislative package called the 'Hydrogen Constitution,' the main objective of which is to create a regulatory framework for the functioning of the hydrogen market in Poland. The overarching changes it contains include:

- introducing a set of concepts in the Energy Act necessary for the development and functioning of the hydrogen market in Poland;
- creating a framework for cross-sectoral gas and hydrogen activities;
- establishing rules for certification and designation of hydrogen operators;
- regulating the licensing rules for hydrogen storage activities;
- developing rules for the operation of hydrogen systems;
- establishing system support mechanisms to implement research and development activities for hydrogen technology projects;
- proposing simplifications for entities investing in the development of the hydrogen system.

According to the Geological and Mining Law Act of 9 June 2011, legislative provisions which apply to hydrocarbons also apply to hydrogen. This Act explicitly provides for the possibility of obtaining a concession for tankless hydrogen storage.

The Fuel Quality Monitoring and Supervision Act of 25 August 2006 obliges hydrogen producers to meet certain quality requirements. The same requirements also apply to those who transport, store and supply hydrogen. This Act also contains rules on supervising activities related to hydrogen. A Regulation Of The Ministry Of The Climate And The Environment On The Quality Requirements For Hydrogen, dated 23 December 2022, stipulates requirements regarding the use of hydrogen as a fuel used to propel vehicles.

The Renewable Energy Source Act of 15 February 2015 includes provisions on issuing guarantees of origin for renewable hydrogen producers.

A Regulation of the Ministry of the Economy On The Detailed Conditions For The Functioning Of The Gas System, dated 2 July 2010, stipulates pre-requisites for transporting hydrogen through the gas grid as a component of a gas mixture.

11. Are there any foreign investment restrictions related to energy and infrastructure sectors?

Poland is open to investment in the energy sector. In general, there are only a few restrictions on foreign investors.

The Control Of Certain Investments Act of 24 July 2015 is of fundamental importance in terms of establishing restrictions on foreign investment. Initially, this Act only protected a limited number of entities of strategic importance for the state. Entities deemed to be strategic, according to detailed criteria contained in the Act, were included in a list of protected entities established by a Regulation of the Polish Council of Ministers.

In connection with the Covid-19 outbreak, additional restrictions were introduced on the possibility for foreign investors to acquire shares or stocks in companies engaged in certain activities. These restrictions applied to investors from outside the European Union who are not based in the European Economic Area (EEA) or member states of the Organisation for Economic Co-operation and Development (OECD). Following the outbreak of war in Ukraine, these additional restrictions have been extended. They will expire on 25 July 2025. As of the date of this update, no further extension of the regulations in question has been announced.

12. What international treaties are in place that may offer protection to international investors in hydrogen projects in the jurisdiction?

Poland withdrew from the Energy Charter Treaty ("ECT") with effect from 29 December 2023. Pursuant to Art. 47(3) of the ECT, its provisions shall continue to apply to investments made in Poland for 20 years from this date.

The United Nations Conference on Trade and Development ("UNCTAD") website states that Poland is a signatory to 36 bilateral investment treaties (BITs) that are in force. Poland has terminated its intra-EU investment treaties but continues to be a signatory of non-EU investment treaties.

Market developments and opportunities

13. Are there any government grants or other government funding available to hydrogen projects (including for research and development)?

The National Recovery and Resilience Plan includes a programme of investment in hydrogen technology, production, storage and transport. It includes funding of almost €800 million. The programme should lead to a total installed renewable and low carbon hydrogen production capacity of at least 315 MW. Grants will be provided directly to the private sector to achieve this objective. At least €640 million in grants (net of costs and fees) will be made available.

In late 2024/early 2025, there was a call for applications for funding under the National Reconstruction Plan, which included investments in hydrogen technology, hydrogen generation, storage and transport. These investments can receive financial support (B2.1.1) from a budget of €640 million. Support is provided in the form of grants, aiming to develop the hydrogen economy and decarbonise industry and transport. The programme was initiated by the Ministry of the Climate and Environment in cooperation with the Bank Gospodarstwa Krajowego (BGK).

In January 2025, the National Fund for Environmental Protection and Water Management announced a new strategy for 2025–2028. In 2025 alone, the Fund plans to allocate PLN 25 billion to support green investments, including the hydrogen transformation of the economy. These funds come, among others, from the National Recovery Plan and the Modernisation Fund. Furthermore, the EU Commission has approved a third Important Project of Common European Interest (IPCEI) to support hydrogen infrastructure. The project, called "IPCEI Hy2Infra", was jointly prepared and notified by seven Member States: France, Germany, Italy, Netherlands, Poland, Portugal and Slovakia. The Member States will provide up to €6.9 billion of public funding, which is expected to leverage €5.4 billion of private investment. The IPCEI Hy2Infra programme applies to a large part of the hydrogen value chain, particularly by supporting the deployment of 3.2 GW of large-scale electrolysers for the production of renewable hydrogen.

The National Fund for Environmental Protection and Water Management organises a programme called "Support for Electric Vehicle Charging and Hydrogen Refuelling Infrastructure". The programme provides for the possibility of co-financing projects involving the construction or reconstruction of a publicly accessible hydrogen refuelling station. Support is provided in the form of a grant.

14. Are there any notable pilot/demonstration projects in place or planned for the production or offtake of clean hydrogen?

Solaris hydrogen bus: On 14 September 2022, Solaris unveiled the Urbino 18 hydrogen bus. The Urbino 18 hydrogen bus is powered by the most advanced hydrogen cell on the market, which acts as a miniature hydrogen power plant. The cell converts hydrogen into electricity, which is then transferred to the drive system.

Trigeneration in Gaj Oławski: A pioneering hydrogen management system has been implemented in Gaj Oławski. An electrolyser system powered by electricity from renewable energy sources and a hydrogen storage facility have been built. The technical parameters of the cogeneration unit are 0.999 MWe electrical capacity and 2.2 MWt thermal capacity (including 1.0 MWt outside the cogeneration process - waste energy from the electrolysis process). The project was developed by SBB ENERGY S.A. together with Promet-Plast.

PESA hydrogen locomotive: PESA SM42-6Dn hydrogen locomotive is the first certified hydrogen locomotive approved for operation in Europe. Equipped with two Ballard fuel cells, each of which has a power of 85 kW, the locomotive is completely emission-free and intended for shunting work and light freight transport. The locomotive can operate for 24 hours on a single refueling, and its maximum speed is 90 km/h. This project is part of PESA's broader programme, aimed at implementing hydrogen technology in rail vehicles.

Hydro Sanok: this project focuses on electrifying the district heating system in Sanok through renewable energy. The initiative includes the construction of photovoltaic farms, energy storage systems, and electrolysers for hydrogen production. Waste heat from the electrolysis process will cover 85% of the city's heating demand, while the produced hydrogen will be used in local industries and public transport. The project also plans to build hydrogen refueling stations and fast chargers for electric vehicles. The estimated investment is approximately €173 million.

15. Are there any commercial-scale clean hydrogen production projects in development or already operating?

H2Silesia: This is a large-scale, green hydrogen plant project, developed by Polenergia. It will be built in Upper Silesia, a region associated with the extraction and use of fossil fuels. The plant will have a capacity of around 105 MW. It will produce 13,000 tonnes of green hydrogen per year. This hydrogen will be supplied to heavy industry and zero-emission transport. Polenergia is the only Polish company included in the Hy2Infra programme, under which the European Commission has approved funding of up to €142.77 million (over PLN 630 million) for the H2Silesia project.

Hydrogen refuelling station: In 2023, Polsat Plus Group and ZE PAK Group built and launched the first publicly accessible hydrogen refuelling station for cars and buses. It is one of Europe's most modern hydrogen refuelling stations. The network of hydrogen refuelling stations will be built under the NESO brand.

PEM electrolyzer in Konin: Grupa Polsat Plus and ZE PAK launched a new green hydrogen production facility in Konin in December 2024. The 2.5 MW PEM technology electrolyzer produces approximately 1000 kg of hydrogen daily, which enables the refueling of 40 city buses. The green hydrogen production is in the startup phase. Plans exist to increase the number of electrolyzers in the future. The green hydrogen meets international purity standards for hydrogen used in fuel cells for transportation.

Hydrogen Eagle PL02: is a comprehensive infrastructure project by ORLEN to ensure the holistic development of the entire hydrogen value chain in the region. The project's main objective is to establish five low-emission and zero-emission hydrogen production HUBs and up to 54 hydrogen refuelling stations. The hydrogen production facilities will be powered by a diversified portfolio of renewable energy sources (onshore, offshore, PV) and municipal waste treatment plants. The estimated installed capacity of electrolysers at all sites will be around 110 MW.

Green H2: this project by the ORLEN Group aims to produce green hydrogen through water electrolysis, to support the refinery in Gdańsk and the transport sector. By 2030, full-scale operations are expected, with an annual production capacity of 10,000 tons of renewable hydrogen. The project includes the construction of a 100 MW electrolyzer and a 50 MW photovoltaic farm, enabling hydrogen production solely from renewable energy.

16. Have there been any hydrogen-related disputes in your jurisdiction?

No.

Last updated April 2025

Portugal

Ashurst collaborated with **Morais Leitão, Galvão Teles, Soares da Silva & Associados** in the preparation of this content. We are grateful for their input.

Policy and regulation

1. Is there a government hydrogen strategy or policy?

Yes, the National Hydrogen Strategy (*Estratégia Nacional para o Hidrogénio* or "**EN-H2**") was approved by Resolution of the Council of Ministers no. 63/2020, of 14 August 2020. This strategy outlines the country's vision for the development of a hydrogen economy, with a focus on green hydrogen production using renewable energy sources.

The National Hydrogen Strategy is also shaped by EU guidelines and regulations, with the current need to transpose a directive and harmonize a regulation within the national framework. Furthermore, the strategy is integrated into broader national climate and energy plans, such as the 2050 Carbon Neutral Roadmap, approved by Resolution of the Council of Ministers no. 107/2019, of 1 July, as well as with the National Climate and Energy Plan 2030, approved by Resolution of the Council of Ministers no. 53/2020, of 10 July, and recently amended by Resolution of the Council of Ministers no. 149/2024, of 4 October.

Additionally, the National Gas System law (*regime jurídico da organização e funcionamento do Sistema Nacional de Gás*), approved by Decree-Law no. 62/2020, of 28 August 2020, serves as a fundamental legal instrument for the development of the national hydrogen market. It provides a legal framework for the promotion, regulation, and integration of hydrogen projects in Portugal, particularly focusing on renewable gases and the support mechanisms available for their deployment.

2. What are the key goals and commitments included in the strategy/policy?

The EN-H2 is aligned with the 2050 Carbon Neutral Roadmap, which establishes the goal to achieve a carbon neutral economy by 2050, as well as with the National Climate and Energy Plan 2030, which constitutes the main instrument of the national energy and climate policy for the next decade towards a carbon neutral future.

In this context, Portugal envisages a key role for hydrogen in reducing emissions in difficult-to-decarbonize sectors and in end-uses, assuming as main goals for 2030:

- 2% to 5% of green hydrogen in energy consumption of the industry sector;
- 1% to 5% of green hydrogen in energy consumption of the road transport sector;
- 3% to 5% of green hydrogen in energy consumption of the domestic shipping sector;
- 1.5% to 2% of green hydrogen in final energy consumption;
- 10% to 15% of green hydrogen injection into natural gas grids;
- 50 to 100 hydrogen refuelling stations;
- 2 GW to 2.5 GW of installed capacity in electrolysers;
- 50 to 100 hydrogen supply stations.

3. Which industry sectors are most likely to be affected by hydrogen deployment?

Portugal's strategy focuses on deploying green hydrogen to promote decarbonisation of the following sectors: industry, transport and energy market.

The industries most likely to benefit from hydrogen as a decarbonization solution include metallurgy and metal working, cement and building materials, refining, chemical, extractive, food, glass and ceramics industries.

4. Who are the main regulators for the hydrogen market?

The main regulators for the hydrogen market are the Directorate General for Energy and Geology (Direção-Geral de Energia e Geologia or DGEG), which has been designated as the licensing authority, and the Energy Services Regulatory Authority (*Entidade Reguladora dos Serviços Energéticos*), designated as the regulatory authority.

5. Does the government hydrogen strategy or policy support the development of both low-carbon (blue) hydrogen and renewable (green) hydrogen?

EN-H2 only supports the development of renewable (green) hydrogen. However, the National Gas System law allows for the production of both green and low-carbon (blue) hydrogen.

6. If the government hydrogen strategy or policy supports the development of low-carbon hydrogen, to what extent is carbon capture and storage being taken forward?

The Portuguese Government's hydrogen strategy already supports the production of low-carbon and green hydrogen. This support is evident through the established rights for hydrogen injection into existing networks and the regulated registration process for hydrogen producers, which is crucial for the licensing of production units. The strategy outlines the development of 100% hydrogen networks, reflecting a significant commitment to creating infrastructure specifically tailored for hydrogen integration. Moreover, investments are being considered to adapt natural gas storage facilities to accommodate hydrogen, which suggests a forward-thinking approach to infrastructure development.

Also, there is a legal framework in place for carbon capture and storage in Portugal, approved by Decree-Law no. 60/2012, of 14 March, establishes the legal regime for the geological storage of carbon dioxide, transposing Directive 2009/31/EC of the European Parliament and Council.

7. Are there targets for the production of hydrogen?

Portugal's main target is to have an installed capacity up to 2,5GW by 2030 to produce green hydrogen through electrolysers.

Additionally, there are other relevant targets in the hydrogen field, including (i) include the large-scale production of green hydrogen in Sines with a capacity of 1 GW by 2030, (ii) achieving a 5% share of green hydrogen in final energy consumption in road transport and industry, (iii) injecting 15% green hydrogen into natural gas networks, and (iv) deploying between 50 and 100 hydrogen refuelling stations across the country.

8. Are there any incentive mechanisms/business models in place to support the production of hydrogen?

The Portuguese Government is actively promoting an industrial policy focused on hydrogen and renewable gases, structured around a coordinated set of public policies designed to guide and mobilize both public and private investments in production, storage, transportation, and consumption of renewable gases across Portugal.

The action measures under this strategy include:

- Developing legislation, regulation, and normative frameworks to support this emerging sector, including amendments related to the injection of renewable gases into existing infrastructure;
- Implementing nationwide incentives targeting priority hydrogen value chains, recognizing hydrogen both as an energy vector and as a commercial product;
- Promoting, developing, and monitoring projects across various sectors and scales, prioritizing those aligned with national value chains, technological maturity, cost reduction, and renewable energy sourcing;
- Simplifying procedures for innovative projects;
- Maximizing the value of existing energy system and industrial assets;
- Strengthening national expertise, research and innovation, fostering cooperation, and supporting hydrogen-related innovation;
- Conducting in-depth analysis of the hydrogen industrial project in Sines covering the full value chain;
- Establishing a Collaborative Hydrogen Laboratory to support R&D and industrial deployment.

Regarding incentives, the Portuguese Government intends to implement a support scheme for green hydrogen production in 2020¬2030 – a transparent and competitive mechanism that provides support by covering the difference between the production price of green hydrogen and the price of natural gas in the national market. The funds expected to be allocated to this mechanism are around 500 to 550 million euros.

The National Gas System law allows the Government to approve specific regimes for purchasing renewable or low carbon gases.

Ministerial Order no. 15/2023, of 4 January, approved by the member of the Government for energy affairs, establishes the centralised purchasing system for biomethane and hydrogen produced by electrolysis from water, using electricity from renewable energy sources. The order provides for the launch of a competitive electronic auction for the acquisition, by the supplier of last resort, of hydrogen (120 GWh/year) for injection into the national gas network, with a maximum purchase price of € 127/MWh, and the hydrogen purchase agreements to be entered into as part of this auction will be valid for a period of 10 years (as of the date of the first hydrogen supply). Accordingly, Order no. 5971-A/2024, of 27 May, approved by the Minister of Environment and Energy, determined the opening of the first electronic auction for the centralized purchase of biomethane and hydrogen, the results of which were disclosed in February 2025, with four companies selected for the supply of green hydrogen.

Additionally, PO SEUR - Operational Programme for Sustainability and Efficient Use of Resources, established through an Execution Decision from the European Commission on 16 December 2014, issued an invitation in December 2020 calling for applications of renewable gas generation projects (including green hydrogen) with a view to grant a total of 40 million Euros to such projects. The Portuguese Government has also launched, under Order no. 6403-A/2020, of 17 June, a call for interested parties to manifest interest in participating in the Hydrogen Important Projects of Common European Interest (IPCEI) and, out of 74 interested parties, 37 have been considered eligible to constitute an IPCEI. Between 2022 and 2024, some of these projects were approved for European funding under the IPCEI frameworks Hy2Tech, Hy2Use, and Hy2Infra.

9. Are there any standards in place for the classification and/or certification of low-carbon or renewable hydrogen?

The Directive (EU) 2024/1788 on Common Rules for the Internal Markets in Renewable and Natural Gases and in Hydrogen includes definitions of renewable and low-carbon hydrogen:

- Renewable hydrogen is defined by reference to the definition of the Directive (EU) 2018/2001 on the promotion of the use of energy from renewable sources, as hydrogen that (i) derives its energy content from renewable sources other than biomass; and (ii) achieves a 70% GHG emission reduction compared to fossil fuels;
- Low-carbon hydrogen is defined as hydrogen with an energy content that is derived from non-renewable sources, and that meets a GHG emission reduction threshold of 70% compared to fossil-based hydrogen.

Thus, the main difference between renewable and low-carbon hydrogen is the production process of the hydrogen and, in particular, the source of the energy that is used to produce hydrogen. This approach allows low-carbon hydrogen to play a role in decarbonization and facilitate the energy transition until 2030. The expectation is that by 2030 the EU will introduce a stricter GHG reduction threshold for the definition of low-carbon hydrogen.

In Portugal, the National Gas System law, approved by Decree-Law No. 62/2020, of 28 August, as recently amended by Decree-Law No. 79/2025, of 21 May, establishes the following definitions:

- Low-carbon gases are gaseous fuels produced from a process using energy from non-renewable sources whose carbon emissions correspond to less than 36.4 gCO(index 2)-eq/MJ, hypocarbonic hydrogen, and synthetic gaseous fuels whose energy content comes from low-carbon hydrogen, which meet the greenhouse gas emission reduction threshold of 70% compared to the reference fossil fuel value for renewable fuels of non-biological origin established in the methodology adopted under the Commission Delegated Regulation (EU) of 10 February 2023.
- Gases of renewable origin are gaseous fuels produced from processes using energy from renewable sources within the meaning of Directive (EU) 2018/2001 (which establishes that "energy from renewable sources" or "renewable energy" means energy from renewable non-fossil sources, namely wind, solar (solar thermal and solar photovoltaic) and geothermal energy, ambient energy, tide, wave and other ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas and biogas»).
- Hypocarbonic hydrogen is hydrogen whose energy content comes from non-renewable sources, which meets the threshold for reducing greenhouse gas emissions by 70% compared to the fossil fuel reference value for renewable fuels of non-biological origin established in the methodology for assessing the reduction of greenhouse gas emissions from renewable fuels of non-biological origin and recycled carbon fuels, adopted under the Commission Delegated Regulation (EU) of 10 February 2023.
- Renewable Hydrogen is hydrogen produced by electrolysis of water (in an electrolyzer powered by electricity), with electricity sourced from renewable sources. The greenhouse gas emissions throughout the entire production cycle of renewable hydrogen are close to zero. Renewable hydrogen can also be produced by reforming biogas (instead of natural gas) or through biochemical conversion of biomass, provided it meets sustainability requirements.

It should also be noted that the European Commission, under the **Commission Delegated Regulation (EU) of 10 February 2023**, has set detailed rules for determining when electricity used for the production of renewable liquid and gaseous transport fuels of non-biological origin can be considered fully renewable. Accordingly, the Directorate General for Energy and Geology (*Direção-Geral de Energia e Geologia or DGEG*) issued an interpretative note (**Order no. 30/2023, of 13 July 2023**) further clarifying the procedure to be adopted by hydrogen generators using renewable sources. In particular, these generators must submit a statement whereby they undertake to fulfil all obligations stemming from the Directive (EU) 2018/2001 and all relevant delegated acts.

10. Does the regulatory framework clearly define the regulatory requirements relating to the production, storage, transportation or supply of hydrogen?

Although the national regulatory framework is not yet highly detailed, the DGEG and the APA have published a Promoter's Guide to "Legislation and Regulation for the Hydrogen Economy", establishing that the production of green hydrogen, as a gaseous fuel of renewable origin, falls within the framework of the Responsible Industry Regime (*Sistema de Indústria Responsável or SIR*), annexed to Decree-Law no. 169/2012, of 1 August, which regime governs the prior administrative control of facilities intended for the production of gases of renewable origin in general.

More recently, the DGEG has issued two key technical regulations in early 2025 that further specify the conditions for hydrogen integration into the national gas system:

- The Technical Regulation for the National Gas Transmission Network (February 2025); and
- The Technical Regulation for the Gas Distribution Network (March 2025).

These regulations establish the technical and safety requirements for the injection of renewable gases, including hydrogen, into the existing natural gas networks. They also set the framework for the development and operation of dedicated 100% hydrogen networks, a critical step towards facilitating hydrogen deployment across the country.

Together, these measures provide a growing and increasingly detailed legal and regulatory foundation for the production, storage, transportation, and supply of hydrogen in Portugal.

Moreover, the legal framework for the organization and operation of the National Gas System, which provides for the regulation of the activities of production of low-carbon gases and gases of renewable origin, determines that, in order to carry out these activities, interested parties must register in advance as producers of such gases, pursuant to Articles 69 et seq. of that legal framework.

Regarding the need for an Environmental Impact Assessment (*Avaliação de Impacte Ambiental*), established by Decree-Law no. 151-B/2013, of 31 October, the law does not determine specifically that hydrogen projects are subject to such procedure. However, according to the abovementioned Promoter's Guide, the need to subject hydrogen production, transportation and storage projects to an environmental impact assessment procedure must be assessed in light of the activities that, pursuant to the abovementioned legal framework, may be obliged to carry out such procedure, in particular the following:

- Production: "integrated chemical process" and "treatment of intermediates and manufacture of chemicals";
- Storage: "surface and underground storage of fuels";
- Transportation: "pipelines with a diameter of more than 800 mm and a length exceeding 40 km, for the transportation of gas" and "industrial installations for the transportation of gas";
- Associated projects: "water collection and transportation", "wind and solar photovoltaic power plants" and "infrastructures associated with electricity transmission".

Hydrogen is also one of the substances that falls within the scope of the Prevention of Severe Accidents Regime (*regime jurídico da prevenção de acidentes graves*), approved by Decree-Law no. 150/2015, of 5 August. Facilities where this substance is present in quantities equal to or greater than 5 tons (lower level) and 50 tons (upper level) are subject to a number of obligations, including communication obligations (Articles 14 and 15) and a location compatibility assessment (Article 8), as well as the definition of a severe accident prevention policy (Article 16).

In addition, the operation of facilities where hydrogen production activities are carried out is conditional on obtaining an environmental licensing decision.

Decree-Law no. 12/2020, of 6 April, establishes the legal framework applicable to the Greenhouse Gas Emissions Trading Regime (*regime jurídico aplicável ao comércio de licenças de emissão de gases com efeito de estufa*), transposing Directive (EU) 2018/410 into national law. Under this regime and according to the provisions of Annex II, the production of hydrogen – specifically the production of hydrogen and synthesis gas by reforming or partial oxidation with a production capacity exceeding 25 tons per day, from which results in greenhouse gas emissions – is included in the scope of such legal regime. Therefore, depending on the type of project in question (depending on the type of technology, raw material and primary energy source used for the production of hydrogen or synthesis gas) it may or may be subject to the legal obligations set out in the abovementioned decree-law. Typically, green hydrogen projects based on the electrolysis of water using renewable energy sources (such as solar energy) are not covered by this regime.

It should be noted that the aforementioned law is also not applicable to facilities or parts of facilities used for research, development and testing of new products and processes, as well as to facilities using exclusively biomass, including equipment using fossil fuels only during start-up and shut-down situations.

Depending on the production process, the hydrogen production activity may also be covered by Decree-Law no 39/2018, of 11 June, the Air Emissions Legal Regime (regime de emissões para o ar or REAR), which establishes the regime for the prevention and control of emissions of pollutants into the air, as it may be considered an activity of chemical products manufacture.

11. Are there any foreign investment restrictions related to energy and infrastructure sectors?

Foreign investments in Portugal's energy and infrastructure sectors are generally permitted; however, certain restrictions apply. Foreign investments in the natural gas sector are subject to a specific control regime under **Decree-Law no. 138/2014, of 15 September,** which establishes a safeguard system for strategic assets essential to national defense, security, and the supply of services fundamental to the national interest, particularly in the energy, transport, and communications sectors.

This law allows the Portuguese Government to review and potentially block transactions that result, directly or indirectly, in the acquisition of control by investors from outside the European Union (EU) or the European Economic Area (EEA) over such strategic assets. The government may prohibit these acquisitions if they are deemed to pose a threat to national defense and security or to the security of supply of critical services vital to the country's interests.

12. What international treaties are in place that may offer protection to international investors in hydrogen projects in the jurisdiction?

Portugal is a signatory to the Energy Charter Treaty (ECT), an international agreement that entered into force in April 1998, which specifically addresses energy trade, transit and investment between its contracting parties, providing additional legal protection for international investments in the energy sector in signatory countries.

Market developments and opportunities

13. Are there any government grants or other government funding available to hydrogen projects (including for research and development)?

The Portuguese Recovery and Resilience Plan (*Plano de Recuperação e Resiliência* or *PRR*) establishes a set of reforms and public and private investments to be implemented in Portugal until 2026 with the European Union financial support, granted under the Recovery and Resilience Facility (as outlined in Regulation (EU) 2021/241) – particularly in what concerns the Climate Transition dimension, as 38% of the PRR's total allocation for reforms and investments is intended to support climate objectives, by means of measures such as supporting private projects for the production of hydrogen and use of other renewable energy sources, amid other energy transition measures.

The Portuguese Government also instated the Environmental Fund (Fundo Ambiental), aimed at supporting sustainable development and climate change projects, and which revenues come from the carbon emission licenses auctions, the carbon tax on aviation, and maritime and fluvial travels, environmental administrative penalties, taxes such as the ISP (Tax on Petroleum and Energy Products), among others. The funding of the "Green Pipeline Project", a pilot project for the injection of green hydrogen into the natural gas grid and decarbonisation of the energy sector, is one example of the support being provided by this fund.

14. Are there any notable pilot/demonstration projects in place or planned for the production or offtake of clean hydrogen?

There are a number of different projects being developed in Portugal regarding clean hydrogen production, among which:

- "Green Pipeline Project": pilot project for the injection of green hydrogen into the natural gas grid and decarbonisation of the energy sector, under which the Portuguese government has authorised a fund of 867,692 euros until 2024.
- HyLab - Collaborative Laboratory (COLAB): for the development of R&D activities around the main relevant components of the hydrogen value chain.

15. Are there any commercial-scale clean hydrogen production projects in development or already operating?

There are currently no existing commercial-scale clean hydrogen production projects already operating in Portugal, but there are several projects under development (in different stages of development), mainly in the area of Sines and only a few in other industrial or port areas. Those projects are set to start production from 2026 onwards, and include, among others:

- MadoquaPower2X (MP2X): a large-scale industrial project aimed at producing green hydrogen and ammonia in the Sines industrial hub, leveraging renewable electricity and electrolysis technology to supply both domestic and export markets.
- Grey2Green-II: a project designed to convert grey hydrogen production processes to green alternatives, contributing to industrial decarbonisation and energy transition goals.

16. Have there been any hydrogen-related disputes in your jurisdiction?

Portugal has not experienced significant public or highly contentious disputes concerning hydrogen. However, there have been tensions, debates, and concerns, particularly related to environmental impacts.

Last updated June 2025

PRC

Policy and regulation

1. Is there a government hydrogen strategy or policy?

Yes. The new Energy Law that took effect on 1 January 2025 expressly says the government will carry out the development and utilisation of hydrogen in a proactive and orderly manner, with the aim of developing a high-quality hydrogen industry.

Before that overarching national law on energy was put in in place, the National Development and Reform Commission (**"NDRC"**) published a comprehensive Medium-to-Long Term Plan for the Development of Hydrogen Industry (**"Hydrogen Plan"**) in March 2022, laying out the government's overall policy and strategy on the hydrogen industry.

The key themes in the Hydrogen Plan are:

- Making it clear that hydrogen is a critical component of China's national energy system in the future.
- Recognizing hydrogen as an important medium in transitioning the energy consumption to a green and low-carbon manner.
- Emphasizing the hydrogen industry as a strategic new industry.

As a specific plan to implement to the Hydrogen Plan, MIIT and NDRC issued further notice in December 2024 calling for speeding up the application of hydrogen across different industries. The 30-point plan aims to, by 2027, bring "clean and low-carbon" hydrogen into mass use in sectors like metallurgy, petrochemicals, synthetic ammonia and synthetic methanol, with pilot demonstrations in industrial green mini-grid, shipping, aeronautics and rail transit and commercial usage proved for hydrogen-supported transportation, power generation and power storage.

2. What are the key goals and commitments included in the strategy/policy?

The Hydrogen Plan lays out a three-stage development program with the relevant key goals as follows:

Phase	Key Goals
1 – by 2025	• Develop a relatively mature policy and institutional framework for the hydrogen industry • Maintain a basic level of control over the key technologies and manufacturing processes • Achieve substantive milestones in pilot projects • Establish a rudimentary supply of hydrogen based mainly on industrial by-product hydrogen and green hydrogen primarily targeted for near-site consumption • 50,000 fuel-cell vehicles in use
2 – by 2030	• Develop a complete system of hydrogen technological innovation and green hydrogen production and supply • Establish an orderly industrial supply chain • Achieve widespread application of green hydrogen
3 – by 2035	• Establish a mature hydrogen industry • Establish a hydrogen ecosystem with diversified application in sectors including transportation, energy storage and industrial process • Green hydrogen's contribution to the energy consumption has increased significantly as an important pillar in supporting the green transition of the energy industry

As of now, China has not set out specific goals beyond 2025 for the production of hydrogen or green hydrogen or its contribution to the energy consumption.

3. Which industry sectors are most likely to be affected by hydrogen deployment?

The industries that conventionally use fossil fuel as their primary energy source and manufacturing inputs are anticipated to be affected the most by hydrogen deployment. Some examples are as follows:

- Power (as one of the energy storage methods in addition to pumped hydro and battery storage; distributed fuel-cell power generation facilities in specific locations)
- Infrastructure (for hydrogen distribution, e.g., piping and hydrogen stations)
- Automobile and other mobility sectors (hydrogen-powered mobility, transportation and logistics, with a particular emphasis on fuel-cell medium and heavy duty trucks)
- Steel, petrochemistry, metallurgy (shifting from conventional fuel (e.g., coal and gas) to hydrogen for generation of power in industrial process, use of hydrogen as deoxidiser, expanding the replacement of conventional fossil fuel inputs with hydrogen in petrochemical process)

4. Who are the main regulators for the hydrogen market?

The main regulators for the hydrogen market in China are as follows:

- NDRC: overall industry regulator and promulgator of the primary regulations and policy guidelines
- Ministry of Industry and Information Technology: industrial regulator in charge of the equipment manufacturing and technological developments
- Ministry of Ecology and Environment: environmental regulator supervising the environmental aspects of the industry
- Ministry of Emergency Management: regulator focusing on the safety management in production and utilisation of hydrogen throughout the industry chain
- Ministry of Commerce: foreign investment regulator

5. Does the government hydrogen strategy or policy support the development of both low-carbon (blue) hydrogen and renewable (green) hydrogen?

The Hydrogen Plan does not lay out a specific national plan for the production of blue and green hydrogen, envisaging both grey and green hydrogen to be produced in light of the local resources and industries. A diversified hydrogen production system that is clean, low-carbon and low-cost will be gradually built.

In places with clustered coking, chlorine alkali and PDH industries, utilisation of industrial by-product hydrogen should be preferred. However, there is also a general policy push for carbon capture, utilisation and storage (CCUS) under China's zero-carbon policy, which presumably applies to the current grey hydrogen industry as well.

Green hydrogen, on the other hand, has been singled out for emphasis in the Hydrogen Plan, with areas of plenty renewable resources encouraged to develop green hydrogen projects on a pilot basis.

6. If the government hydrogen strategy or policy supports the development of low-carbon hydrogen, to what extent is carbon capture and storage being taken forward?

In a national policy paper issued in September 2021 following China's announcement of its goals for carbon-peak and zero-carbon, CCUS has been listed as an area for technological improvement, pilot project development and commercialisation. While China has promoted the experimentation and pilot projects in CCUS area since early 2010s, so far China's progress in most sub-fields of CCUS sector remains limited to the pre-commercialization stage. As of the end of 2021, it is estimated that about 21 CCUS pilot or commercial projects are still running, mostly in relation to coal-fired power plants and enhanced oil/gas recovery projects.

In terms of policy incentives, CCUS has been listed as an encouraged sector for foreign direct investment and included in the PRC central bank's financing support for carbon-reducing projects. It remains to be seen if the government will issue further, more specific incentives in this regard.

7. Are there targets for the production of hydrogen?

As of 2021, China's annual hydrogen production is about 33 million tonnes, of which 12 million tonnes are of industrial quality.

The government has not set out any specific target for hydrogen production save that the Hydrogen Plan targets the green hydrogen production to reach a modest 100,000 to 200,000 tonnes by 2025.

8. Are there any incentive mechanisms/business models in place to support the production of hydrogen?

On the national level, the following hydrogen related projects have been listed as encouraged category and thus are capable of enjoying the general policy benefits applicable to encouraged industries:

- Technological development and application of the complementary system of hydrogen and solar and wind power generation.
- Technological development and application and equipment manufacturing in high-efficiency hydrogen production, hydrogen transportation and high-density hydrogen storage.

Some of the more developed regions in China, on the other hand, have promulgated more specific measures to incentivize the development of hydrogen industries, including setting out specific targets for hydrogen production, hydrogen filling stations and fuel cell vehicles. These measures are constantly evolving and investors are expected to approach the authorities for more details for any particular project.

9. Are there any standards in place for the classification and/or certification of low-carbon or renewable hydrogen?

There is no classification and/or certification of low-carbon or renewable hydrogen in China but the market expects green hydrogen to be one of the priority products for which a national standard for its carbon footprint may be promulgated by 2025. Comments pushing for a national standard for certification of green hydrogen have been made by high-level industry players from time to time, but so far such standards have yet to be promulgated.

Some local government (such as Beijing) has indicated their plan to establish certification standards for certifying renewable hydrogen in the coming years and industry bodies have been pushing for issuance of national standards in this regard in recent years, including convergence of national standards with international ones.

10. Does the regulatory framework clearly define the regulatory requirements relating to the production, storage, transportation or supply of hydrogen?

The regulatory requirements relating to the production, storage, transportation or supply of hydrogen are scattered and lack consistency. There have been a few industry standards issued in relation to the specific components of the hydrogen supply chain but most of them are rudimentary.

Recognising the problem, the National Energy Agency under NDRC issued a standardisation-related work plan in 2022 for the energy sector, which includes the following key workstreams for the hydrogen industry:

- Fast pace the top-level design and system set-up for hydrogen related standards.
- Carry out the research and preparation of the standards for the production, storage, transportation, filling and diversified application of hydrogen to support the full development of the hydrogen industry chain.
- Pay particular attention to developing standards in relation to renewables hydrogen, complementary use of power and hydrogen, fuel cell and related system.

Further to the 2022 plan, the Standardisation Administration of China, jointly with other ministries overseeing the hydrogen industry, issued in 2023 a guideline for building up the standards for hydrogen industry, which has integrated the existing standards and called for more comprehensive work on filling the gaps in standards along the industry chain.

Under the national push for industry standards, various provincial governments have also started to set out local guidance on in the industry to promulgate investments in hydrogen industry in their respective localities.

11. Are there any foreign investment restrictions related to energy and infrastructure sectors?

China is generally supportive of foreign investment in the energy sector. In terms of power sector, the only restriction is that nuclear power plants must be majority owned by Chinese investors.

In addition, foreign investment in both large-scale conventional power plants and renewables/clean energy power plants is encouraged, including:

- Production, storage, transportation and liquefaction of green hydrogen
- Manufacturing of equipment for production, storage, transportation and safety-check of hydrogen
- Renewables power plants including solar, wind, geothermal etc
- Waste to energy projects
- Hydrogen filling stations
- New power storage equipment including hydrogen-related

12. What international treaties are in place that may offer protection to international investors in hydrogen projects in the jurisdiction?

The United Nations Conference on Trade and Development (UNCTAD) website states that China is a signatory to about 120 bilateral investment treaties (BITs) that are in force as at December 2022, and in addition certain other treaties may contain protections for investors in South Korea. These can be accessed from **UNCTAD's Investment Policy Hub**.

Market developments and opportunities

13. Are there any government grants or other government funding available to hydrogen projects (including for research and development)?

China's government grants, subsidies and funding for the hydrogen sector are scattered among the many policy documents issued by both the national and local governments, with the local governments providing more specific funding in most cases. So far, there is no specific grant or funding for hydrogen production projects per se but the following measures are illustrations of how the grants, subsidies or funding may be obtained in practice for hydrogen investors:

- Currently, there are various national and local subsidies for purchasing fuel cell vehicles and for breakthroughs in fuel cell vehicle related technologies, in particular of those that can be demonstrated as being capable of commercialization. Reduced tariffs also apply to the import of key upstream equipment used in the manufacturing of fuel cell vehicles.
- Some local governments has issued policies granting subsidies for building hydrogen filling stations on a per station basis in amount reaching RMB 1.5 to 2.5 million.

14. Are there any notable pilot/demonstration projects in place or planned for the production or offtake of clean hydrogen?

It appears that most of the demonstration projects in China so far have been undertaking by the SOE power majors – the following being some recent examples:

- Sinopec has put into operation its first large-scale green hydrogen project in Kuche, Xinjiang in August 2023. The project is expected capable of producing 20,000 tons of hydrogen per year using PV-generated electricity.
- SPIC started in late 2022 a solar and wind power supported green hydrogen to ammonia demonstration project in Baicheng, Jilin. The project is expected to generate green hydrogen of 32,000 tons per year (which can then be converted into green ammonia of 180,000 tons per year) by utilizing a power installation capacity of 800MW.
- Three Gorges Group put into operation PV solar plus green hydrogen project in December 2023. The PV-based hydrogen project with 75MW capacity is capable of generating 10,000 tons of green hydrogen per year, in Erdos, Neimenggu.

Overall, it is reported that around 40 green hydrogen projects were started in 2023 nationwide with total investment exceeding RMB260 billion.

In each of 2024 and 2025, NDRC has published an annual list of green and low-carbon demonstration project list with aim to providing fiscal and other support for their implementation. The lists so far have picked up a number of green hydrogen related projects, mainly sponsored by SOE players, spanning whole industrial chain from production to use.

15. Are there any commercial-scale clean hydrogen production projects in development or already operating?

Due to cost and technological constraints, so far there is no reported commercial scale green hydrogen project in China. There have been some "renewables plus electrolysis" hydrogen projects being branded as commercial, but to date their operations have not been smooth and apparently still rely on fiscal support from the government.

16. Have there been any hydrogen-related disputes in your jurisdiction?

There has not been major dispute reported in respect of hydrogen projects in China.

Last updated April 2025

Saudi Arabia

Policy and regulation

1. Is there a government hydrogen strategy or policy?

As of now and to the best of our knowledge, no national hydrogen strategy/policy has been launched as yet, The Kingdom has launched National Industry Strategy, which aims to reach an industrial economy that attracts investment and contributes to achieving economic diversification, developing domestic product and non-oil exports, in line with the objectives of the Saudi Vision 2030. As Saudi Arabia has not publicly released an official, comprehensive hydrogen strategy document. However, the Kingdom of Saudi Arabia has articulated its ambitions and is actively formulating policies to position itself as a leading global hydrogen producer.

Strategic Initiative and Announcements:

- **National Hyrdrogen Strategy** – In April 2022, Ahmed Al-Dowsary, Director at the Ministry of Energy indicated that Saudi Arabia was finalizing its National Hydrogen Strategy, aiming to attract over $36 billion in investments by 2030.[77]
- Neom Green Hydrogen Company is an equal joint venture by ACWA Power, Air Products and NEOM, building the world's largest green hydrogen and ammonia production plant in Saudi Arabia. The $8.4bn plant will produce up to 600 tonnes of hydrogen daily, which will be converted into about 1.2 million tonnes of ammonia a year.[78]
- Saudi authorities have set a hydrogen production target of approximately 3 million tons per year by 2030 and 4 million tons per year by 2035, emphasizing blue hydrogen production.[79]
- **24 March 2025** - Saudi Aramco Completes Acquisition of 50% stake in Blue Hydrogen Industrial Gases Company (BHIG)[80]

Collaborations and International Engagements:

- **3 February 2025** –'Saudi-German Green Hydrogen Bridge' MoU between ACWA Power and SEFE to produce 200,000 tons of green hydrogen and deliver it starting from 2030
- **Italy Partnership** – In January 2025, Saudi Arabia and Italy signed a five-year MoU to enhance energy cooperation, focusing on supplying Saudi-produced hydrogen to Europe

2. What are the key goals and commitments included in the strategy/policy?

During the Saudi-South African Investment Forum, 11 agreements and memoranda of understanding were signed in the public and private sectors in energy, water, green hydrogen, waste diversion, logistics, and aerial survey services, aimed at promoting the developing investment sectors between the two countries and between the Middle East and South Africa regions. As of now, Saudi Arabia has not publicly released an official hydrogen strategy or policy document. However, the Kingdom has demonstrated a strong commitment to becoming a leading global producer and exporter of clean hydrogen through various initiatives and strategic investments.

Investment Attraction:

- Aiming to attract over $36 billion in investment by 2030, focusing on the entire hydrogen value chain, including production, export, and domestic utilization.[81]

Production Targets:

Saudi Arabia has set ambitious production goals:

- By 2030 – Produce 2.9 million tons of clean hydrogen annually
- By 2035 – Increase production to 4 million tons per year.[82]

77 https://www.zawya.com/en/projects/industry/saudi-arabias-hydrogen-strategy-targets-36bln-of-investments-by-2030-cgok6oye
78 https://www.meed.com/acwa-power-signs-hydrogen-mou-with-german-firm)
79 https://www.arabnews.com/node/2013521?utm_source
80 https://www.aramco.com/en/news-media/news/2025/aramco-completes-acquisition-of-50-percent-stake-in-blue-hydrogen-industrial-gases-company
81 https://hydrogen-central.com/saudi-arabia-hydrogen-strategy-36bln-investments-2030/
82 https://economysaudiarabia.com/news/saudi-ambition-for-global-leadership-in-the-hydrogen-industry/

Focus areas:

Emphasizing several priority areas:

- Government-to-government engagements – Fostering international collaborations to support hydrogen mobility and export infrastructure
- Establishing regulatory framework standards and certifications.
- Investment facilitation – Accelerating hydrogen-related investments.

4. Major Projects:

Mentioned in Q1, Neom Green Hydrogen Project.

5. International Partnerships:

Saudi Arabia is actively pursuing collaborations to facilitate hydrogen exports, particularly to Europe. For instance, a five year energy cooperation agreement with Italy focuses on supplying Saudi-produced hydrogen to European markets. These goals and commitments reflect Saudi Arabia's strategic intent to diversify its economy, leverage its renewable energy potential, and establish itself as a central player in the emerging global hydrogen market.[83]

3. Which industry sectors are most likely to be affected by hydrogen deployment?

The Ministry of Investment has signed a memorandum of understanding with Alstom Company. The MoU aims to explore the future of sustainable transport in the Kingdom of Saudi Arabia and identify investment opportunities in the public transport sector related to railway infrastructure, sustainable transport technologies and reducing carbon emissions, in line with the objectives of the Kingdom's Vision 2030. **www.spa.gov.sa/2374677**.

Transportation: This includes long-haul transport, heavy-duty vehicles, and the development of sustainable aviation fuels (SAF), all areas where hydrogen is being actively explored and invested in by Aramco.[84]

High-Emitting Industries: Sectors with significant carbon emissions are a primary target for hydrogen as a cleaner alternative fuel and feedstock, as highlighted by Aramco's strategic focus.[85]

Power Generation: The use of hydrogen, particularly blue ammonia, for electricity generation is being pursued by Aramco as a way to lower carbon emissions in the energy sector[86]

Fertilizers and Chemicals: SABIC is in negotiations for a major blue ammonia and urea production facility in Jubail, indicating a significant impact of low-carbon hydrogen on the fertilizer and chemical industries.[87]

4. Who are the main regulators for the hydrogen market?

Given all above mentioned MoUs were signed by the Minister of Energy, it can be assumed that The Ministry of Energy, Industry and Mineral Resources will be regarded as the main agency having oversight of the hydrogen market in Saudi Arabia, despite not being appointed a regulator per se. It is expected the National Hydrogen Strategy might address the question of a hydrogen market regulator once published.

Saudi Standards, Metrology, and Quality Organization (SASO) is responsible for approving mandatory safety and quality standards in the Kingdom. In March 2022, SASO issued a technical regulation defining the requirements and conformity assessment procedures for hydrogen vehicles, marking a significant step toward regulating hydrogen-powered transportation.[88]

5. Does the government hydrogen strategy or policy support the development of both low-carbon (blue) hydrogen and renewable (green) hydrogen?

As stated above, there is no strategy or policy available in the public domain. However, through Saudi's public announcements, it can be inferred that Saudi Arabia has the required resources to pursue a green or blue hydrogen strategy. The Eastern region is more likely to produce and export blue hydrogen while the Western region would be suitable for producing green hydrogen with the development of renewable energy resources.

83 https://www.reuters.com/business/energy/italy-saudi-arabia-sign-energy-cooperation-agreement-2025-01-14/
84 https://aramcoventures.com/news/aramco-ventures-makes-strategic-investment-in-hydotech/
85 https://www.aramco.com/en/news-media/elements-magazine/2024/heading-for-hydrogen-and-a-lower-carbon-future
86 https://www.aramco.com/en/news-media/elements-magazine/2024/heading-for-hydrogen-and-a-lower-carbon-future
87 https://www.meed.com/sabic-in-negotiations-with-ammonia-urea-project-bidders
88 https://www.saso.gov.sa/en/Laws-And-Regulations/Technical_regulations/Documents/TR-Hydrogen-Vehicles.pdf

6. If the government hydrogen strategy or policy supports the development of low-carbon hydrogen, to what extent is carbon capture and storage being taken forward?

As previously stated, there has been no information released in the public domain of a strategy or policy that can determine to what extent carbon capture and storage would be taken further.

7. Are there targets for the production of hydrogen?

Kindly refer to Question 13.

8. Are there any incentive mechanisms/business models in place to support the production of hydrogen?

For the plans that have been confirmed and released to public domain, refer to question 13.

Theoretically, Saudi's endorsement to 'The Circular Carbon Economy framework' could be deemed significant and provide an idea of where future business models and incentive mechanisms would be put in place to support the production of hydrogen.

9. Are there any standards in place for the classification and/or certification of low-carbon or renewable hydrogen?

There is currently no defined statement in the public domain regarding the classification or certification of low carbon and/or hydrogen from renewable resources. However, Saudi Arabia has initiated steps toward establishing standards and certifications related to hydrogen technologies, particularly focusing on hydrogen vehicles. The Saudi Standards, Metrology, and Quality Organization (SASO) has developed the Technical Regulation of Hydrogen Vehicles.

10. Does the regulatory framework clearly define the regulatory requirements relating to the production, storage, transportation, or supply of hydrogen?

There is no dedicated legislation for hydrogen.

11. Are there any foreign investment restrictions related to energy and infrastructure sectors?

If it falls under the activity (oil exploration, drilling and production) it would be excluded from foreign investment.

12. What international treaties are in place that may offer protection to international investors in hydrogen projects in the jurisdiction?

We are not aware of any international treaty; however Saudi Aramco is a member of the Hydrogen Council.

Market developments and opportunities

13. Are there any government grants or other government funding available to hydrogen projects (including for research and development)?

The Saudi Arabian Government offers several funding opportunities to support hydrogen projects, including research and development (R&D) initiatives. Key programs and funding bodies include:

- Research and development grants regarding hydrogen projects are being executed at King Abdullah Petroleum Studies and Research Center (KAPSARC) and the King Abdullah University of Science and Technology (KAUST).
- **Saudi Innovation Grants Program (SIGP)** introduced in collaboration with the National Technology Development Program (NTDP), SIGP aims to empower startups, small and medium-sized enterprises (SMEs), and entrepreneurs to transform ideas and research into innovative products and services. Energy and Industrial Leadership supports advancements in energy technologies, hydrocarbons, and industrial innovations. This program could potentially support hydrogen-related innovations.[89]
- **The National Development Fund (NDF)** has provided substantial funding for large-scale green hydrogen projects, such as the $8.5 billion financing deal for a green hydrogen plant in NEOM. This financing includes contributions from the NDF and the Saudi Industrial Development Fund (SIDF), indicating strong governmental support for hydrogen infrastructure development.[90]
- **Public Investment Fund (PIF)** has committed over $9 billion, in partnership with entities like ACWA Power and Badeel, to develop renewable energy projects. These investments include initiatives aimed at producing carbon-free hydrogen, such as the NEOM Green Hydrogen Company.[91]
- **Aramco** offers grants for charitable, educational, humanitarian, cultural, and scientific purposes, which may include funding for hydrogen-related research projects.[92]

14. Are there any notable pilot/demonstration projects in place or planned for the production or offtake of clean hydrogen?

- Saudi Arabia has catalysed the expansion of hydrogen in September 2020. **Aramco and the Institute of Energy Economics, Japan, in partnership with SABIC, successfully demonstrated the production and shipment of blue ammonia from Saudi Arabia to Japan** with support from the Japanese Ministry of Economy, Trade and Industry. Forty tons of high-grade blue ammonia were dispatched to Japan for use in zero-carbon power generation. This was the world's first blue ammonia supply-chain demonstration – a significant milestone.
- Saudi plans to build the world's **largest export-oriented green ammonia plant in the city of Neom**. Saudi's zero-carbon fuel plan is to build a four gigawatt plant completely powered by wind and solar energy. This electricity will produce 650 tonnes of hydrogen daily via water electrolysis in a process known as 'green' hydrogen. This hydrogen will be used to produce 1.2 million tonnes of ammonia per year, which will be shipped from Saudi Arabia's western coast to markets in Europe and Asia. (Scheduled in 2025).
- On the 18th of June in 2019 **Saudi Aramco inaugurated the first hydrogen fuelling station in Saudi Arabia**. This pilot station will fuel an initial fleet of six Toyota Mirai fuel cell electric vehicles with high purity compressed hydrogen.

15. Are there any commercial-scale clean hydrogen production projects in development or already operating?

At present, projects plans in Saudi through public announcements as mentioned in Question 13.

16. Have there been any hydrogen-related disputes in your jurisdiction?

There has been nothing in terms of hydrogen-related disputes, to the best of our knowledge..

Last updated June 2025

89 https://www.spa.gov.sa/en/N2231630?
90 https://www.agbi.com/energy/2023/03/8-5bn-funding-deals-signed-for-saudi-green-hydrogen-project/
91 https://www.pif.gov.sa/en/the-future-of-renewables/
92 https://www.aramco.com/en/sustainability/society/grants-and-sponsorships/grants

Singapore

Policy and regulation

1. Is there a government hydrogen strategy or policy?

Yes, Singapore published its National Hydrogen Strategy in October 2022.

2. What are the key goals and commitments included in the strategy/policy?

Singapore believes that low-carbon hydrogen has the potential to be a major decarbonisation pathway to support Singapore's transition towards its committed target of net zero emissions by 2050. While not an explicit goal or commitment, the expectation is that hydrogen will complement and diversify Singapore's power mix alongside solar, imported electricity, and other potential low-carbon energy sources; and that (depending on technological developments and the development of other energy sources), hydrogen could supply up to half of Singapore's power needs by 2050 and play an important role in decarbonising Singapore's industry.

3. Which industry sectors are most likely to be affected by hydrogen deployment?

Hydrogen deployment in Singapore is expected to be most likely relevant to the following industrial sectors:

- power generation
- manufacturing (both as a fuel and as a feedstock)
- maritime and aviation
- land transport

4. Who are the main regulators for the hydrogen market?

While there is no dedicated hydrogen market regulator in Singapore, the storage and transport of hydrogen in Singapore is regulated by various governmental agencies, including the Singapore Civil Defence Force, the Land Transport Authority and the Maritime and Port Authority of Singapore; it may also be relevant to note (e.g. in connection with hydrogen-for-power) that the Energy Market Authority is the regulator of the power market in Singapore.

5. Does the government hydrogen strategy or policy support the development of both low-carbon (blue) hydrogen and renewable (green) hydrogen?

Singapore's National Hydrogen Strategy refers to "low-carbon hydrogen" and does not explicitly distinguish between blue hydrogen and green hydrogen.

6. If the government hydrogen strategy or policy supports the development of low-carbon hydrogen, to what extent is carbon capture and storage being taken forward?

Singapore expects to be a net hydrogen importer and the focus of the National Hydrogen Strategy is in developing the low-carbon hydrogen supply chain and value chain.

7. Are there targets for the production of hydrogen?

Singapore's National Hydrogen Strategy does not contain any explicit target for the domestic production of hydrogen.

8. Are there any incentive mechanisms/business models in place to support the production of hydrogen?

Singapore's National Hydrogen Strategy does not include any explicit incentive for the domestic production of hydrogen.

9. Are there any standards in place for the classification and/or certification of low-carbon or renewable hydrogen?

No. However, part of Singapore's National Hydrogen Strategy is to work collectively with international partners (governments and international organisations) on a number of relevant areas including the development of "Guarantee of Origin" certification methodologies to certify low-carbon hydrogen with verified emissions intensities.

10. Does the regulatory framework clearly define the regulatory requirements relating to the production, storage, transportation or supply of hydrogen?

Not specifically. However, certain existing laws will likely apply to various activities relating to hydrogen; for example:

- *the Fire Safety Act 1993* and the *Fire Safety (Petroleum and Flammable Materials) Regulations* regulate hydrogen as a "flammable material" and therefore regulates, among other things, certain acts in respect of hydrogen such as: (i) import; (ii) storage; (iii) dispensation; (iv) conveyance over pipelines; and (v) transportation;
- the *Maritime and Port Authority of Singapore Act 1995* and the *Maritime and Port Authority of Singapore (Dangerous Goods, Petroleum, and Explosives) Regulations 2005* designate compressed hydrogen as a "First Schedule dangerous good", such that any vessel carrying compressed hydrogen is subject to certain restrictions on movement in certain prescribed areas of the Singapore ports as well as in relation to the handling, discharging and loading of compressed hydrogen;
- the *Gas Act 2001* defines "gas" as including "town gas" which is defined as "any substance in a gaseous state which is conveyed in gas pipes and is manufactured from petrochemical feedstock or natural gas, and has hydrogen as one of its main constituents" and this may capture some forms of hydrogen (though likely not low-carbon hydrogen); and
- the *Workplace Safety and Health Act 2006* and the Workplace Safety and Health (Major Hazard Installations) Regulations 2017 set out hydrogen as a "dangerous substance", so that any premises where processing, manufacturing or bulk storage by way of trade or for the purpose of gain is carried on in respect of hydrogen where a prescribed quantity of hydrogen is present or likely to be present, is deemed to be a "major hazard installation" and subject to more stringent workplace health and safety requirements.

11. Are there any foreign investment restrictions related to energy and infrastructure sectors?

Singapore operates a generally open policy towards foreign investment and there are no restrictions expressly targeted against foreign investment relating to the energy and infrastructure sectors. It should also be noted that Singapore offers a number of incentives such as tax breaks and grants to encourage international companies to base their regional headquarters or other key facilities in Singapore.

12. What international treaties are in place that may offer protection to international investors in hydrogen projects in the jurisdiction?

The United Nations Conference on Trade and Development (UNCTAD) website states that Singapore is a signatory to 38 bilateral investment treaties (BITs) and 33 treaties with investment protections (TIPs) that are in force, as well as a number of Investment Related Instruments (IRIs) – these can be accessed from the online database maintained by UNCTAD's Investment Policy Hub **here**. Singapore's "Enterprise Singapore" agency also maintains an online database of bilateral and regional free trade agreements (FTAs) that Singapore is party to, which may contain protections for investors in Singapore; these can be accessed **here**.

Market developments and opportunities

13. Are there any government grants or other government funding available to hydrogen projects (including for research and development)?

Certain grants for research and development are available specifically for low-carbon technology-related research, including in connection with hydrogen (in addition to the tax breaks and grants available for qualifying foreign investments).

Singapore introduced the Low-Carbon Energy Research (LCER) Funding Initiative in 2020 and the first phase of the programme awarded S$55 million to projects aiming to improve the technoeconomic viability of low-carbon technologies such as carbon capture, utilisation, and storage (CCUS) and hydrogen. For hydrogen, the LCER funded projects in areas such as the development of catalysts for ammonia cracking, and methane pyrolysis.

The National Hydrogen Strategy provides and an additional S$129 million of research funding under LCER will be set aside to support the development of low-carbon technologies including hydrogen; and that the need for further funding will be further assessed, depending on Singapore's national needs.

14. Are there any notable pilot/demonstration projects in place or planned for the production or offtake of clean hydrogen?

There are currently no particularly notable pilot projects in place or planned for the production of clean hydrogen in Singapore. On the offtake front:

- Keppel Infrastructure, through its wholly-owned subsidiary Keppel Energy, has announced that it has reached FID to develop the Keppel Sakra Cogen Plant, a 600-megawatt advanced combined cycle gas turbine (CCGT) power plant which can be run entirely on clean-burning hydrogen, and that the EPC contract for the construction of the plant has been awarded to a consortium comprising Mitsubishi Power Asia Pacific and Jurong Engineering. The plant is expected to be ready by the first half of 2026; and
- Keppel New Energy Pte Ltd, a wholly owned subsidiary of Keppel Infrastructure; Mitsubishi Heavy Industries, Ltd. and DNV, have announced that they have signed a Memorandum of Understanding (MoU) for a strategic collaboration to explore the feasibility and implementation of an ammonia-fired gas turbine on Jurong Island, Singapore.

15. Are there any commercial-scale clean hydrogen production projects in development or already operating?

There are currently no existing commercial-scale clean hydrogen production projects being developed, or in operation, in Singapore.

16. Have there been any hydrogen-related disputes in your jurisdiction?

No.

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South Africa

Ashurst collaborated with **Bowmans** in the preparation of this content. We are grateful for their input.

Policy and regulation

1. Is there a government hydrogen strategy or policy?

Yes, the Department of Science, Technology and Innovation (**DSTI**) published the South African Hydrogen Society Roadmap (HSRM) on 17 February 2022. The HSRM intends to serve as a national framework for policy and actions relating to hydrogen in South Africa. In October 2023, the Cabinet approved the Green Hydrogen Commercialisation Strategy (**GHCS**).[93] The GHCS is a strategy framed within the HSRM, and it builds on the Hydrogen South Africa programme (**HySA**). HySA was a 15-year programme by the DSTI that was approved by the Cabinet in May 2007 and officially launched in September 2008.[94]

Other government policies also recognise hydrogen's role and potential uses in the South African economy. These include:

- the Renewable Energy Policy of South Africa;
- the Integrated Energy Plan; and
- the Integrated Resource Plan.

2. What are the key goals and commitments included in the strategy/policy?

The identified goals and commitments in the HSRM policy include:

- the decarbonisation of the transport and energy-intensive sectors by 2050;
- the creation of a green hydrogen export market so that South Africa can capitalise on the projected increase in demand in response to international climate commitments;
- the creation of a Centre of Excellence in Manufacturing for hydrogen products and fuel cell components which will contribute to their respective value chains;
- transforming and stabilising the power sector by employing green technologies; and
- increasing the role of hydrogen in the South African energy system.

The identified goals and commitments in the GHCS strategy include:

- Prioritising exports by targeting exports of green hydrogen and green chemicals by leveraging on South Africa's proprietary Fischer Tropsch technology and utilising financing support mechanisms including grants, concessional debt and contract for difference / price subsidies to improve the financial viability of these projects;
- Stimulating domestic market by developing projects along the value chain to stimulate demand for green hydrogen in South Africa. "Low hanging fruit" opportunities to be prioritised to provide confidence in the domestic market. Examples include green steel, hydrogen valley mobility programme and sustainable aviation fuel projects;
- Supporting localisation by developing local industrial capability to produce fuel cells, cells, electrolyser, ammonia cracking and balance of plant equipment and components by leveraging on South Africa's PGM resources. Together with demand stimulation this will drive longer term GH2 price reduction allowing penetration in various sectors;
- Securing funding from various sources and in various forms including grants, concessional debt and contract for differences;
- Maximising development impact (including skills and economic development and social inclusion). Ensure gender equality, BBBEE and community participation;
- Prioritising the execution of the green hydrogen commercialisation strategy and the development of a national GH2 infrastructure plan; and
- Driving the required policy and regulatory changes required to sustain long term growth of the new hydrogen industry.

93 See https://www.sanews.gov.za/south-africa/sas-green-hydrogen-commercialisation-strategy-approved-cabinet.
94 See https://www.hysasystems.com/index.php/about-hysa.

3. Which industry sectors are most likely to be affected by hydrogen deployment?

The following sectors are most likely to be impacted by the deployment of hydrogen:

- the transport sector;
- energy-intensive sectors;
- the electricity sector;
- the aviation sector; and
- the mining sector.

4. Who are the main regulators for the hydrogen market?

There are no specific regulators of hydrogen production and exportation in South Africa. The production, storage, transportation or supply of hydrogen would largely be regulated as an industrial process, and it may be subject to environmental and health and safety regulations. The regulators would include local, provincial and/or national environmental authorities, as well as health and safety regulators from the local or national authorities. In addition, renewable energy production ties to the production of green hydrogen and would be regulated by the National Energy Regulator of South Africa (**NERSA**).

5. Does the government hydrogen strategy or policy support the development of both low-carbon (blue) hydrogen and renewable (green) hydrogen?

Yes, one of the aims of the HSRM is to develop the role of blue and green hydrogen in the energy system and the HSRM makes provision for the eventual transition from blue to green hydrogen by 2050 to ensure that clean hydrogen is integrated as an energy vector in the South African energy system. In the short term, South Africa will focus on catalytic projects to stimulate local demand for all types of hydrogen to illustrate its commercial viability and scalability. As noted above, the GHCS also aims to prioritise the export of green hydrogen. However, the GHCS does not make mention of blue hydrogen.

6. If the government hydrogen strategy or policy supports the development of low-carbon hydrogen, to what extent is carbon capture and storage being taken forward?

As part of the building blocks for creating a South African hydrogen society, the HSRM includes two carbon capture, usage and storage (**CCUS**) pilot projects. One project focuses on creating a CCUS site in an identified priority area in Mpumalanga that has a high concentration of coal mining and power generation. This project forms part of HSRM's Action Plan for Hydrogen generation, storage and distribution and will be implemented between 2021 and 2024. In September 2024, the Minister of Mineral and Petroleum Resources unveiled this CCUS piolet project in Leandrea Mpumalanga .[95] This event also featured the signing of a memorandum of understanding between the Council for Geoscience and the Mpumalanga Department of Economic Development, Environment and Tourism, which signifies a commitment to joint efforts in advancing CCUS and related programmes. The second pilot project aims to create CCUS projects on a national scale. This project has not yet commenced.

7. Are there targets for the production of hydrogen?

Yes, the HSRM provides targets for hydrogen production. The targets, and their respective timeframes, are as follows:

- 2021-2024: small scale electrolysis production and at least 1MW of green hydrogen to be used, for example, in the transport sector and in power generation;
- 2025-2030: the construction of 5GW electrolysis capacity; the deployment of a total of 11.7GW electrolyser capacity; and, at least, 500kt of Hydrogen produced annually by 2030. The main areas of utilisation include power generation and the transport sector; and
- 2030-2040: increase electrolysis capacity to at least 15GW for full use in the transport industry and power generation.

8. Are there any incentive mechanisms/business models in place to support the production of hydrogen?

There are currently no direct incentive mechanisms or business models that support hydrogen production. However, the HSRM recognises existing incentive opportunities, such as tax incentives, that could support hydrogen production. These include:

- section 11D of the Income Tax Act No 58 of 1962 (ITA) may be used to advance research and development relating to hydrogen production as it does not circumscribe the categories of R&D;
- companies operating in Special Economic Zones (i.e. designated areas for targeted economic activities) may have a reduced corporate tax rate of 15% and an accelerated 10% tax allowance on buildings; and
- the Support Programme for Industrial Innovation (SPII), which is particularly focused on the development phase of innovative products or processes may be used to promote the development of hydrogen technologies.

9. Are there any standards in place for the classification and/or certification of low-carbon or renewable hydrogen?

There are no existing standards in place for the classification and/or certification of low-carbon or renewable hydrogen in South Africa.

10. Does the regulatory framework clearly define the regulatory requirements relating to the production, storage, transportation or supply of hydrogen?

South Africa does not have a regulatory framework that specifically concerns hydrogen. However, there are other, non-specific, regulatory regimes that may impact upon its production, storage, transportation or supply. These include, for example, the Occupational Health and Safety Act 85 of 1993 regulations.

On 25 February 2025, the Minister of Forestry, Fisheries and Environment launched the Environmental Impact Assessment Guidelines for Green Hydrogen Projects and the South African Green Hydrogen Potential Atlas.[96] The aims of these instruments are to remove the uncertainty around hydrogen regulation, drive investment, and accelerate South Africa's transition to a green hydrogen economy.

The EIA Gudelines for Green Hydrogen provides that certain green hydrogen (GH2) projects may require environmental authorisation.[97] This will be the case if the project falls in any listed activity in terms of the listing notices.

11. Are there any foreign investment restrictions related to energy and infrastructure sectors?

There are no restrictions on foreign investments in the energy and infrastructure sectors. Neither the primary legal framework governing foreign investment in South Africa, the Protection of Investment Act 22 of 2015 (**Investment Act**), nor sectoral regulations provide for such restrictions. However, the ownership requirements in the Broad-Based Black Economic Empowerment Act 53 of 2003 must be considered, these do not create compulsory investment thresholds, but such thresholds may be a requirement for participation in any government investment support scheme.

12. What international treaties are in place that may offer protection to international investors in hydrogen projects in the jurisdiction?

According to the United Nations Conference on Trade and Development (**UNCTAD**), South Africa has signed 50 bilateral investment treaties (**BITs**). Of the 50, however, 26 were signed but are not in force, 12 have been terminated and only 12 are currently in force. A summary of these treaties can be found on the UNCTAD's Investment Policy Hub **database**.

It must be noted, however, that South Africa is not currently engaged in any new BIT negotiations and future negotiations are unlikely. The Investment Act is national legislation that is aimed at providing protection to investors and their investments. Significantly, the Act states that existing investments that were made under such treaties will continue to be protected for the period and terms stipulated in the treaties. Any investments made after the termination of a treaty, but before promulgation of this Act, will be governed by the general South African law. Therefore, it is envisaged that international investors will likely be protected in terms of national and not international law.

Market developments and opportunities

13. Are there any government grants or other government funding available to hydrogen projects (including for research and development)?

The Netherlands and Denmark are collaborating with South Africa to create the **SA-H2 Fund** to advance South Africa's green hydrogen sector and circular economy. This fund was announced in June 2023, and involves several organisations, including Climate Fund Managers, Invest International B.V. (II), Sanlam Limited, the Development Bank of Southern Africa, and the Industrial Development Corporation of South Africa. The goal of the SA-H2 Fund is to secure USD$1 billion in funding for South Africa in order to expedite the funding and development of large-scale green hydrogen projects in South Africa.[98] Also in June 2023, South Africa and Germany signed a joint declaration of intent to establish the **South African German Hydrogen Task**

95 MINISTER GWEDE MANTASHE INAUGURATES SOUTH AFRICA'S FIRST PILOT CCUS RESEARCH SITE IN MPUMALANGA - Council for Geoscience.

96 Please see https://www.dffe.gov.za/mediarelease/george_greenhydrogenrevolution.
97 Please see https://bit.ly/SAGH2eia at page 16.
98 See https://www.dbsa.org/press-releases/unveiling-sa-h2-fund-south-africas-dedicated-green-hydrogen-fund.

Force.[99] The primary objective of this task force is to promote the economic feasibility of green hydrogen projects, as well as the development of related industries and infrastructure in both South Africa and Germany. Additionally, the Critical Infrastructure Programme (**CIP**), run by the Department of Trade, Industry and Competition (**DTIC**) aims to, amongst other objectives, provide financial support to projects that alleviate dependency on the national grid. In the revised guideline to the CIP, published in November 2021, support for clean/green energy infrastructure was included. Although the CIP guideline does not define 'clean/ green energy', the Deputy Minister of the DTIC has stated that the CIP would involve financial assistance in alleviating the infrastructure costs associated with hydrogen production, fuelling and transport facilities. The CIP guideline does not provide an estimate of the available funding.

In November 2024, the South African Government received €32 million in grants from the EU to inject in the funding of public and private sector green hydrogen infrastructure. The grants are also demarcated for the national port authority to fund green hydrogen projects for ports, rail, and pipelines to realise Transnet's vision of net-zero emissions by 2040.[100]

14. Are there any notable pilot/demonstration projects in place or planned for the production or offtake of clean hydrogen?

Yes, there are a number of pilot projects planned to determine the feasibility of green hydrogen in different sectors and to kick-start the development of a hydrogen society in South Africa. These include the following projects:

- **the Hydrogen Valley or Platinum Valley Project** is a project of the DSI, with various partners, to study the feasibility of developing catalytic green hydrogen hubs. These hubs will form part of the Hydrogen Valley and will be connected to form a 'Hydrogen Corridor'. The identified hubs are in Johannesburg, Durban/Richards Bay and Mogalakwena/Limpopo. The hubs will host pilot projects in the industrial, mobility and building sectors. The projects involve, for example, developing ethylene and ammonia from green hydrogen and running paper mills with hydrogen instead of natural gas fuels.
- **the COALCO2 – X Project** aims to use green hydrogen and other pollutants found in flue gas from coal-fired boilers to make value-added products. The objective is to support the transition to a decarbonised energy system and assist in reducing gas emissions. This project will also be used to scale up domestic demand for hydrogen and create capabilities for the export market.
- **Boegoebaai**, an area in the Northern Cape, has been identified by the government as a Strategic Integrated Project in the South African National Development Plan. The project, led by Sasol, is focused on determining whether an export hub for green hydrogen and ammonia is feasible and proposed construction projects include green hydrogen and ammonia production sites, a desalination plant to support the production of green hydrogen and a storage facility. In addition, Sasol has finalised a memorandum of agreement with both national and local government to develop the Boegoebaai site. The development aims to produce 400,000 tonnes of green hydrogen annually.
- The **Prieska Power Reserve Project**,[101] set to commence in 2025, intends to develop technology for producing hydrogen and ammonia using renewable energy sources, while also focusing on their storage and distribution. This initiative is expected to play a significant role in advancing South Africa's socio-economic development goals.15. Are there any commercial-scale clean hydrogen production projects in development or already operating?

15. Are there any commercial-scale clean hydrogen production projects in development or already operating?

There are currently no commercial-scale clean hydrogen production projects in development or already operating in South Africa.

16. Have there been any hydrogen-related disputes in your jurisdiction?

There have not been any hydrogen-related disputes in South Africa that have been addressed in open court.

Last updated April 2025

99 See https://www.gov.za/speeches/minister-electricity-dr-kgosientsho-ramokgopa-signs-joint-declaration-intent-german.
100 Please see https://energycapitalpower.com/south-africa-secures-e32m-in-eu-grants-for-green-hydrogen-projects/.
101 See https://prieskapower.com/#:~:text=The%20Prieska%20Power%20Reserve%20Project,resources%20of%20water%20and%20air.

South Korea

Content provided by **Ashurst Korea JV**

Policy and regulation

1. Is there a government hydrogen strategy or policy?

Yes, on 17 January 2019, the Ministry of Trade, Industry and Energy (MOTIE) announced the **Hydrogen Economy Vitalization Roadmap** (Roadmap) which focuses on hydrogen utilisation, such as hydrogen fuel cell vehicles and fuel cells. Further, South Korea enacted the Hydrogen Economy Promotion and Hydrogen Safety Management Act (**the Hydrogen Act**) on 4 February 2020 which came into effect on 5 February 2021. The latest amendment bill for the Hydrogen Act was passed in May 2022 and came into effect on 11 December 2022 (the **Amendment**).

On 26 November 2021, MOTIE established the **First Master Plan for Hydrogen Economy Implementation (Master Plan)** which covers the entire hydrogen value chain of production, storage, transportation and utilisation. Following the March 2022 change in administration, the new administration updated the country's hydrogen roadmap with the Plan for Creating a Clean Hydrogen Ecosystem (the 3UP Policy) in 9 November 2022.

2. What are the key goals and commitments included in the strategy/policy?

The policy goal is to pioneer the clean hydrogen economy through establishing a full-cycle ecosystem of hydrogen economy. The Master Plan includes four pillars of strategy and 15 objectives as set out below:

Phase	Key Goals
(1) Pioneer in domestic and global production of clean hydrogen	(i) Green hydrogen production (ii) Blue hydrogen production (iii) Overseas production of clean hydrogen
(2) Establish compact infrastructure	(iv) Establishment of hydrogen distribution infrastructure (v) Construction of hydrogen piping network (vi) Increase the number of hydrogen stations
(3) Utilise hydrogen in all aspects of day-to-day life	(vii) Enlargement of hydrogen power generation (viii) Pioneer in global market of hydrogen mobility (ix) Establish foothold for hydrogen utilization in industrial fields
(4) Strengthen the foundation of the ecosystem	(x) Technology development/manpower cultivation/standardization (xi) Procurement of world-class hydrogen-safety (xii) Lead global collaboration (xiii) Nurture hydrogen-specialised enterprises and vitalize hydrogen finance (xiv) Diffuse hydrogen cluster city special regulatory zones (xv) Establish policy foundation and enhance public acceptance

The Master Plan puts a particular emphasis on clean hydrogen generation (i.e. green hydrogen and blue hydrogen), and aims to meet 100% of the anticipated annual demand of 27.9 million tons of hydrogen in 2050 with clean hydrogen, 60% of which is produced domestically or based on domestic technology and/or capital. The milestone targets under the Master Plan are:

- to reach a clean hydrogen ratio of 75% by 2030 and 100% by 2050; and
- to reach a self-sufficiency rate of 34% by 2030 and 60% by 2050.

The new administration's updated policy under the 3UP Policy has three key goals: scale up, build up and level up.

Scale up – expand the clean-hydrogen ecosystem by creating demand for hydrogen energy in power and transportation	Development of dual fuel-based power generation technology using hydrogen and ammonia by 2027 (50% hydrogen, 20% ammonia) Construction of a hydrogen-ammonia-mix power plant by 2028, with production centres set up in Korea and overseas Expansion of number of hydrogen-fuelled commercial vehicles to 30,000 by 2030
Build up – develop infrastructure and regulations	70 liquified hydrogen charging stations by 2030 Ammonia receiving terminals with a capacity of 4 million tons a year to be set up in areas with a high concentration of coal plants (e.g. Incheon, Gangwon, and South Gyeongsang); liquified hydrogen receiving terminals with an annual capacity of 100,000 tons to be set up near LNG generators Installation of hydrogen-exclusive pipes Regulatory base for safe and clean hydrogen distribution (including hydrogen power bidding market starting 2023 and a certification system for clean hydrogen starting 2024)
Level up – focus on industry and technology development	Seven strategic technologies: water electrolysis, liquid hydrogen carriers, trailers, charging stations, fuel cells for mobility, fuel cells for power generation and hydrogen turbines 600 companies specialising in the hydrogen business by 2030

The new policy updated the country's hydrogen milestone targets, with clean hydrogen and ammonia to make up 2.1% of total electricity production by 2030, and 7.1% by 2036. With this policy, MOTIE intends to expand its scope, from areas such as hydrogen vehicles and power generation fuel cells to include all areas of the hydrogen value chain.

3. Which industry sectors are most likely to be affected by hydrogen deployment?

The industries that conventionally use fossil fuels as their primary energy sources are anticipated to be affected the most by hydrogen deployment. Some examples are as follows:

- the energy sector (due to the introduction of hydrogen power generation);
- infrastructure (for hydrogen distribution, e.g. piping and hydrogen stations);
- the automobile and other mobility sectors (e.g. hydrogen-powered mobility; transportation and logistics); and
- the steel, petrochemistry and cement sectors (due to the shift from conventional fuel (e.g. coal) to hydrogen for the generation of power).

The automobile industry has experienced the biggest impact so far, and it is expected that it will continue to be affected. Korea's current production capacity for hydrogen fuel cell cars is 10,000 cars per year. Under the 3UP Policy the government has a goal of producing 30,000 hydrogen commercial vehicles by 2030.

4. Who are the main regulators for the hydrogen market?

The main government entity responsible for the hydrogen economy is the Ministry of Trade, Industry and Energy (MOTIE). The Hydrogen Act regulates MOTIE's authority in relation to the promotion and management of the country's hydrogen economy.

Article 6 of the Hydrogen Act provides for the establishment of the Hydrogen Economy Committee, which is chaired by the Prime Minister and includes the Minister of Economy and Finance, the Minister of Science and ICT, the Minister of the Interior and Safety, the Minister of Trade, Industry and Energy, the Minister of Environment, the Minister of Land, Infrastructure and Transport, the Minister of Oceans and Fisheries, the Minister of Small and Medium Enterprises (SMEs) and Startups, and other persons working at industrial, academic, research institutes, etc. with sufficient expertise and experience in fostering the hydrogen economy who are commissioned by the Prime Minister. The Hydrogen Economy Committee is responsible for the following:

1. Matters concerning formulating and executing master plans in accordance with the Hydrogen Act, and reviewing and evaluating the implementation results thereof;
2. Matters concerning recommendations for improving statutes and regulations pertaining to implementing the hydrogen economy;
3. Matters concerning policy coordination, cooperation, and support related to the hydrogen economy by relevant central administrative agencies and local governments;
4. Matters concerning cooperation between countries, establishment of a hydrogen industry ecosystem, and handling of grievances of enterprises, etc. in relation to the hydrogen economy;
5. Matters required to undergo deliberation of the Committee under other statutes; and
6. Other matters deemed necessary by the Chairperson of the Committee in relation to the hydrogen economy.

In accordance with the Hydrogen Act, the following institutions have been designated as the corresponding designated organizations:

1. Hydrogen Convergence Alliance (H2KOREA) as the designated organization for hydrogen industry promotion;
2. Korea Gas Corporation (KGS) as the designated organization for hydrogen distribution; and
3. Korea Gas Safety Corporation (KGSC) as the designated organization for hydrogen safety.

The designated organizations are responsible for facilitating the government's hydrogen economy policies by laying the requisite foundations such as training professionals and standardization, achieving price stabilization and establishing a fair distribution ecosystem, and establishing safety standards.

5. Does the government hydrogen strategy or policy support the development of both low-carbon (blue) hydrogen and renewable (green) hydrogen?

MOTIE introduced a policy paradigm shift in the Roadmap from conventional grey hydrogen to renewable green hydrogen in 2019. It supports a safe and economic hydrogen production and supply system through water electrolysis and importing the same from overseas. In addition, the Master Plan puts emphasis on clean energy, both green and blue hydrogen.

With regard to green hydrogen, the Korean Government plans to scale up:

- electrolysis technology capacity from the current 500 KW to 1 MW by 2025, and 10 MW by 2030; and
- electrolysis efficiency from the current 55% to 69% by 2030 and 77% by 2050.

In addition to setting out the expansion plan of water electrolysis for green hydrogen production, the Master Plan introduced a roadmap for the production of blue hydrogen, such as the establishment of new blue hydrogen clusters by 2025, technology development for early commercialization of CCUS (carbon capture, utilisation and storage), and procurement of storage facilities, inside and outside of Korea.

South Korea's hydrogen policy had been criticised for depending too heavily on fossil-fuel based grey hydrogen. The updated plan under the 3UP Policy makes it clear that the government is focusing on building a low-carbon and renewable hydrogen ecosystem, with a goal of 7.1 percent clean hydrogen power by 2036, and a clean hydrogen certification system to be active by 2024. The policy also supports research and development of key technologies such as water electrolysis.

The Amendment introduces a graded clean hydrogen certification system, under which clean hydrogen is classified into four levels based on the amount of greenhouse gas emissions. Depending on the grade of clean hydrogen, MOTIE may provide differentiated administrative and financial support to producers and users of clean hydrogen. Further, it adds an obligation to develop, produce and supply clean hydrogen unto the national and local governments, as well as mandating the inclusion of matters regarding the promotion of the development, production and supply of clean hydrogen and matters regarding the transition to hydrogen economy for carbon neutralization to the Master Plan.

6. If the government hydrogen strategy or policy supports the development of low-carbon hydrogen, to what extent is carbon capture and storage being taken forward?

The Master Plan explicitly aims to achieve early commercialisation of CCUS technology in relation to blue hydrogen.

With regard to CCS (carbon capture and storage), it is proposed that exhausted gas fields in the East Sea (with a total storage capacity of 12 million tons) will be utilised for early commercialisation. The plan is for environmental reviews and safety evaluations to be completed by mid-2023, with facilities constructed by 2024, and for facilities to be operated for 30 years from 2025 to 2054.

- In 2022, six Korean companies signed a memorandum of understanding to establish a CCS project with Malaysia's state energy company, with the first step being a feasibility study. Through this project, carbon dioxide emitted in Korea will be captured, transported to Malaysia, and stored. In August 2023, four additional domestic and international companies with relevant experience and technical expertise joined the project, and accordingly, the memorandum of understanding was renewed.

With regard to CCU (carbon capture and utilisation), it is proposed that CCU products will be commercialised to reduce green-house gas emissions through large scale substantiation focusing centrally on business sites with high green-house gas emissions. The plan is for the government to lead substantiation of small- and mid-size technology by 2026; procure commercial technology by 2028; and diffuse commercial technology through private technology transfer by 2030. The Master Plan also proposes participation in international joint research in order to procure advanced CCU/CCS technology.

On 21 March 2023, the government published the 1st National Basic Plan for Carbon Neutrality and Green Growth (the "Carbon Basic Plan"), which facilitates hydrogen production technology, CCUS and the application of carbon reduction technology in industrial sites. It aims to enact a single law on CCUS, including provisions to foster the CCUS industry, and establish certification standards. The Carbon Basic Plan raised the 2030 carbon treatment target through CCUS from the previous 10.3 million tons to 11.2 million tons, indicating that more proactive policies on CCUS are expected to be pursued.

7. Are there targets for the production of hydrogen?

When the Roadmap was published in January 2019, MOTIE anticipated that the annual demand for hydrogen would rise to 5.26 million tons by 2040. The Roadmap anticipated this demand would be met by extracted hydrogen (30%) and water electrolysis, byproduct hydrogen and overseas production (70%).

However, in November 2021, MOTIE renewed its forecast and proposed an updated plan which anticipated annual demand for hydrogen would rise to 27.9 million tons by 2050, all of which is targeted to be supplied with clean hydrogen, with a self-sufficiency rate of 60% (accounting for hydrogens produced domestically as well as those produced overseas with domestic technology or capital). More specifically, the Master Plan includes the following production targets:

- Green hydrogen: 250,000 tons per annum by 2030 and 3 million tons per annum by 2050; and
- Blue hydrogen: 750,000 tons per annum by 2030 and 2 million tons per annum by 2050.

The Master Plan further intends to establish 40 overseas hydrogen supply chains by 2050 to diversify the supply chain for energy security enhancement, whereby the country would, together with the green hydrogen and blue hydrogen produced domestically, achieve a 60% self-sufficiency rate for clean hydrogen.

8. Are there any incentive mechanisms/business models in place to support the production of hydrogen?

Currently, there are no incentive mechanisms/business models in place which specifically support the production of hydrogen. However, the following incentives may indirectly stimulate the production of hydrogen:

- national and local governments are authorised, pursuant to Article 17 of the Hydrogen Act, to grant certain tax benefits to businesses engaging in hydrogen activities and the Master Plan states that the government will push to enlarge tax incentives for hydrogen R&D activities and infrastructure investment to support the establishment of the foundation of supply and demand of hydrogen economy. Key technologies in the hydrogen industry have been classified as core technologies for new growth under the Restriction of Special Taxation Act, allowing companies to continue receiving R&D tax credits. Furthermore, starting in 2023, hydrogen technologies were newly designated as national strategic technologies, making them eligible for higher tax credit rates. As of May 2025, ten hydrogen technologies have been designated as national strategic technologies;
- the government may, pursuant to Article 9 of the Hydrogen Act, provide administrative and financial support to 'hydrogen-specialised enterprises' which meet certain thresholds in relation to its hydrogen business-related turnover or hydrogen business-related R&D investment amount compared to its total turnover. As part of the initiative to strengthen the foundation of the hydrogen ecosystem under the Master Plan, the government plans to designate 1,000 enterprises as hydrogen-specialised enterprises by 2040, and provide a distinguished support system, such as with regard to R&D and securement of market. As of May 2025, approximately 110 companies have been designated as hydrogen-specialised enterprises; and
- the Master Plan also provides a plan in relation to hydrogen finance which includes: utilising the existing climate fund to create an early market for hydrogen, establishing a hydrogen infrastructure fund to support the infrastructure for hydrogen production and distribution, and encouraging private hydrogen industry funds to nurture promising hydrogen businesses (including hydrogen-specialized enterprises). The Hydrogen Act also introduces 'hydrogen-specialised investment companies', which are required by law to invest more than half of their funds into hydrogen-specialised companies.

Since the government's introduction of different grades of clean hydrogen under the certification system (see question 9), there has been speculation that a tax credit system similar to the US' Inflation Reduction Act may be introduced. However, as of 3 May 2025 there has been no official confirmation.

9. Are there any standards in place for the classification and/or certification of low-carbon or renewable hydrogen?

The Amendment introduced legal grounds for the certification of clean hydrogen, and the government began implementing the system in March 2024.

According to the amended Enforcement Decree of the Hydrogen Act, the MOTIE minister may, in consultation with the heads of relevant central administrative agencies, establish and announce the certification standards for clean hydrogen based on greenhouse gas (**"GHG**") emissions. Under the Notification on the Operation of the Clean Hydrogen Certification System, which took effect on 4 March 2024, hydrogen production must emit no more than four kilogrammes of carbon dioxide equivalent ($4kgCO_2eq$) per kilogram of hydrogen to be certified as clean hydrogen. The notification classifies clean hydrogen into four grades depending on actual GHG emissions.

Classification	Grade 1	Grade 2	Grade 3	Grade 4
Emissions (kgCO2eq/kgH2)	0.00 – 0.10	0.11 – 1.00	1.01 – 2.00	2.01 – 4.00

GHG emissions are calculated by life cycle assessment, meaning calculation begins from raw material extraction through to hydrogen production/import. These GHG emissions are then divided into direct emissions (Scope 1), indirect emissions (Scope 2), and other indirect emissions (Scope 3).

On 28 December 2023, MOTIE designated the Korea Energy Economics Institute (KEEI) as the certification operating institution, and the Korea Testing Certification Institute (KTC) and the Korea Testing & Research Institute (KTR) as the certification testing and evaluating institutions. In order to obtain a clean hydrogen certificate, a business operator must file an application with the certification operating institution for confirmation of the clean hydrogen facility after completing its construction. Once the facility certificate is issued, a certificate for certified clean hydrogen production volume will be issued. Such volume will be determined based on either (a) the amount of hydrogen when the producer began to sell clean hydrogen in Korea, or (b) the amount of hydrogen at the point when permission for unloading at a port was secured in case of overseas production.

10. Does the regulatory framework clearly define the regulatory requirements relating to the production, storage, transportation or supply of hydrogen?

Regulatory Framework for Hydrogen Safety Management in Korea

- The safety management of the hydrogen industry in Korea is governed by multiple laws, including the Hydrogen Act, the Occupational Safety and Health Act, the High-Pressure Gas Safety Control Act, the Urban Gas Business Act, and the Liquefied Petroleum Gas Safety Control and Business Act (the "LPG Act").
- The Hydrogen Act applies to the safety of fuel cells and low-pressure hydrogen facilities. However, where the supplied hydrogen has a pressure of 1 MPa (10 bar) or higher, the High-Pressure Gas Safety Control Act applies instead.
- In addition, under the Hydrogen Act, where matters related to hydrogen business and safety are addressed by the High-Pressure Gas Safety Control Act, the Urban Gas Business Act, or the LPG Act, those laws take precedence.

Safety Management Provisions under the Hydrogen Act

- The Hydrogen Act imposes requirements such as licensing for hydrogen product manufacturing businesses, completion inspections and periodic inspections of hydrogen product manufacturing facilities, and the establishment and implementation of safety management regulations. Licensing is granted by local governments, while inspections are conducted by the KGSC.
- Hydrogen storage and pipeline facilities must pass a technical review by KGSC and subsequently undergo completion and periodic inspections.
- For hydrogen products manufactured overseas, the foreign manufacturer intending to export to Korea must undergo a technical review and on-site factory inspection by KGSC and register the product with the MOTIE.
- Lastly, both domestic manufacturers and importers of hydrogen products must obtain inspection approval from KGSC before selling or using the products, and are required to carry insurance to cover damages to life, body, or property resulting from hydrogen-related accidents.

Hydrogen Safety Management Roadmap 2.0

- In line with the government's shift toward clean hydrogen, there is a need to develop safety standards for new technologies, products, and facilities in this sector. On 9 May 2023, the government announced Hydrogen Safety Management Roadmap 2.0, which focuses on clean hydrogen. The roadmap includes plans to establish safety standards for clean hydrogen production facilities, as well as for the production, distribution, utilisation, and storage of liquefied hydrogen and ammonia.

11. Are there any foreign investment restrictions related to energy and infrastructure sectors?

The Foreign Investment Promotion Act and the Rules on Foreign Investments prohibits/restricts foreign investment in the following categories of business:

Business	Foreign Investment Restriction
Nuclear power generation	Fully restricted
Water power generation	The aggregate domestic power generation facilities acquired by foreigners from KEPCO must be less than 30% of the aggregate domestic power generation facilities (only applicable with respect to purchase of facilities from KEPCO)
Thermo power generation	
Solar power generation	
Wind power generation	
Other power generation	
Electricity transmission and supply	Foreign investment ratio must be less than 50% and foreign investors shall not hold more voting rights than the largest domestic shareholder
Sale of electricity	(Sale of electricity is only applicable to electricity sales businesses, as defined under the Electricity Business Act.)

12. What international treaties are in place that may offer protection to international investors in hydrogen projects in the jurisdiction?

The United Nations Conference on Trade and Development (UNCTAD) website states that South Korea is a signatory to 106 bilateral investment treaties (BITs) that are in force as at 3 May 2025, and certain other treaties also contain protections for investors in South Korea. These can be accessed from **UNCTAD's Investment Policy Hub**.

Korea is currently only an observer and not an official member of the Energy Charter Treaty. Therefore, the protection of international investors follow international recommendations and consensuses including from the OECD, UNCTAD, and WTO.

The Master Plan states various international treaties sought by the Korean government including:

- overseas blue hydrogen storage treaties;
- Korea to take the initiative in establishing a global hydrogen association, with members of which Korea shall seek to enter into or amend existing FTA to introduce a new chapter on hydrogen; and
- mutual recognition agreement with regard to clean hydrogen certification by preparing joint evaluation standards with respect to the quantity of greenhouse emissions from production to release.

Market developments and opportunities

13. Are there any government grants or other government funding available to hydrogen projects (including for research and development)?

Article 10 of the Hydrogen Act provides that the government may support hydrogen-specialised enterprises by providing subsidies or loans for:

- expenses incurred in technology development and training of experts necessary to innovate safe, economically friendly, and eco-friendly hydrogen businesses;
- expenses for international cooperation and technology exchanges with foreign countries; and
- expenses for the commercialisation of developed technology, the securement of market, or the filing of applications for intellectual property rights.

In the beginning of 2023, the MOTIE announced that it had earmarked KRW 205.9 billion of funding for the development of technologies for electrolysis, fuel cells and low-carbon power generation. This includes an ammonia co-firing demonstration project to run from 2023 until 2027.

As of May 2024, the Ministry of Environment announced that subsidies of up to KRW 8.2 billion have been allocated to hydrogen refuelling stations in order to support fuel purchase costs, encourage participation in the hydrogen industry and improve operating conditions. This is part of an ongoing subsidies programme in which support through funding is provided twice a year to private operators.

The Ministry of Science and ICT previously announced a six-year plan (2021–2026) to invest a total of KRW 33.3 billion in the development of new technologies for clean hydrogen production and storage through the Future Hydrogen Source Technology Project. On 23 January 2025, it also announced plans to invest approximately KRW 37.7 billion from 2024 to 2027 under the Green Hydrogen Technology Independence Project, aimed at achieving a self-reliant hydrogen economy through the localisation of green hydrogen production technology. Further, on 24 April 2025, the ministry selected 27 new projects under its Climate and Environment R&D Programme, committing KRW 23.37 billion to support the advancement of key technologies in water electrolysis and CCU.

Further, in September 2021, 17 key players participating in the hydrogen value chain voluntarily established the Korea H2 Business Summit, and announced in July 2022 the establishment of their first KRW 500 billion hydrogen fund, which will start investing in early 2023 to solidify the foundations for CCUS and the development of core hydrogen technology. The Korean government has committed to grant certain financial support (e.g. lower interest rates and expansion of loans) to the invested companies and support the fund's activities, such as deal sourcing, commercialisation of technology, and supporting SME's R&D.

14. Are there any notable pilot/demonstration projects in place or planned for the production or offtake of clean hydrogen?

The Master Plan includes various clean hydrogen production projects such as:

- **Green hydrogen production**: In Jeju Island, a 3.3MW water electrolysis-based green hydrogen production facility that utilises surplus wind power has completed its demonstration phase and has commenced commercial operations. As of May 2025, the facility produces approximately 29 tons of hydrogen annually.
- **H2 STAR Project**: Led by the Korean government, a project is underway to establish a global clean hydrogen supply chain through a consortium of companies across the entire value chain—from overseas clean hydrogen production to transportation, storage, and utilisation. The proposal for this project in the Master Plan states the potential counterparty country (e.g., Australia, Saudi Arabia, UAE, Chile, Oman), the subject substance (e.g., green/blue ammonia), and usage (e.g., vehicles, ammonia co-firing in power generation). The name of the project, 'STAR' stands for supply, transportation, application and relationship.
- **Establishment of an international hydrogen exchange**: According to the Master Plan, the hydrogen exchange was anticipated for launch in 2023 to set a standard hydrogen price. As of March 2025, the exchange has not yet been launched, however legislative efforts to establish it are ongoing in the National Assembly.
- **Clean hydrogen auctions**: South Korea has held the world's first hydrogen power bidding market (the General Hydrogen Market) was held in South Korea in late 2023, with tender rounds held in June 2023 and October 2023. These tenders opened without any constraints on emission intensities, but tenders for 3,000 to 3,500 GWh of 'clean hydrogen' (annually since 2023. In 2024, the first-ever auction for the Clean Hydrogen Market) are planned for 2024 (with delivery in 2027) was conducted, awarding one power plant with an annual capacity of 750 GWh. The 2025 bid notices for both the General and Clean Hydrogen Markets are expected to be announced in May 2025.

15. Are there any commercial-scale clean hydrogen production projects in development or already operating?

The Master Plan contains various commercialisation plans in relation to clean hydrogen production. Some examples are:

- **Mass substantiation**: Commercialisation of gigawatt-level water electrolysis facilities through mass substantiation for green hydrogen production in order to create an early market for hydrogen utilising renewable energy complexes in Jeju, Jeonbuk, and Jeonnam provinces. In September 2022, MOTIE and Jeju Province announced the country's largest green hydrogen production substantiation project of 12.5MW in scale located on Jeju Island, which will be able to produce 1,176 tons per year at a 60% rate of operation, to supply hydrogen to 200 garbage trucks and 300 intra-/inter-city buses on Jeju island. The project aims to establish an early green hydrogen ecosystem by 2025, develop production hubs and refuelling stations by 2030, and position Jeju as Korea's green hydrogen hub by 2050. As part of this initiative, Jeju commenced commercial sales of green hydrogen on 1 November 2024.
- Maritime green hydrogen: Commercialisation of stationary and floating hydrogen production plants utilising maritime-based renewable energy (wave power and wind power) by 2036 and maritime-bio linked plants by 2028.

The Chungju Bio Green Hydrogen Station, Korea's first commercial green hydrogen station, began operations in March 2022. It serves as a mother station, refueling hydrogen vehicles and supplying hydrogen to nearby stations. The station produces up to 500 kg of green hydrogen per day using biogas extracted from food waste.

Other ongoing commercialisation projects in relation to hydrogen production include:

- Lotte Chemical installed CCU equipment which applies gas separation membrane in its facility , which is currently under operation and is being plans for commercialisation of this technology.
- Doosan Heavy Industries & Construction is planning to construct the Changwon Hydrogen Liquefaction Plant, an equipment which produces blue hydrogen by liquefying captured carbon dioxide using CCUS technology, by 2023.

- Biox is producing 20 litres of hydrogen per day by HAAMA system which utilises food waste, and is also testing an integrated process that simultaneously manages green hydrogen production and waste fluid.
- Korea Southern Power is pursuing the commercialisation of ammonia co-firing technology at its coal-fired power plant in Samcheok, Gangwon Province. Samsung C&T has been awarded the contract to construct a 30,000-ton liquefied ammonia storage tank and related infrastructure for 20% ammonia co-firing, with completion targeted for July 2027.

16. Have there been any hydrogen-related disputes in your jurisdiction?

The Korean Government implemented an energy technology development project from 2015 to 2019 to produce and utilise green hydrogen through water electrolysis, using renewable energy. As part of the project, facilities were installed in an industrial complex in Gangneung, where a hydrogen tank explosion occurred on 23 May 2019. The incident caused damage to nearby businesses, which resulted in a damages lawsuit being filed against the Korea Institute of Energy Technology Evaluation and Planning (KETEP) and KGSC. On 27 February 2025, the Supreme Court affirmed the lower court's ruling and determined that both institutions were liable for failing to fulfil their safety inspection duties and found that the institutions acted with negligence in preventing the accident.

Last updated June 2025

Spain

Policy and regulation

1. Is there a government hydrogen strategy or policy?

Yes, the Council of Ministers approved the **Spanish Hydrogen Roadmap** (*Hoja de Ruta del Hidrógeno*) on 6 October 2020.

On 14 December 2021, the Council of Ministers approved the Strategic Project for the Recovery and Economic Transformation on Renewable Energies, Renewable Hydrogen and Storage (*Proyecto Estratégico para la Recuperación y Transformación Económica (PERTE) de Energías Renovables, Hidrógeno Renovable y Almacenamiento*) which foresees a public budget of €1,555 million for the development of renewable hydrogen.

2. What are the key goals and commitments included in the strategy/policy?

The Hydrogen Roadmap aims to develop 4GW of electrolyzing capacity by 2030 and intends to qualify Spain as a technological benchmark in the production and use of renewable hydrogen, as well as the creation of innovative hydrogen value chains to contribute to the following objectives:

- Reducing local pollutant emissions and greenhouse gases generated during the production cycle.
- Taking advantage of the surplus of renewable energy generated during off-peak electricity consumption hours, by allowing manageability and continuity of the production cycle from renewable energy sources through energy storage.
- Extending decarbonisation and renewable energy consumption to such sectors where electrification is not feasible or cost-effective.

In June 2023, the Spanish Government initiated the process of updating the Integrated National Energy and Climate Plan (*Plan Nacional Integrado de Energía y Clima*) for the period 2023-2030 which serves as the primary programmatic tool outlining the energy initiatives to be undertaken by the Spanish Government. With regards to hydrogen, the revised Integrated National Energy and Climate Plan (2023-2030), which was approved by Royal Decree 986/2024, of 24 September, envisions an increase in electrolysis capacity for producing green hydrogen, with a target of 12 GW by 2030.

3. Which industry sectors are most likely to be affected by hydrogen deployment?

- Refining, chemical and metallurgical industries
- Gas and power sectors, including energy storage
- Mobility sector (road, maritime, railway and/or aviation transportation)
- Residential sector

4. Who are the main regulators for the hydrogen market?

There is a regulatory gap on specific provisions applicable to green hydrogen production facilities. Indeed, the existing legal framework considers hydrogen production as an industrial activity (chemical industry for the production of inorganic gas). Despite the foregoing, rulemaking and oversight competences in Spain belong to the following State, regional and local bodies:

- Mainly, the Ministry for the Ecological Transition and Demographic Challenge (MITERD) (in particular, Subdirectorate General for Hydrocarbons and New Fuels).
- The Ministry of Industry and Tourism.
- The National Markets and Competition Commission (CNMC).
- The Department of Energy/Industry in each relevant autonomous region.
- The Department of the Environment in each relevant autonomous region.
- Local authorities.

5. Does the government hydrogen strategy or policy support the development of both low-carbon (blue) hydrogen and renewable (green) hydrogen?

No, both the Hydrogen Roadmap and **the Strategic Project for the Recovery and Economic Transformation on Renewable Energies, Renewable Hydrogen and Storage** are only intended for the development of green hydrogen.

6. If the government hydrogen strategy or policy supports the development of low-carbon hydrogen, to what extent is carbon capture and storage being taken forward?

N/A.

7. Are there targets for the production of hydrogen?

The target set out in the Hydrogen Roadmap is to achieve 4GW of electrolyzing capacity by 2030. However, as mentioned above, according to the updated the Integrated National Energy and Climate Plan for the period of 2023-2030, electrolysis capacity target for 2030 has been increased from 4 GW to 12 GW.

8. Are there any incentive mechanisms/business models in place to support the production of hydrogen?

Currently there are no incentive mechanisms in place to support the production of green hydrogen other than certain government grants or funding to specific projects. Also, the Hydrogen Roadmap states that taxation should provide incentives for renewable hydrogen as opposed to hydrogen whose origin is not traceable, but no further actions have been carried out yet in this regard.

9. Are there any standards in place for the classification and/or certification of low-carbon or renewable hydrogen?

Yes, Royal Decree 376/2022, of 17 May, on the sustainability and reduction of greenhouse gases emissions' criteria for biofuels, bioliquids and biomass fuels as well as on the system of guarantees of origin of renewable gases (*Real Decreto 376/2022, de 17 de mayo, por el que se regulan los criterios de sostenibilidad y de reducción de las emisiones de gases de efecto invernadero de los biocarburantes, biolíquidos y combustibles de biomasa, así como el sistema de garantías de origen de los gases renovables*), which partially transposes Directive 2018/2001 on the promotion of the use of energy from renewable energy sources and provides for the implementation of a guarantees of origin scheme for gases obtained from renewable sources (e.g., biogas, biomethane or renewable hydrogen, etc.).

Additionally, Royal Decree 376/2022, of 17 May has been further developed by Order TED/1026/2022, of 28 October, on the supervision and auditing scheme for the abovementioned guarantees of origin.

10. Does the regulatory framework clearly define the regulatory requirements relating to the production, storage, transportation or supply of hydrogen?

There is no specific permitting regulation applicable to green hydrogen production facilities. The existing general regulatory framework considers the hydrogen production as a chemical industry consisting of the production of inorganic gas and hence it is subject to strict environmental requirements.

A specific regulatory framework for the injection of renewable gases was approved in August 2022 and foresees two different forms of supply: (i) by direct injection into the natural gas transmission and distribution grids; and (ii) by direct piping to a gas consumption facility.

More recently, on 9 April 2025, the CNMC issued Circular 2/2025, which establishes the methodology and conditions governing access to and allocation of capacity within the natural gas system (Circular 2/2025). Circular 2/2025 applies to all types of gases that may be injected into the natural gas grid, defined as "other gases", which include hydrogen as a separate subgroup as it requires blending in order to be injected. For these gases, injection capacity will be allocated annually via a competitive process, which is to be detailed in a forthcoming CNMC resolution, based on the principles set out in Article 14.5 of Circular 2/2025.

Additionally, Circular 2/2025 introduces two significant changes for hydrogen injection. First, available capacity is deemed as conditional, i.e., its use may be restricted depending on factors such as gas flow characteristics, quality specifications, demand in the connected grid or upstream flow limitations. Second, it allows for indefinite-duration access contracts which will remain valid until reassigned, modified or cancelled. To secure access rights, a formal request must be submitted prior to the facility's commissioning date; otherwise, the capacity will be considered relinquished and made available to other interested parties. Multiple users may share access, provided that the cumulative capacity does not exceed the limit under the relevant connection contract.

Finally, Circular 2/2025 details the following key issues to be included in connection contracts for hydrogen facilities injecting into the grid, among others: parties' identification, the specific connection point, allocated capacity (in kWh/d), connection costs and construction timelines, technical limitations, economic compensation (e.g. in case of subsidies), and termination provisions. The CNMC is also empowered to approve a standard form of contract for such connections, which may not be transferred or applied to any facility other than the one originally specified. These agreements must be entered into between the hydrogen plant developer and the owner of the corresponding grid infrastructure.

11. Are there any foreign investment restrictions related to energy and infrastructure sectors?

Yes, a new foreign direct investment (FDI) control was implemented in the context of the COVID crisis and is still in force, in accordance to which acquisition transactions in which the Investor (as defined below) (i) acquires a stake of ten per cent or more of the share capital; or (ii) as a result thereof, effectively takes part in the management of or control a Spanish company, are subject to an administrative authorisation if carried out[102]:

- in certain strategic sectors (objective restriction), including, among others, supply of fundamental inputs (e.g. energy, raw materials), with certain specific exceptions for energy sector; or
- where the Investor is considered to be a "risky" person (subjective restriction), including: (i) Investors directly or indirectly controlled by the government of a third country; (ii) foreign Investors that have invested or participated in sectors affecting security, public order and public health in another Member State; and (iii) if there is a serious risk that the foreign Investor carries out criminal or illegal activities affecting public security, public order or public health in Spain.

For the purposes of FDI Control, **Investor** means:

- residents of non-EU or EFTA countries;
- residents of EU or EFTA countries whose real ownership corresponds to residents of non-EU or EFTA countries, or
- residents of other EU/EFTA countries may qualify (on a transitory basis until 31 December 2026) as foreign Investors if the investment is made in (i) companies listed in Spain; and (ii) unlisted companies if the value of the investment exceeds 500 million euros and, in both cases, if carried out in strategic sectors. This extension until 31 December 2026 was passed on January 2025.

12. What international treaties are in place that may offer protection to international investors in hydrogen projects in the jurisdiction?

The United Nations Conference on Trade and Development (**UNCTAD**) website states that Spain is a signatory to 70 bilateral investment treaties (**BITs**) that are in force, and certain other treaties may contain other investment provisions.

The Energy Charter Treaty (ECT) is a multilateral investment treaty which entered into force in April 1998 and specifically addresses energy trade, transit and investment between its contracting parties, which include all EU states (except Italy). Discussions as to the modernisation of the ECT have been ongoing for several years focussing, in particular, on investment protection and "greening" the ECT.

These discussions have focused on reducing the protections afforded to fossil fuels and explicitly protecting emissions reduction technologies (including hydrogen). This should be kept under review. There are differing views as to whether hydrogen production would be afforded protection under the current terms of the ECT, and to our knowledge the question has not been considered by an arbitral tribunal.

Market developments and opportunities

13. Are there any government grants or other government funding available to hydrogen projects (including for research and development)?

Yes, in February 2022, the Spanish Government launched:

- four calls for incentive programmes for the green hydrogen innovative value chain amounting to a total of €250 million. The funding will be allocated (i) for large electrolysers (€100 million); (ii) vehicles demonstration and validation (€80 million); (iii) industrial and experimental research (€40 million); and (iv) capacity building and technological advances in test and manufacturing lines (€30 million).
- a call for public grants amounting to a total of €50 million for pioneering renewable hydrogen projects, with commercial viability, for local production and consumption in sectors that are difficult to decarbonise, such as industry and heavy transport.

In addition, the Spanish Government approved on 18 May 2023 a call for public grant amounting to a total of €150 million for pioneering and unique renewable hydrogen projects (second round of "H2 PIONEERS" programme) in the framework of the EU-funded Recovery, Transformation and Resilience Plan (specifically PERTE ERHA programme). IDAE, entity affiliated with the MITERD has also granted on 26 January 2023 a direct allocation of subsidies amounting to €74 million to Spanish projects participating in the Important Project of Common European Interest in hydrogen technology (the so-called PIICE Hy2Tech). Furthermore, on 6 February 2024 the Spanish Government announced its intention to grant €900 million to 10 major projects participating in the Important Project of Common European Interest (PIICE) for the production, transport and development of renewable hydrogen technologies.

102 The applicable regulations in force are (i) Law 19/2003, of July 4, on the legal regime governing capital movements and foreign economic transactions; and (ii) Royal Decree 571/2023, of July 4, on foreign investments.

Moreover, on 31 July 2024 the IDAE launched the First call for proposals for the Incentive Program for Renewable Hydrogen Production and Consumption Projects (CLUSTERS OR VALLEYS) within the framework of the Recovery, Transformation, and Resilience Plan—Funded by the European Unions NextGenerationEU, amounting to a total of €1.200 million.

Finally, the IDAE approved on 30 January 2025 a direct award of €149 million in grants to Spanish projects for their participation in the PIICE on hydrogen in mobility and transport, under component 9 of the Recovery, Transformation and Resilience Plan (*Plan de Recuperación, Transformación y Resiliencia*).

Certain regional governments have also launched additional grants.

14. Are there any notable pilot/demonstration projects in place or planned for the production or offtake of clean hydrogen?

Different pilot projects have been deployed to examine and test the feasibility of green hydrogen production and its potential use in different sectors, such as the projects outlined below:

- **The Basque Hydrogen Corridor (BH_2C)** aims at creating a hydrogen ecosystem in the Basque Country, which will enable progress to be made towards decarbonising the energy, industrial, residential and mobility sectors. The project stems from Repsol's strategic decision to invest in the Basque Country to continue advancing in the energy transition with a view to achieving its goal of becoming a net-zero emissions company by 2050.
- **The Hydrogen Valley of Catalonia** which emerged as the region's response to the strategy launched by the European Commission in 2020. So far two projects are been developed in the context of this program: (i) Project VAL2H2 is a project for the development of technologies for the generation of renewable hydrogen from waste that is difficult to manage; and (ii) Project T-HYNET aims to develop an electrolyser with a capacity of 150 MW in its first phase, scheduled for commissioning in 2026, and then increase the renewable hydrogen production capacity to 1 GW in a second phase starting in 2027.
- **H2Ports** is a pilot project located in the Port of Valencia that develops the transformation to green hydrogen of a reach stacker and a yard tractor in real operating conditions. The project includes the development of green hydrogen generation facilities at 350 bars, as well as the study and development of the green hydrogen supply logistics in the Port of Valencia.
- **Andalusian Green Hydrogen Valley** is a project from Cepsa, which envisages the construction of two green hydrogen production facilities that will produce up to 300,000 tonnes of green hydrogen a year. The Huelva plant will be located at Cepsa's La Rábida Energy Park in Palos de la Frontera, and will start up in 2026, reaching full capacity in 2028. The Campo de Gibraltar Plant will be installed at the San Roque Energy Park and will be operational in 2027.
- **Green Hydrogen Valley in Aragón** consists of two projects, the Catalina Project, which will be located in Teruel, Aragón, and is planned to be operational in 2029, and the Pilar Project in Caspe. Together they aim to produce more than 80,000 tonnes of green hydrogen in that region.
- **Arteixo H2V**, a project promoted by Accionaplug, S.L., which will be developed in the economic activity park (Acteca) in Morás, and is expected to produce 3000 tonnes of green hydrogen a year.
- **Iberdrola's hydrogen Project**, which includes two hydrogen plants across Spain, one in Palos de la Frontera (Huelva) that aims to produce over 62,000 tonnes/year of green hydrogen, and one in Castellón, which is expected to be operational in the second half of 2026, and will produce an estimated 2,800 tonnes of green hydrogen per year.
- **Green Hydrogen Valley Platform of the Region of Murcia**. This project intends to develop the production of green hydrogen in the Escombreras Valley (Murcia). Iberdrola's hydrogen project at Palos de la Frontera (Huelva) that aims to produce over 62.000 tonnes/year of green hydrogen.

15. Are there any commercial-scale clean hydrogen production projects in development or already operating?

There are a number of projects in the pipeline, at different stages of development, including:

- **Lloseta industrial green hydrogen production plant**, comprised within the "Power to Green Hydrogen Mallorca", which is powered by photovoltaic sources. The project entered into operation in March 2022 and envisages to produce at least 300 tonnes/year of green hydrogen.
- **Iberdrola's hydrogen project at Puertollano (Ciudad Real)**, which aims to be one of the largest green hydrogen plants in Europe. It is expected to start operations in 2022 with a capacity of 20 MW and the green hydrogen produced will be used in a nearby Fertiberia's factory.
- **Iberdrola´s hydrogen project in Barcelona**, which is the first hydrogen plant for public use in Spain, currently supplying 8 metropolitan buses of the company TMB.
- **The Tarragona hydrogen network (T-Hynet)**, a hydrogen production plant using water electrolysis, scheduled to be operational by the end of 2027, with a production of 22,727 tonnes per year for commercial purposes.
- **Green H2 plant in Garray (Soria)**. The project consists of the construction of a 3 MW green hydrogen production plant, which is expected to start operating in 2025.
- **HY Bizkaia E-fuels and mobility at the Basque Hydrogen Corridor**, which is a production plant under construction, with a capacity of 10 MW. The hydrogen will supply a synthetic fuel production plant in the port of Bilbao.
- **Hydrogen Cluster of the Valencian Community (HyVal) at BP's Castellón refinery**. This public-private partnership aims to develop up to 2 GW of electrolysis capacity by 2030 to produce green hydrogen. HyVal's mission is to significantly contribute to the decarbonization of bp refinery operations in Castellón with bp planning to invest €2 billion. Its main activities include the production and use of green hydrogen intended to replace the grey hydrogen currently used at bp's refinery. Additionally, renewable hydrogen will be used as a raw material for producing biofuels, particularly sustainable aviation fuel (SAF). Biofuel production is expected to triple, reaching 650,000 tons per year by 2030. The first phase of the project—installation of a 200 MW electrolysis plant—will be operational in 2027.
- **La Robla (León)**. Project aimed at developing a clean hydrogen initiative to install an electrolyser with an initial capacity of 60 MW, and eventually extending it to 280 MW.
- **'HyDeal España'**. Consortium involving ArcelorMittal, Enagás and Grupo Fertiberia. The project aims to start delivering green hydrogen in 2028 through electrolysers with a capacity of 3.3 GW.

16. Have there been any hydrogen-related disputes in your jurisdiction?

We are not aware of any hydrogen-related disputes in our jurisdiction.

Last updated April 2025

Sweden

Ashurst collaborated with **Schjødt** in the preparation of this content. We are grateful for their input.

Policy and regulation

1. Is there a government hydrogen strategy or policy?

There is currently no government hydrogen strategy or policy. The Swedish Government has appointed the Swedish Energy Agency to act as coordinator for the national agencies on their activities in the hydrogen field. On 26 March 2024, the agency presented a first report and proposed activities to be handled by national agencies. The previously presented strategy for hydrogen has not been adopted.

As of date of this guidance note, there is a legislative proposal on referral from the Swedish Environmental Protection Agency, which suggests including small hydrogen installations in the EU ETS emissions trading system (Dnr. KN2025/00812).

2. What are the key goals and commitments included in the strategy/policy?

There are no set key goals or commitments.

3. Which industry sectors are most likely to be affected by hydrogen deployment?

The industry sectors most likely to be affected by hydrogen deployment are:

- the steel industry;
- heavy road freight;
- refineries and chemical industries; and
- fertilisers.

The power sector in Sweden is already largely based on clean energy (namely hydropower (35-45%), wind (18-20%) and nuclear (30%)) and Swedish households mainly rely on electricity because Sweden lacks a gas distribution network. Therefore, as the power and the heating sectors are already decarbonised, they will most likely not be affected by hydrogen deployment.

4. Who are the main regulators for the hydrogen market?

Sweden has not appointed an authority to be responsible for the hydrogen gas market. The Swedish Energy Agency (Energimyndigheten), the authority that drafted the proposal for a national strategy on hydrogen, is responsible for supervising traditional gas companies and their compliance with different regulations such as the new EU regulation concerning measures to safeguard the security of gas supply and access to natural gas transmission networks. As such, the hydrogen market would likely come under their jurisdiction at present.

5. Does the government hydrogen strategy or policy support the development of both low-carbon (blue) hydrogen and renewable (green) hydrogen?

The proposed strategy focuses on renewable (green) hydrogen produced by electrolysis. However, as the proposed strategy has not been adopted, it is not clear whether both blue and green hydrogen will be supported.

6. If the government hydrogen strategy or policy supports the development of low-carbon hydrogen, to what extent is carbon capture and storage being taken forward?

The proposed strategy does not currently include carbon capture.

7. Are there targets for the production of hydrogen?

The proposed strategy includes the following targets:

- 5GW of hydrogen capacity by 2030; and
- 15GW of hydrogen capacity by 2045.

8. Are there any incentive mechanisms/business models in place to support the production of hydrogen?

There are currently no direct incentive mechanisms in place other than negative incentives in the form of energy and CO2 taxes. However, there are a number of initiatives related to government funding.

Further, the research institute of Sweden is taking an active role in supporting the development of a sustainable society by providing active support to a large number of industry and research projects.

9. Are there any standards in place for the classification and/or certification of low-carbon or renewable hydrogen?

There are no existing national standards in place for the classification of hydrogen. However, as a member state of the European Union, Sweden relies on the EU classifications as outlined in the EU hydrogen policy.

10. Does the regulatory framework clearly define the regulatory requirements relating to the production, storage, transportation or supply of hydrogen?

As Sweden has no legacy of gas use for household heating, there are currently no relevant regulations. The proposed strategy identifies that there is a need for a new regulatory framework regulating inter alia production, distribution, and storage of hydrogen.

11.Are there any foreign investment restrictions related to energy and infrastructure sectors?

The European Union framework for the screening of foreign direct investments into the European Union and the new regulatory framework came into force in Sweden on 1 December 2023.

12. What international treaties are in place that may offer protection to international investors in hydrogen projects in the jurisdiction?

The Electronic Database of Investment Treaties (EDIT) website states that Sweden is a signatory to 79 bilateral investment treaties (BITs) that are in force. As Sweden is a member state of the European Union, there are also certain other treaties entered into by the European Union which contain protections for investors in Sweden.

The Energy Charter Treaty (ECT) is a multilateral investment treaty which entered into force in April 1998 and specifically addresses energy trade, transit and investment between its contracting parties, which include Sweden and all other EU states (except Italy). Discussions as to the modernisation of the ECT have been ongoing for several years focusing, in particular, on investment protection and “greening” the ECT.

Market developments and opportunities

13. Are there any government grants or other government funding available to hydrogen projects (including for research and development)?

There are currently a number of national and EU support mechanisms which provide financing for hydrogen-related projects. This includes the following:

- **Klimatklivet (the Climate Leap)** - an initiative by the Swedish Environmental Protection Agency which is actively promoting a number of hydrogen projects and has set aside BSEK 6.5 for clean energy projects during 2025;
- Industriklivet (the Industry Leap) - an initiative by the Swedish Energy Agency which provides support for feasibility studies, research, pilot projects, demonstration projects and investment projects which aim to reduce industrial emissions and has set aside BSEK 2.2 for projects during 2025; and
- Swedish Agency for Economic and Regional Growth provides subsidies, loans and guarantees to SMEs.

14. Are there any notable pilot/demonstration projects in place or planned for the production or offtake of clean hydrogen?

There are a number of different pilot projects being deployed in Sweden to examine and test the feasibility of clean hydrogen production and the use of hydrogen in different sectors. The main projects are within the steel industry and include the following:

- Metacon AB has announced that they are planning to build a Gigafactory for production of electrolysers in Sweden.

- **Hybrit pilot project** – is a pilot project for the production of green steel and the storage of hydrogen in Luleå in northern Sweden.
- **Ovako** – a new hydrogen plant in Hofors, which is expected to be completed by the end of 2022, which will heat steel with hydrogen prior to rolling and is expected to generate 3,500 cubic meters of green hydrogen per hour.

15. Are there any commercial-scale clean hydrogen production projects in development or already operating?

There are currently no existing commercial-scale clean hydrogen production projects in Sweden, but there are a number of projects in the pipeline, at different stages of development, including the following:

- **Hybrit Development** – a pilot project by SSAB, LKAB and Vattenfall which substitutes coal for hydrogen in the steel making process;
- **H2 Green Steel** – a pilot project which will produce green steel using hydrogen produced from wind and hydropower;
- **Spanish Grupo Fertiberia and Swedish Cinis Fertilizer** – are investing in two production plants in northern Sweden for the production of commercial fertilizers;
- **OKG** - a Swedish nuclear plant operator, is intending on producing and selling hydrogen;
- **BotnialänkenH2** - a project run by Uniper, ABB and the Port of Luleå which plans to establish a regional hydrogen hub in Luleå where hydrogen is produced from wind power, and where the hydrogen can both be used in the regional process industry or converted into fuel;
- **Volvo Group and Daimler Trucks** – are forming a joint venture for the development of fuel cells for their fuel cell electric vehicle trucks; and
- **Hydrogen Refueling Stations** – there are currently six hydrogen refueling stations in Sweden but this is expected to increase to 50 by 2025 as Hydri AB has announced that it will build 24 hydrogen refueling stations before the end of 2025 and a number of other projects are underway.

16. Have there been any hydrogen-related disputes in your jurisdiction?

To our knowledge, there have not been any hydrogen-related disputes in Sweden.

Thailand

Ashurst collaborated with **Chandler Mori Hamada Limited** in the preparation of this content. We are grateful for their input.

Policy and regulation

1. Is there a government hydrogen strategy or policy?

Yes, hydrogen is recognized and included in the Draft Thailand Power Development Plan 2024-2037 (Draft PDP 2024). This will serve as the master plan for the country's long-term electricity generation to ensure the security and sufficiency of its power generation capacity. The Draft PDP 2024 covers national energy policies and various factors including economic, social, and environmental aspects. Thailand Power Development Plans are periodically reviewed every 1-2 years to reflect any changes from the initial assumptions so that a new or revised version can be drafted. However, as this plan has not yet been approved by the National Energy Policy Council, chaired by the Prime Minister, the plan still currently in use is the Power Development Plan 2018, revised version 1 (PDP 2018 Rev.1), which covers the period between 2018-2037.

However, there is no hydrogen-specific legislation or regulatory framework that supports commercialisation of hydrogen production and utilisation as an energy source. Under the current regulatory framework, hydrogen is recognised as an alternative transport fuel, but current activities relating to hydrogen production in Thailand are not considered energy production under the Energy Industry Act or the Petroleum Act BE 2514 (1971).

In addition to the Draft PDP 2024, the Energy Research and Development Institute-Nakornping, Chiang Mai University, in collaboration with the Energy Research Institute at Chulalongkorn University, launched the Draft Plan for the Development of Commercial Hydrogen Production and Utilization for Thailand, 2022-2050 (Draft Hydrogen Plan 2022-2050) in August 2024. This initiative, supported by the Energy Policy and Planning Office of the Ministry of Energy, Thailand, aims to foster the use of hydrogen as a new, clean energy source.

In parallel, the Action Plan for Renewable and Alternative Energy 2024 – 2037 (AEDP 2024) serves as a more immediate and actionable roadmap for promoting the deployment of renewable and alternative energy sources, including hydrogen. Its purpose in brief is to set specific targets and outline concrete measures to increase the share of these cleaner energy sources in Thailand's overall energy mix.

2. What are the key goals and commitments included in the strategy/policy?

The primary goal within the Draft PDP 2024 related to hydrogen is the integration of a 5% hydrogen blend with natural gas for power generation by the year 2030. This translates to a target of approximately 45 million cubic feet of hydrogen per day being utilized in the power sector.

The AEDP 2024 sets a specific target for the commercial deployment of hydrogen, aiming for a production equivalent of 4,000 ktoe (kilo tons of oil equivalent) by the year 2030.

The Draft Hydrogen Plan 2022-2050 outlines a three-phase approach for developing the commercial hydrogen sector:

- Short-term (2022-2030 – Preparation: Focus on market development and creating incentives and regulatory framework for users in power plants, industries, and vehicles through financial and investment support. Development of a pricing mechanism to reflect GHG emissions criteria.
- Medium-term (2031-2040) – Early-stage commercialisation: Initiate the development of a commercially sustainable user market for hydrogen.
- Long-term (2041-2050) – Full-scale commercialisation: Support the sustained growth and maturity of the hydrogen market in Thailand.

3. Which industry sectors are most likely to be affected by hydrogen deployment?

Based on current developments, the following industry sectors in Thailand are most likely to be affected by hydrogen deployment:

- Power Generation: Hydrogen will be blended with natural gas for electricity production, with a target of 5% hydrogen by 2030 in the Draft PDP 2024.
- Industrial Sector: Hydrogen can be utilized as a fuel for thermal applications, potentially replacing LPG and fuel oil, especially in areas near natural gas pipelines. It can also serve as a feedstock for industries like petrochemicals and in the production of green ammonia.

- Transportation: The transportation sector is a significant focus, with plans to promote the use of hydrogen in fuel cell electric vehicles (FCEVs), particularly for heavy-duty vehicles such as buses and trucks. This may also be expanded to light-duty vehicles and intercity trains in the future.
- Aviation: The production of sustainable aviation fuel (SAF) using hydrogen is being explored by the International Hydrogen Ramp-Up Programme (H2Uppp), the Civil Aviation Authority of Thailand (CAAT) and companies in the energy and aviation industries as a way to decarbonize the aviation industry.

4. Who are the main regulators for the hydrogen market?

The Ministry of Energy (MOE) serves as the overarching authority, responsible for setting national energy policies and long-term strategic plans, including those related to emerging technologies like hydrogen. Under the MOE, the Energy Regulatory Commission (ERC) regulates all energy industries while the Energy Policy and Planning Office (EPPO) plays a pivotal role in planning and shaping regulations and managing funds for energy initiatives—ranging from traditional oil conservation to renewable energy projects (e.g., solar, waste-to-energy, and now hydrogen). According to the Energy Development and Promotion Act B.E. 2535 (1992) (as amended), the Department of Alternative Energy Development and Efficiency (DEDE) is authorized to establish regulations and standards involving the production, processing, transmission, use, and conservation of energy. As the definition of "energy" under this act includes both renewable and non-renewable sources, which are origins of various types of hydrogen, the DEDE, as a department within the MOE, is likely to be the primary agency overseeing hydrogen.

As grey hydrogen is sometimes produced as a byproduct of fossil fuels like natural gas via steam reformation, such grey and blue hydrogen (where the carbon is captured), if produced as part of the petroleum business, may fall under the Petroleum Act B.E. 2514 (1971) (as amended). Consequently, petroleum activities, including exploration, production, storage, transportation, sale, or distribution, are regulated by the DMF.

Other regulators include:

- Ministry of Industry (MIND): The production of hydrogen may be considered a business that produces, distributes, or sells gas (excluding natural gas), classified as factory type 3 (No. 89), requiring a factory license under the Factory Act, B.E. 2535 (1992). Therefore, the MIND would likely be involved in regulating the industrial aspects of hydrogen production facilities.
- Department of Industrial Works (DIW): Hydrogen is classified as a flammable substance in Category 1 under the Hazardous Substance Act B.E. 2535 (1992) (as amended), and if not overseen by a specific regulatory body, it will be regulated by the DIW. According to Section 18 of the Hazardous Substance Act, the production, importation, exportation, or possession of Category 1 hazardous substances does not require registration or approval. However, it must comply with prescribed criteria and procedures, such as transportation and storage standards.
- Thailand Greenhouse Gas Management Organization (TGO): TGO is crucial for setting standards and providing certification related to the carbon footprint of hydrogen production, particularly for low-carbon (blue and green) hydrogen.
- Ministry of Natural Resources and Environment (MNRE): The MNRE oversees the environmental impact of hydrogen production, storage, transportation, and use, including emissions. They play a key role in environmental permitting and regulations related to hydrogen projects.

5. Does the government hydrogen strategy or policy support the development of both low-carbon (blue) hydrogen and renewable (green) hydrogen?

Yes, the Draft Hydrogen Plan 2022-2050 considers the development of both low-carbon (blue) hydrogen and renewable (green) hydrogen. The projected production costs mentioned are approximately US$2.5 per ton for blue hydrogen by 2030 and US$1.65 per ton by 2050, while green hydrogen costs are expected to be around US$3 per ton by 2030 and approximately US$2.3 per ton by 2050.

The development of blue hydrogen is reliant on the carbon capture, storage and utilisation legal framework, which is being developed in connection with the Petroleum Act; while the applicable regulatory frameworks for green hydrogen produced from electrolysis or biomass/biofuels can be found under general legal frameworks on occupational health and safety, manufacturing activities, and environmental protection laws.

6. If the government hydrogen strategy or policy supports the development of low-carbon hydrogen, to what extent is carbon capture and storage being taken forward?

Carbon Capture Utilization and Storage (CCUS) is recognized as a key technology for Thailand to achieve its carbon neutrality target by 2050 and net-zero emissions by 2065. This is highlighted in the National Energy Policy (NEP2022) and Thailand's Long-term Low Greenhouse Gas Emission Development strategy (LT-LEDs).

Furthermore, the Draft PDP 2024's inclusion of hydrogen blending with natural gas necessitates the implementation of Carbon Capture and Storage (CCS) to classify a portion of this hydrogen as low-carbon or blue hydrogen. Similarly, the Draft Hydrogen Plan 2022-2050, aiming to promote commercial hydrogen production and use, considers carbon certification (hydrogen certificates) as a mechanism to support and standardize low-carbon hydrogen production, particularly for blue and green hydrogen in the long term.

Thailand is already making great strides in exploring and implementing CCS. For example, PTT Exploration and Production Public Company Limited (PTTEP) has initiated Thailand's first pilot CCS project at its Artit gas field in the Gulf of Thailand, demonstrating early efforts in deploying this technology. Moreover, Banpu Public Company Limited has invested in CCUS/CCS projects in the United States. It currently has two main projects, "Barnett Zero", which is operational, and "Cotton Cove", expected to be operational in the first half of 2026, and has recently announced a third project also expected to be operational in early 2026. These international projects would allow knowledge and technology transfer for future projects Banpu may wish to implement in Thailand.

Recognising the importance of a supportive regulatory framework, a draft revision to the Petroleum Act was submitted to the ERC for review last year. This revision aims to specifically address and regulate CCS/CCUS activities within Thailand, paving the way for wider adoption of this critical technology.

7. Are there targets for the production of hydrogen?

The Draft PDP 2024 aims to blend approximately 45 million cubic feet of hydrogen per day in power generation by 2030. Additionally, the AEDP 2024 targets 4,000 ktoe (kilo tons of oil equivalent) of hydrogen production for commercial use by the same year.

8. Are there any incentive mechanisms/business models in place to support the production of hydrogen?

To encourage local demand and develop domestic industries for hydrogen-powered vehicles and green hydrogen production, Thailand's Board of Investment (BOI) has offered special privileges for hydrogen businesses since January 2023. Businesses producing green hydrogen from renewable sources qualify for the highest-tier (A1) incentives, including import duty exemptions on machinery and an 8-year corporate income tax holiday with no limit. Meanwhile, hydrogen production from fossil fuels using carbon capture and storage, as well as hydrogen fuel power plants, are eligible for the slightly lower-tier (A2) incentives, which still include import duty exemptions on machinery and an 8-year corporate income tax holiday, although this is capped based on the investment amount (excluding land and working capital costs).

9. Are there any standards in place for the classification and/or certification of low-carbon or renewable hydrogen?

Yes, for low-carbon hydrogen, the Thailand Greenhouse Gas Management Organization (TGO) can issue Carbon Footprint of Products (CFP) labels, as demonstrated by their certification of Bangkok Industrial Gases Co., Ltd. (BIG)'s hydrogen production showing a 95% carbon emission reduction, equivalent to blue hydrogen. While this system helps hydrogen producers certify their produced hydrogen, Thai laws on generation of electricity do not currently distinguish between grey, blue, or green hydrogen.

For renewable hydrogen, the Electricity Generating Authority of Thailand (EGAT) is the exclusive local issuer of Renewable Energy Certificates (RECs) from The International REC Standard (I-REC) Foundation, which promotes and verifies electricity generation from renewable sources, including green hydrogen production – although no hydrogen power project currently exists.

10. Does the regulatory framework clearly define the regulatory requirements relating to the production, storage, transportation or supply of hydrogen?

Given that the green and blue hydrogen industries are still in their early developmental stage, Thai policymakers are still conducting feasibility studies for these energy sources. Consequently, a specific regulatory framework dedicated to hydrogen has not yet been established. However, even without a comprehensive hydrogen-specific framework, hydrogen activities are expected to fall under the general legal framework. Currently, Thailand's energy licensing regime does not explicitly recognize hydrogen as a distinct energy source. Therefore, existing laws such as the Hazardous Substance Act and the Factory Act should be observed for industrial hydrogen production.

11. Are there any foreign investment restrictions related to energy and infrastructure sectors?

Foreign investment in Thailand's energy and infrastructure sectors is subject to regulations primarily outlined in the Foreign Business Act B.E. 2542 (1999) (FBA). This act categorizes business activities into three lists, each with varying levels of restriction for foreign individuals and entities.

Historically, the energy sector in Thailand has been relatively accessible to foreign investment. However, as of July 2023, the Energy Regulatory Commission (ERC) announced plans to increase the restrictions on foreign ownership of all electricity

companies, including renewable energy firms. The ERC is currently reviewing draft regulations that would cap foreign ownership at 49% and require that half the directors of any energy company be Thai. The current status and implementation of these draft regulations should be monitored.

Certain infrastructure sectors, particularly those related to transportation, also have specific foreign ownership limitations. For instance, at least 50% of the total issued shares of a company engaging in the land transport industry must be held by Thai investors. Additionally, land ownership itself is generally restricted for foreign companies, typically requiring Thai nationals to hold 51% or more of the shares, although exceptions can be granted on a case-by-case basis, especially for projects promoted by the Board of Investment (BOI).

12. What international treaties are in place that may offer protection to international investors in hydrogen projects in the jurisdiction?

While Thailand does not have specific international treaties solely focused on hydrogen projects, Bilateral Investment Treaties (BITs) offer safeguards like fair treatment and protection against expropriation. Notably, the Treaty of Amity with the U.S. provides significant advantages to American investors, granting national treatment in most business sectors.

Additionally, multilateral agreements like the ASEAN Comprehensive Investment Agreement (ACIA) and the Regional Comprehensive Economic Partnership (RCEP) offer certain investment protections to investors from member countries.

Market developments and opportunities

13. Are there any government grants or other government funding available to hydrogen projects (including for research and development)?

While a comprehensive, dedicated, government grant programme specifically for hydrogen projects is still in its early stages, there are emerging avenues for support:

- The Energy Policy and Planning Office (EPPO) has established a working group to develop hydrogen strategies, which could lead to future funding initiatives according to the resolution of the Energy Policy and Planning Committee Meeting No. 4/2567 (No. 68) on 25 September 2024.
- EGAT, a state-owned enterprise, has been actively investing in hydrogen pilot projects and research & development in partnership with the private sector since 2023 as part of its carbon neutral goals. While not direct grants to external entities, this demonstrates government investment in hydrogen advancement.
- International collaborations like the e-ASIA Joint Research Program, involving Thailand's National Research Council (NRCT), offer grants for alternative energy research, including hydrogen, for projects conducted with international partners.

14. Are there any notable pilot/demonstration projects in place or planned for the production or offtake of clean hydrogen?

Yes, several notable pilot and demonstration projects are underway or are planned:

- EGAT's Wind Hydrogen Hybrid System (2016): Operating since 2016 at the Lam Takhong Learning Center, this project stores energy from wind turbines as hydrogen and generates electricity via a fuel cell. EGAT plans to expand this system.
- Feasibility Study on Clean Hydrogen/Ammonia Value Chain (2023): A collaboration between MOL, EGAT, Mitsubishi Company, and Chiyoda Corporation to study the entire value chain derived from renewable energy in southern Thailand.
- EGAT and BIG Hydrogen Blending Demonstration (2024): A collaboration to study hydrogen storage and transportation for blending hydrogen with natural gas in EGAT's power plants.
- EGAT and Chiang Mai University Blue Hydrogen Study (2024): Researching hydrogen production from coal with Carbon Capture, Utilization, and Storage (CCUS) in the Mae Moh area.
- BIG and Ratchaburi Power Plant Green Hydrogen Feasibility Study (2024): Exploring green hydrogen production from a floating solar farm for use as transportation fuel.
- MHI and EGAT Hydrogen Co-firing Pilot (2024): Researching the introduction of hydrogen co-firing technology in EGAT's gas turbine power plants, aiming for a 20% hydrogen blend.

15. Are there any commercial-scale clean hydrogen production projects in development or already operating?

Commercial-scale clean hydrogen production in Thailand is in the early development phase. While BIG has achieved certified low-carbon hydrogen production, large-scale dedicated commercial-scale facilities are not yet widely operational. The government's collaboration for a 25 MW green hydrogen electrolysis project represents a significant step towards commercialization, but its current status requires further monitoring. Large-scale commercial production is generally anticipated to scale up further in the coming decades.

16. Have there been any hydrogen-related disputes in your jurisdiction?

As of now, there are no significant hydrogen-related legal conflicts that have been publicly documented in Thailand.

Last updated April 2025

UAE

Policy and regulation

1. Is there a government hydrogen strategy or policy?

The UAE unveiled its Hydrogen Leadership Roadmap on 31 October 2021. The Hydrogen Leadership Roadmap is part of the "UAE Net Zero by 2050 Strategic Initiative", the first strategic 2050 initiative in line with the 2015 Paris Agreement announced by a country in the MENA region.

In July 2023, the UAE's Ministry of Energy and Infrastructure ("MoEI") publicly released the UAE's National Hydrogen Strategy (tThe "Strategy"). It forms part of the UAE's Hydrogen Leadership Roadmap and helps establish the UAE's vision and inform its policy decisions. The Strategy outlines the key steps the UAE aims to take to position itself as a top global producer and supplier of low-emission hydrogen by 2031 and to meet the UAE's commitment to net zero by 2050.

As well as these national commitments, the Supreme Council for Financial and Economic Affairs in Abu Dhabi, together with the Abu Dhabi Department of Energy ("DoE") launched the Abu Dhabi Public Policy on Low-Carbon Hydrogen in November 2023. The specifics of the policy are not yet fully developed, and no official communication regarding timelines for the release of further details or the finalisation of the policy has been made at the time of writing. It is expected that the policy will focus on creating hydrogen oases and clean electricity parks, which will be managed within a comprehensive governmental regulatory framework, to attract investment and increase operational efficiency in low-carbon hydrogen production and associated sustainable industries.

In May 2024, the UAE Cabinet approved the updated Strategy, reaffirming the country's commitment to becoming a leading global producer and supplier of low-emission hydrogen by 2031. The Strategy outlines plans to scale up hydrogen production to 1.4 million tonnes per annum (mtpa) by 2031, 7.5 mtpa by 2040, and 15 mtpa by 2050. It also emphasises the development of hydrogen oases and dedicated research centres to foster innovation in hydrogen technologies.

2. What are the key goals and commitments included in the strategy/policy?

The Hydrogen Leadership Roadmap comprises three core objectives:

- unlocking new sources of value creation through exports of low-carbon hydrogen, derivatives and products to key importing regions;
- creation of new hydrogen derivative opportunities through low-carbon steel; and
- development of sustainable kerosene as well as other priority UAE industries.

As outlined in the Hydrogen Leadership Roadmap, the UAE aims to support the low-carbon hydrogen business through five critical enablers:

- a clear regulatory framework backed by policies, incentives, standards, and certifications;
- best-in-class technology through value-add partnerships and the UAE domestic research and development structure;
- access to existing and new intergovernmental relationships to accelerate growth of a domestic ecosystem;
- readily available traditional land and infrastructure resources to support domestic production; and
- green financing within the UAE and in international capital markets.

In addition, through the Strategy, the UAE aims to contribute to:

- developing a regulatory framework and policies that support hydrogen as a sustainable fuel for the future;
- strengthening regional collaboration to establish a regional hydrogen market;
- bolstering investments in research and development to improve the cost-effectiveness of hydrogen production, transport and utilisation; and
- fostering the domestic market.

The UAE aims to achieve the objectives set out in the Strategy through ten enablers:

- building international partnerships and creating investment opportunities to drive the global transition to a hydrogen economy;
- leveraging natural resources and existing assets to competitively lead future energy markets;
- guiding society to embrace hydrogen and unlocking the common good as a result of global carbon mitigation;
- creating the infrastructure necessary to link production with demand, accelerating hydrogen availability and utilisation;
- incubating and accelerating next generation hydrogen technology development across the value chain;
- establishing the legislative mechanisms needed to support the low carbon hydrogen transition, including hydrogen certification and guarantees of origin;
- creating an attractive investment environment to support the hydrogen transition, as well as developing green finance mechanisms domestically;
- providing the certainty, predictability and confidence that industry needs to transition to hydrogen;
- achieving and maintaining globally competitive hydrogen pricing through a long-term market driven support mechanism; and
- nurturing and growing a highly skilled workforce to drive forward the transition to hydrogen.

The updated Strategy includes the establishment of hydrogen oases – dedicated regions for hydrogen production and utilization – with plans to develop two by 2031 and expand to five by 2050. Additionally, the strategy aims for a 25% reduction in emissions from hard-to-abate sectors by 2031, progressing to a 100% reduction by 2050.

3. Which industry sectors are most likely to be affected by hydrogen deployment?

The primary use for low-carbon hydrogen is aimed at supporting the decarbonisation efforts of the UAE's domestic industry with a focus on stimulating local demand in the following sectors:

- energy sector (storage and generation);
- oil and gas;
- chemical and fertiliser production;
- transport, shipping and aviation;
- iron and steel production;
- aluminium sector; and
- infrastructure (refineries, ports and terminals, fuelling stations).

There is an expectation that the export of hydrogen and hydrogen derivatives will be considered in parallel once domestic demand is met.

4. Who are the main regulators for the hydrogen market?

The UAE is in the process of developing its hydrogen-related policy and regulations, driven in large part by the MoEI and DoE.

It is likely this will be the primary responsibility of the MoEI (given this ministry is leading the development of the hydrogen roadmap), the DoE and/or the Ministry of Climate Change and Environment, as the Ministry responsible for the UAE Net Zero by 2050 strategic initiative which encompasses the Hydrogen Leadership Roadmap. At present, hydrogen-related projects may also deal with the relevant Emirate's Department of Economic Development (in respect of any foreign investment component) and Environmental Agency (for general permitting and approvals), as applicable.

In addition, the Strategy envisages a governance structure which comprises of four layers:

- the Federal Hydrogen Committee;
- the Hydrogen Strategy Advisory Council,
- the Working Groups; and
- the Coordination Office.

The Federal Hydrogen Committee, chaired by the Undersecretary of the Ministry of Energy and Infrastructure, will be responsible for the overall implementation of the strategic objectives by facilitating cohesive support on required Cabinet decisions relating to policy, regulatory, fiscal, and non-fiscal interventions. The Committee will include Undersecretaries of key government ministries assigned and responsible for monitoring and updating the performance of each of the ten elements of the hydrogen strategy.

The Hydrogen Strategy Advisory Council will include senior leaders of major hydrogen stakeholders from relevant Emirates and organisations who will be responsible for providing recommendations to the Federal Hydrogen Committee. The Council collaborate to identify, inform, and promote actions for enabling the production, transmission, storage, and end of low carbon hydrogen across different sectors to accelerate the UAE's sectoral demands and export needs.

The Working Groups will comprise five layers of expert focus groups in Production, Demand, Safety, Standards and Certification, Policy and Regulation, and Research and Development. The Working Groups will collaborate with the existing groups, such as the National Hydrogen Technical Committee, the Abu Dhabi Hydrogen Alliance, and the Hydrogen leadership Initiative, on existing and new priorities as the market develops. These working groups will actively engage stakeholders in the community to educate and collect insights.

The Ministry of Energy and Infrastructure will act as the Coordination Office to facilitate and coordinate the activities of the National Hydrogen Committee, the Hydrogen Strategy Advisory Council, and the Working Groups. The coordination office will be responsible for tracking and reporting activities regarding the actions and progress of recommendations of the Strategy. Terms of Reference will be established to define the detailed organisation, including structure memberships, objectives, priorities, and meeting schedules of the Hydrogen Strategy Advisory Council and the Working Groups.

5. Does the government hydrogen strategy or policy support the development of both low-carbon (blue) hydrogen and renewable (green) hydrogen?

The Strategy welcomes the development of all clean hydrogen and contemplates the following categories of hydrogen:

- Light green, referring to renewable energy through electrolysis;
- Dark green, referring to renewable energy through water gasification;
- Blue, referring to energy generated by natural gas through methane reforming with CCUS;
- Turquoise, referring to energy generated by natural gas through methane pyrolysis); and
- Pink, referring to nuclear energy.

The UAE is already well positioned to be a leader in clean hydrogen with natural competitive advantages for both blue and green hydrogen, including abundant hydrocarbons, existing large-scale hydrogen and ammonia production facilities, access to some of the world's most cost-competitive solar PV energy and large-scale carbon capture and storage capacities, which Abu Dhabi National Oil Company (ADNOC) already possesses and continues to advance in.

The UAE sees blue hydrogen a stepping stone to increase domestic hydrogen use and distribution and plans on adding CCUS technologies to hydrogen production using natural gas.

Green hydrogen is envisaged to play a significant role in UAE's domestic strategy to meet the UAE 2050 Net-Zero goals and which will also assist globally by exporting hydrogen. Green hydrogen production however remains in its infancy, requiring an international collaboration to accelerate its development.

6. If the government hydrogen strategy or policy supports the development of low-carbon hydrogen, to what extent is carbon capture and storage being taken forward?

The UAE Ministry of Economy has identified carbon-capture technology as a promising sector for growth given rising industrialisation along with soaring investments toward introduction of emission control machineries. The Strategy confirms that CCUS infrastructure will be linked to hydrogen and non-hydrogen projects and will need to be developed continuously over time. However, there is limited public information in respect of the pipeline of CCUS projects and investment.

The UAE currently has one CCUS project, Al Reyadah, which captures CO2 from the flue gas of an Emirates Steel production facility, uses the captured CO2 for enhanced oil recovery in ADNOC's nearby gas fields and then stores the CO2 underground. ADNOC has announced plans to expand the capacity of this program by over 500%, capturing CO2 from its own plants with the aim of reaching 5 million tonnes of CO2 each year by 2030 and intends to incorporate CCUS technology at its Shah and Habshan-Bab gas plants.

7. Are there targets for the production of hydrogen?

The UAE aims to become a leading global producer of low-carbon hydrogen by 2031, with the updated Strategy targeting 1.4 mtpa by 2031, 7.5 mtpa by 2040, and 15 mtpa by 2050. This capacity includes 0.5 million tonnes of green hydrogen produced domestically, another 0.5 million tonnes abroad, 0.4 million tonnes of blue hydrogen, and 0.0075 million tonnes of pink hydrogen, with potential for upward revision. While specific production targets are yet to be set by the government, the UAE aims to capture 25% of the global low-carbon hydrogen market by 2030.

Despite these targets, domestic sectoral demand within the UAE is projected to reach 2.1 million tonnes annually by 2031, providing an opportunity to exceed export targets by an additional 0.6 million tonnes annually. Looking ahead to 2050, forecasts suggest that hydrogen sectoral demand in the UAE could potentially expand to around 10.1 million tonnes annually by 2050.

In addition, company-specific targets have been announced at industry level. ADNOC has plans to increase hydrogen production to 500 kt per annum and is exploring several new growth opportunities. ADNOC is already a producer of over 300 kt per year of hydrogen in its downstream facilities, which is largely used for industrial purposes.

8. Are there any incentive mechanisms/business models in place to support the production of hydrogen?

Incentives such as public ownership stakes, direct grants, and long-term contracts from public bodies for hydrogen purchases to accelerate the development of a future hydrogen economy in the UAE are envisioned for the initiative. The initial focus is on finding incentives for hard to abate industries such as steel, aluminium, cement and heavy goods vehicles, with sustainable aviation fuel and ancillary grid services to follow in 2026 and 2028 respectively.

At the time of writing, there are no formal incentive mechanisms or established business models to support hydrogen production in the UAE. However, the Strategy outlines various incentives to foster the growth of the UAE's hydrogen industry:

- On the supply side, the Strategy references cost support mechanisms to diminish the Levelised Cost of Hydrogen for projects with the precise form this will take to be established at a later stage in the Hydrogen Leadership Roadmap;
- On the demand side, potential carbon pricing mechanisms and cap-and-trade systems are contemplated;
- On the finance side, revenue support guarantees are contemplated with the overarching goal of offering low-interest sustainable financing options; and
- A market price for clean hydrogen is intended to be established between 2026 and 2028 to ensure stability for hydrogen consumers.

In addition to following standard business models to establish a hydrogen market, the Strategy contemplates a number of different models:

- Contracts for Difference to help bridge the cost gap between low carbon hydrogen and alternative fuels of greater carbon intensity;
- Regulated Asset Bases to incentivise private investment into public projects, helping guarantee developers' payback in order to create the lowest capital cost basis for projects to reach construction;
- Hydrogen Purchase Agreements as a market-driven model that could link supply and demand. The UAE expects this to work similarly to Power Purchase Agreements, where a Hydrogen Purchase Agreement is entered into between a green hydrogen producer and the end user for a specific sale price for a specific amount of hydrogen over an agreed timeframe; and
- Other auction-based mechanisms to promote a timely and effective power to synthetic fuels (PtX) market ramp-up on an industrial scale similar to the H2Global mechanism.

9. Are there any standards in place for the classification and/or certification of low-carbon or renewable hydrogen?

There is currently no defined statement in the public domain regarding the classification or certification of low carbon and/or hydrogen from renewable resources.

However, the UAE is exploring the establishment of a Hydrogen Certification Scheme ("Scheme") designed to monitor carbon emissions throughout the entire hydrogen value chain. The Scheme will track emissions from each process across the hydrogen value chain from renewable energy generation to construction and production, through to distribution. The goal is to engage with key export markets and international entities to devise the Scheme in order to meet cross-jurisdictional standards. The envisioned timeline targets implementation between 2026 and 2028, with subsequent reviews and adjustments scheduled for 2029 to 2031 to ensure optimisation of the Scheme as necessary.

10. Does the regulatory framework clearly define the regulatory requirements relating to the production, storage, transportation or supply of hydrogen?

The Strategy sets out the guiding principles, targets and institutional design for the hydrogen sector in the UAE and requires all relevant public and private entities to develop and implement further coordinated and supporting strategies and regulatory frameworks to achieve the Strategy's objectives. However, the UAE has not yet established the legal and regulatory framework that is necessary to encourage and regulate the emerging hydrogen economy.

11. Are there any foreign investment restrictions related to energy and infrastructure sectors?

Foreign investment in certain economic activities in the UAE is regulated and there is a "negative list" of certain sectors and economic activities that are not permitted or significantly restricted for foreign direct investment, which includes exploration and production of petroleum materials. There is also a positive list prescribed by the resolution for which up to 100% foreign ownership is accepted – this includes, broadly, permitted activities within the agricultural, manufacturing and services sectors. In respect of activities on neither the negative or positive list (including ownership of pipeline infrastructure and many other activities required for hydrogen projects), the general rule that there shall be no less than 51% local ownership applies.

Further, the Department of Economic Development within each Emirate of the UAE has discretion to specify which business activities will be open to 100% foreign ownership. The Department of Economic Development in each of Abu Dhabi and Dubai, for example, identify over 1,000 registered commercial and industrial activities, for which non-citizens, whether natural or legal persons, have the right to own economic licence, establish commercial companies with up to 100% ownership in the relevant Emirate. The positive list in Dubai currently includes green hydrogen production.

An approval and licensing regime is applicable to any such permissible foreign direct investment.

The Strategy confirms that the UAE plans on collaborating with financial institutions and regulatory bodies to establish an environment conducive to regional foreign investment activity.

12. What international treaties are in place that may offer protection to international investors in hydrogen projects in the jurisdiction?

Intending to promote its developmental goals, the UAE concluded 106 bilateral investment treaties, with most of its trade partners, which at a high level operate to:

protect investments from all non-commercial risks like nationalization, expropriation, sequestration and freezing;

allow the establishment of investments and licensing such investments;

confirm the free transfer of profits and other returns in a freely transferable currency; and

set the dispute settlement procedures between the investor and the State via amicable solution, local courts or international arbitration.

We are not aware of any treaties specific to hydrogen production and development in the UAE.

Market developments and opportunities

13. Are there any government grants or other government funding available to hydrogen projects (including for research and development)?

In November 2021, His Highness Sheikh Mohammed Bin Zayed mandated ADNOC to explore potential opportunities in hydrogen with the ambition to position the UAE as a hydrogen leader.

The Strategy confirms that the UAE intends to dedicate funding for R&D and innovation by establishing a Hydrogen Innovation Fund. Similarly, the Government of Dubai launched the Dubai Green Fund to fund investments in green and sustainable projects aligned with the Dubai Clean Energy Strategy which captures hydrogen projects.

Beside direct grants, the UAE plans on collaborating with financial institutions and regulatory bodies to establish an environment conducive to regional foreign investment activity.

14. Are there any notable pilot/demonstration projects in place or planned for the production or offtake of clean hydrogen?

Practical steps also have been taken in terms of implementing pilot projects, as follows:

- **The Abu Dhabi Hydrogen Alliance** was created in January 2021, comprised of Mubadala, ADNOC and ADQ and the launch on 17 November 2021 of a new global renewable energy venture between ADNOC and TAQA;
- Dubai's first green hydrogen plant was commissioned in May 2021. DEWA, in collaboration with Expo 2020 Dubai and Siemens Energy, is implementing the green hydrogen project at DEWA's R&D Centre at the **Mohammed bin Rashid Al Maktoum Solar Park**;
- DEWA, in partnership with Emirates National Oil Company, is studying building a hydrogen fuelling station in furtherance of the objectives of the Dubai Green Mobility Strategy 2030 to encourage the use of sustainable transportation, as well as the UAE's Hydrogen Vehicles System, which aims to develop the hydrogen economy in the UAE, and open up local markets to hydrogen vehicles;
- Complementing this pilot green hydrogen vehicle project is the development of the first set of domestic technical regulations regarding hydrogen vehicles by the Emirates Authority for Standardization and Metrology;
- Al Futtaim Toyota has partnered with Air Liquide to open the first hydrogen refuelling station at Al Badia, Dubai Festival City;
- ADNOC and German logistics company Hamburger Hafen und Logistik AG signed an agreement with ADNOC in March 2022 to test the transport chain for hydrogen from the UAE to Germany. A pilot delivery of low-carbon ammonia (produced by Fertiglobe, a partnership between ADNOC and OCI, at its Fertil plant in Abu Dhabi's Ruwais industrial complex) was unloaded in Germany in September 2022. This delivery was the first ever shipment of low-carbon ammonia to Germany and set an important milestone for the medium-term imports of green hydrogen;
- Emirates Global Aluminium ("EGA") has partnered with MoEI to become a member of the Hydrogen Leadership Initiative. The Initiative is dedicated to increasing research and development into the increasing use of hydrogen in industrial decarbonization. EGA's membership in the organization means it also becomes a member of the Abu Dhabi Hydrogen Alliance and the National Hydrogen Technical Committee;
- TAQA and Abu Dhabi Ports have partnered to develop an industrial-scale green hydrogen-to-ammonia project in Abu Dhabi, with a production capacity of 73,339 tonnes per year; and
- ADNOC has a joint study agreement with two Japanese companies, INPEX and JERA, and a government agency, the Japan Oil, Gas and Metals National Corporation, to explore blue hydrogen production in the UAE to supply Japanese markets.

15. Are there any commercial-scale clean hydrogen production projects in development or already operating?

- The UAE hydrogen market is already active across the end-to-end value chain for hydrogen, with more than 20 projects and developments which are either completed or underway via the main stakeholders, such as the Abu Dhabi Hydrogen Alliance (ADNOC, Mubadala, & ADQ) and DEWA, including: the Mohammed bin Rashid Al Maktoum Solar Park in Dubai, the first solar PV and green hydrogen producing facility in the MENA region;
- the Fertil blue ammonia production plant in Abu Dhabi's Ruwais industrial complex with a capacity of 1,000 kilotons per annum;
- green hydrogen demonstration plant (initially for road transport, then expanding to e-kerosene synthesis and ocean shipping);
- establishing a UAE hydrogen hub in collaboration with BP;
- the UAE's first green ammonia plant powered by solar based electrolyzer facility developed by Helios and Abu Dhabi Ports (with a 2 GW green ammonia export facility developed by TAQA and Abu Dhabi Ports to be located in the same area);
- Al Reyadah, a large-scale green hydrogen project enabling the first green steel produced in the MENA region; and
- a large scale green hydrogen project to enable green steel production with the capacity of 73,000 tonnes of hydrogen per annum developed by Emirates Steel and TAQA.
- In October 2024, Masdar and Emirates Steel (EMSTEEL) announced the successful completion of a pilot project producing green steel using green hydrogen, marking a significant milestone in the UAE's hydrogen initiatives.
- In December 2024, a UAE-Morocco joint venture announced plans to invest USD $25 billion in a green hydrogen and ammonia production facility in Dakhla, aiming to produce one million tonnes of green hydrogen annually by 2031.

16. Have there been any hydrogen-related disputes in your jurisdiction?

N/A. We are not aware of any hydrogen-related disputes in the UAE.

Last updated May 2025

United Kingdom

Policy and regulation

1. Is there a government hydrogen strategy or policy?

A hydrogen strategy was first published by the previous UK Government on 17 August 2021. This formed the basis of various policies and business models designed to take forward the development of low-carbon hydrogen, as discussed in more detail elsewhere in this guide. The current UK Government published a **Hydrogen Strategy Update to the Market** in December 2024 and a revised Hydrogen Strategy is scheduled to be published in 2025.

2. What are the key goals and commitments included in the strategy/policy?

The UK has ambitious goals for hydrogen development, with an aim of developing up to 10GW of hydrogen by 2030 (as set out in the Hydrogen Net Zero Investment Roadmap of February 2024).

Clean hydrogen is a key part of the UK Government's plans to meet its legally finding carbon budgets and to reaching net zero by 2050.

In June 2025 the Government published its **Clean Energy Industries Sector Plan**, which includes the following commitments with respect to hydrogen:

- a revised Hydrogen Strategy to be published in 2025;
- the UK's first regional hydrogen network to be established by 2031, to support the production, storage and transportation of low-carbon hydrogen;
- future Hydrogen Allocation Rounds (HARs) to allocated revenue support to non-CCUS enabled hydrogen production projects, with HAR3 to be launched by 2026 and HAR8 from 2028;
- the first hydrogen transport and storage business model allocation rounds to be held in 2026; and
- a new hydrogen to power business model to be launched in 2026.

3. Which industry sectors are most likely to be affected by hydrogen deployment?

The industry sectors where clean hydrogen may displace fossil fuels in the UK include the following:

- Power: hydrogen is expected to play a key role in delivering the goals in the UK Government's Clean Power 2030 Action Plan. A hydrogen to power business model is expected to support the deployment of hydrogen to power;
- Off-road machinery: this includes construction machinery and agricultural machinery;
- Transport: this includes road transport, shipping and aviation.
- Heat in buildings: the UK Government will be consulting in 2025 on the role of hydrogen in heating.

Sectors where hydrogen is already being used, such as those that use hydrogen for industrial applications, are expected to switch to low-carbon hydrogen.

The UK Government will also be consulting in 2025 on blending hydrogen into the existing gas transmission system, to inform a policy decision on whether or not to support transmission-level blending.

4. Who are the main regulators for the hydrogen market?

The Department for Energy Security and Net Zero (DESNZ) has overall responsibility for the development of hydrogen policy and regulation.

Hydrogen falls within the ambit of the downstream gas regulatory regime, under the Gas Act 1986, and therefore in Great Britain the gas and electricity markets regulator, Ofgem, is responsible for issuing the licences required to transport and supply hydrogen by pipeline, and for the administration and enforcement of this licensing regime.

The upstream oil and gas regulator, the North Sea Transition Authority, has had its remit extended to facilitating the energy transition in the North Sea, and therefore has a role to play in relation to hydrogen, particularly in relation to the re-use of existing oil and gas infrastructure for the purpose of hydrogen production.

Other regulators also have responsibility for regulating various aspects of hydrogen production, transport and supply, including the Health and Safety Executive (in relation to safety issues) and environmental regulators (in England, this is the Environment Agency). The environmental permitting and decommissioning regimes are relatively complex, and which regulator is responsible for their enforcement depends on whether the activity/infrastructure is onshore or offshore, and in which part of the UK it is located.

5. Does the government hydrogen strategy or policy support the development of both low-carbon (blue) hydrogen and renewable (green) hydrogen?

The UK Government's policies on hydrogen support both carbon capture, utilisation and storage (CCUS) enabled hydrogen (blue) and renewable (electrolytic or green) hydrogen – referred to by the Government as a "twin track" approach. Both of these are referred to as low-carbon hydrogen.

Revenue support for non-CCUS-enabled hydrogen production (such as electrolytic) is provided through Hydrogen Allocation Rounds.

Support for CCUS-enabled hydrogen production is provided through the CCUS cluster sequencing process – see question 6 below.

6. If the government hydrogen strategy or policy supports the development of low-carbon hydrogen, to what extent is carbon capture and storage being taken forward?

Since July 2019 the Government has been progressing a programme towards the deployment of carbon capture, usage and storage (CCUS) by developing the business models and regulatory regime for CCUS. A key component of the CCUS programme is the development of a business model and regulatory regime for the carbon transport and storage networks (T&S networks) that will be used to transport and store the carbon dioxide from emitters such as blue hydrogen producers. Under the new regulatory regime established under the Energy Act 2023, a transmission and storage operator (T&SCo) holds an economic licence to own and operate a T&S network. The revenue of T&SCo is subject to an economic regulatory regime (ERR) overseen by the economic regulator Ofgem.

The Government selected two CCUS projects to be initially developed using the ERR model described above: the Liverpool Bay CCS (LBCCS) project and the Northern Endurance Partnership (NEP) project. Both these projects have now reached financial close.

In June 2025 the UK Government announced its support for further CCUS projects – the Acorn project in Aberdeenshire and the Viking project in the Humber – by providing the development funding to advance their delivery. A final investment decision on those projects will be made in due course.

While both T&S networks will be available to be used by a large number of different carbon dioxide emitters, they will play a key role in the production of blue hydrogen.

7. Are there targets for the production of hydrogen?

The UK's target is to have 10GW of low-carbon hydrogen production capacity by 2030 for use across the economy.

8. Are there any incentive mechanisms/business models in place to support the production of hydrogen?

The Hydrogen Production Business Model (HPBM) is the main mechanism for supporting the production of low-carbon hydrogen. The Net Zero Hydrogen Fund (NZHF) also provides funding, in the form of grants, primarily to fund development and capital expenditure.

The HPBM involves support for hydrogen producers in the form of private law contracts between a hydrogen producer and a government-owned counterparty, the Low Carbon Contracts Company. This revenue support contract is referred to as the Low Carbon Hydrogen Agreement (LCHA). The revenue support being provided under the LCHA has been developed pursuant to the provisions of the Energy Act 2023. A similar model (referred to as the Contracts for Difference regime) has already been in place since 2013 for renewable electricity generators, and is also being developed for emitters of carbon dioxide who will connect to the carbon capture and storage networks described in question 6.

Support under a LCHA is allocated to applicants through Hydrogen Allocation Rounds (HARs). The UK Government launched the first Hydrogen Allocation Round (HAR1) in 2022 and announced the results in December 2023. HAR1 resulted in the award of revenue support contracts to 11 projects, totalling 125MW capacity. HAR1 was only open to electrolytic projects. HAR2 was launched in December 2023 and was only open to hydrolytic projects. Blue hydrogen projects wishing to be awarded support under the LCHA are expected to apply through the "cluster sequencing process", through which carbon capture and storage "clusters" are selected – that is, the T&S networks (see question 6 above) and the carbon dioxide emitters that will connect to those T&S networks.

The key features of the LCHA include the following:

- price support tis provided under a bilateral contract between the hydrogen producer and a counterparty that will make price support payments to the producer;
- the price support is a variable premium, calculated as the difference between a strike price and a reference price for each unit of hydrogen sold, with the strike price being the pre-agreed production cost of low-carbon hydrogen and the reference price being the higher of the producer's achieved sales price and the price of natural gas; and
- a contract term of 15 years.

Some support for hydrogen used in transport is also available through the Renewable Transport Fuel Obligation (RTFO), a green certificate scheme for sustainable renewable fuels used in transport. The RTFO imposes an obligation on fuel suppliers to ensure that sustainable renewable fuel makes up a percentage of the volume of fuel they supply for transport. Two types of renewable hydrogen are supported under the RTFO. The first is hydrogen produced by electrolysis powered by renewable electricity. The second is biohydrogen produced from biological feedstocks, mainly biomethane via reformation.

The Government has also been developing the business model for hydrogen transport and storage, to support the deployment of the infrastructure required to transport and store low-carbon hydrogen. In a similar way to the business model developed for carbon dioxide T&S networks, it is expected that hydrogen transport providers will be licensed (in the case of hydrogen, under the existing Gas Act 1986 regime, which applies to natural gas and extends to hydrogen) and will receive revenue support under a hydrogen transport revenue support contract.

9. Are there any standards in place for the classification and/or certification of low-carbon or renewable hydrogen?

The UK Low Carbon Hydrogen Standard sets a maximum threshold for greenhouse gas emissions for hydrogen to be considered "low-carbon" hydrogen. This is to ensure that low-carbon hydrogen production contributes to the UK's decarbonisation efforts. The Low Carbon Hydrogen Certification Scheme is currently under development. It will verify the emissions intensity of hydrogen, determined using the Low Carbon Hydrogen Standard methodology. This will enable low-carbon hydrogen producers and users to prove the low-carbon credentials of hydrogen. The UK Government has committed to launching the certification scheme in 2025.

10. Does the regulatory framework clearly define the regulatory requirements relating to the production, storage, transportation or supply of hydrogen?

The existing regulatory framework defines the requirements applying to different aspects of the hydrogen value chain. In particular, hydrogen falls within the definition of "gas" under the Gas Act 1986, which means that the existing regulatory framework that applies to downstream gas in Great Britain also applies to hydrogen. The application of the Gas Act 1986 regime to hydrogen means that the transportation, shipping (i.e. arranging for transportation) and supply of gas by pipeline are all activities which require a licence under the Gas Act 1986. Similarly, the health and safety regime that currently applies to downstream natural gas also applies to hydrogen. The Energy Act 2023 includes provisions to establish the statutory framework for the provision of revenue support under the various hydrogen business models (production, transport and storage), as well as provisions which, together with the Gas Act 1986, establish how hydrogen pipeline transportation is regulated.

The UK Government is continuing work on ensuring the existing regulatory framework does not present any barriers for the deployment of low-carbon hydrogen, including through the Hydrogen Regulators Forum.

11. Are there any foreign investment restrictions related to energy and infrastructure sectors?

The National Security and Investment Act 2021 (NSIA), which came into force on 4 January 2022, contains a mandatory notification regime, backed up by criminal sanctions, for transactions involving the acquisition of a right or interest (typically a holding of more than 25%) in 17 key sectors. The regime applies to both foreign and UK investors. For relevant transactions, clearance must be obtained before closing. Certain activities in the energy sector are caught by the mandatory notification regime, including the ownership and operation of various gas infrastructure, such as gas distribution and transmission networks. Because pipeline transportation of hydrogen is covered by the Gas Act 1986 regime that applies to gas distribution and transmission, this means that the NSIA regime would also apply to hydrogen distribution and transmission.

The regime also includes a voluntary notification process (underpinned by a "call-in" power) for other transactions that may affect UK national security interests.

12. What international treaties are in place that may offer protection to international investors in hydrogen projects in the jurisdiction?

The United Nations Conference on Trade and Development (UNCTAD) **website** states that the UK is a signatory to over 80 bilateral investment treaties (BITs) that are in force, and in addition certain other treaties may contain protections for international investors in the UK. These can be accessed from the UK Treaties online **database** maintained by the Foreign, Commonwealth and Development Office, and UNCTAD's Investment Policy Hub.

The Energy Charter Treaty (ECT) is a multilateral investment treaty which entered into force in April 1998 and specifically addresses energy trade, transit and investment between its contracting parties.

There are differing views as to whether hydrogen production and CCUS would be afforded protection under the current terms of the ECT, and to our knowledge the question has not been considered by an arbitral tribunal.

A number of states have withdrawn, or announced that they intend to withdraw, from the ECT. On 28 May 2024 the depositary of the ECT confirmed that it had received written notice of the UK's withdrawal from the ECT, with the withdrawal to take effect on 27 April 2025. New energy investments in the UK will not be protected under the ECT if made after that date. However, investments already made at this point in time will likely continue to enjoy protection for a period of 20 years under the so-called 'sunset provision' of the ECT.

Market developments and opportunities

13. Are there any government grants or other government funding available to hydrogen projects (including for research and development)?

There have been a number of different funding initiatives targeted at different parts of the hydrogen value chain. The Low Carbon Hydrogen Supply Competition has provided funding to a number of pilot projects for the production of low-carbon hydrogen. Funding has been made available to various pilot projects for the use of hydrogen in sectors such as heating and transport. The Net Zero Hydrogen Fund (NZHF), which is intended to provide up to £240 million of government co-investment to support new low-carbon hydrogen production out to 2025, was launched in May 2022.

The £1 billion Net Zero Innovation Portfolio continues to accelerate the commercialisation of low-carbon technologies, such as hydrogen. Other support to research and innovation comes from UK Research and Innovation, the Department for Transport and other public sector bodies.

14. Are there any notable pilot/demonstration projects in place or planned for the production or offtake of clean hydrogen?

There are a number of different pilot projects that have been deployed in the UK to examine and test the feasibility of clean hydrogen production and use in different sectors. One area that is of particular interest, as it has the potential to create a large market for low-carbon hydrogen, is heating, and this has been explored in the pilot projects outlined below.

The HyDeploy demonstration project tested the potential for blending up to 20% hydrogen with natural gas in the existing gas grid. The project was delivered by a consortium of partners, led by Cadent, a gas distribution network operator.

The H21 programme was funded by the regulator Ofgem and led by Northern Gas Networks (another gas distribution network operator) in partnership with other stakeholders, including the HSE. The focus of the H21 programme, which involves a number of different projects, was a complete conversion of the gas grid to 100% hydrogen.

As noted in question 3, the UK Government is scheduled to make further policy decisions on the role of hydrogen in heating and on hydrogen blending in 2025.

15. Are there any commercial-scale clean hydrogen production projects in development or already operating?

There are currently no existing commercial-scale clean hydrogen production projects in the UK, but there are a number of projects in the pipeline, at different stages of development.

16. Have there been any hydrogen-related disputes in your jurisdiction?

There have been no material publicly reported hydrogen-related disputes to date.

Last updated June 2025

USA

Policy and regulation

1. Is there a government hydrogen strategy or policy?

There is currently no comprehensive hydrogen strategy for the United States. However, the Infrastructure Investment and Jobs Act (**IIJA**) – which built upon the Energy Policy Act of 2005 – was signed into law in November 2021 and contains a number of provisions aiding the advancement of hydrogen as an alternative energy source.

Funding and Tax Credits

Furthermore, the Inflation Reduction Act (**IRA**) was signed into law in August 2022 and included $369 billion in energy and climate spending, introduced a clean hydrogen 10-year production tax credit (**45V Credit**) and broadened the existing investment tax credit to apply to hydrogen projects. On January 3, 2025, the Department of the Treasury and the Internal Revenue Service released the final regulations implementing the 45V Credit to provide flexibility in the Energy Attribute Certificate (**EAC**) framework in response to industry concerns and to take into account substantial indirect emissions. EACs are instruments describing attributes about a unit of energy, including the resource used to create the energy and the emissions associated with its production and use, which help provide transparency in energy sector transactions.

Executive Orders

On January 20, 2025, President Donald Trump by way of an executive order[103] titled "Unleashing American Energy" (**Executive Order**) suspended all funding disbursements under the IRA, as well as certain 'Green New Deal' disbursements under the IIJA.[104] The Executive Order requires that federal agencies have until mid-April to submit reviews and to report to the Office of Management and Budget and National Economic Council on how the frozen spending aligns with energy goals. Other than the mid-April deadline, the Executive Order provides no other timelines, including when the OMB may provide its determination to release the paused funding (if at all). It is also unclear whether the spending freeze under the Executive Order will impact tax credits under the IRA or whether spending that is already obligated under the IRA will be affected. Although the scope of the 'Green New Deal' is not explicit in the Executive Order, it is implied that 'Green New Deal' projects are projects that support alternative energy, although hydrogen energy is not expressly mentioned in the Executive Order.

Hydrogen Program Plan

Notwithstanding developments under the Trump administration, multiple federal and state agencies have overlapping authority to research and regulate hydrogen depending on its application. Principally, the US Department of Energy (**DOE**) released its **Hydrogen Program Plan** on 12 November 2020 which provided a strategic framework incorporating the research, development, and demonstration efforts of the Offices of Energy Efficiency and Renewable Energy, Fossil Energy, Nuclear Energy, Electricity and Science, and the Advanced Research Projects Agency. The DOE updated the Hydrogen Program Plan in 2024 to focus on conducting coordinated research, development, demonstration, and deployment activities to enable adoption of hydrogen technologies.

The Hydrogen Program Plan outlines how offices across the DOE collaborate to execute the final **National Clean Hydrogen Strategy and Roadmap**, released by DOE in June 2023, which aims to advance hydrogen adoption and production within the US in the three following ways:

i. targeting strategic, high impact uses of clean hydrogen, such as industrial applications, transportation and power sector applications;

ii. reducing the cost of clean hydrogen across the value chain, with a targeted hydrogen production cost of $1 per kg by 2031 and an interim goal of $2 per kg by 2026; and

iii. focusing on regional networks to enable large-scale clean hydrogen close to hydrogen users and the development and sharing of critical mass of infrastructure, including leveraging the regional clean hydrogen hubs introduced in the IIJA.

103 An executive order is a document under the executive branch signed by the U.S. President, which may (among other powers) instruct federal agencies how to implement a statute, generally by writing a report, undertaking an investigation, or promulgating a new regulation. In addition, a court may challenge an executive order as not following the Constitution or existing federal laws, or Congress can enact a law that limits the intended purpose of an executive order.

104 As of December 2024, $294 billion in IIJA funds remain unallocated.

National Blueprint for Transportation Decarbonization

In January 2023, DOE, the US Department of Transportation, the US Environmental Protection Agency (**EPA**), and the US Department of Housing and Urban Development jointly released the National Blueprint for Transportation Decarbonization, which is aimed at cutting all greenhouse emissions from the transportation sector by 2050. The Blueprint identifies a strategic role of clean hydrogen particularly in freight applications, emphasizes the importance of further developing and deploying clean-energy technologies.

Each state in the US has its own regulatory and financial landscape in relation to hydrogen with California, Texas, Louisiana and Wyoming generally recognized as being the most advanced in their low-carbon hydrogen policies. The focus of this summary is the federal landscape; should you require further state-specific information, please speak to your respective Ashurst contact.

2. What are the key goals and commitments included in the strategy/policy?

Executive Orders

The current administration's Executive Order shifts focus away from some greener projects to oil, natural gas, coal, hydropower, biofuels, critical mineral, and nuclear energy resources. It is not clear whether the Trump administration interprets hydrogen energy as falling under the "Green New Deal" or since it can be produced from natural gas or nuclear power and not just renewables, a preferred domestic source of energy. Clean hydrogen will likely no longer be a priority given that President Trump withdrew from the Paris Agreement by issuing executive order "Putting America First in International Environmental Agreements" on January 20, 2025.

The Executive Order also suspends funding under the IIJA. The IIJA established the Clean Hydrogen Research and Development Program to: (1) advance research and development and commercialize the use of clean hydrogen in the transportation, utility industrial, commercial, and residential sectors; and (2) demonstrate and commercialize the use of clean hydrogen in the transportation, utility, industrial, commercial, and residential sectors by 2040. The IIJA also added the following important provisions to the Energy Policy Act, which may now also be under threat:

- providing $8 billion over four years for the creation of four Regional Hydrogen Hubs;
- requiring the Secretary of Energy to develop a national energy strategy and roadmap to facilitate widescale production, processing, delivery, storage and use of clean hydrogen;
- providing $500 million over four years to award multiyear grants and contracts for research, development, and demonstration projects to advance new clean hydrogen production, processing, delivery, and storage; and
- providing $1 billion to fund a clean hydrogen electrolysis program, focused on reducing the cost of hydrogen produced using electrolysis.

Many of the above and below goals for hydrogen energy may be impacted by the Executive Order if hydrogen energy projects are interpreted as part of the "Green New Deal" projects for which funding is frozen pending review by federal agencies. Alternatively, the NEDC could see hydrogen energy as a potential source of American-produced energy and promote it. Nevertheless, clean hydrogen is likely not a priority given the Trump administration's focus on reducing costs as opposed to reducing greenhouse gas emissions.

National Clean Hydrogen Strategy and Roadmap

The National Clean Hydrogen Strategy and Roadmap sets goals for the US to produce 50 million tons of clean hydrogen per year by 2050, with interim targets of 10 million tons by 2030 and 20 million tons by 2040.

National Blueprint for Transportation Decarbonization

The National Blueprint for Transportation Decarbonization sets the following goals for hydrogen research in relation to transportation:

- before 2030: achieve hydrogen electrolysis, sustainable fuel cost targets, and enable seamless integration with energy systems; and
- 2030-2040: ensure infrastructure needed to support clean technologies and zero emission vehicles, including by building out hydrogen refuelling networks for commercial trucks and other applications.

3. Which industry sectors are most likely to be affected by hydrogen deployment?

It is expected that hydrogen will play the largest role in the following four sectors of the US economy:

- as fuel for buildings;
- as transportation fuel (with a growing focus on heavy-duty vehicles, rail, maritime and aviation sectors);
- as industrial fuel (with a growing focus on steel and cement manufacturing); and

- for power generation and grid balancing (particularly for large-scale power, off-grid distributed power, back-up or emergency power and long-duration energy storage).

Sectors where hydrogen is already being used, such as petroleum refining, fertilizer production, ammonia and methanol processing, and the chemical industry, are expected to switch to low-carbon hydrogen.

4. Who are the main regulators for the hydrogen market?

There is still a lack of a single, comprehensive federal hydrogen strategy or regulator. The main federal agencies with the ability to influence the development of the hydrogen industry include the DOE, the Federal Energy Regulatory Commission (**FERC**), the Pipeline and Hazardous Materials Safety Administration (**PHMSA**), and the EPA.

5. Does the government hydrogen strategy or policy support the development of both low-carbon (blue) hydrogen and renewable (green) hydrogen?

The IIJA supports "clean hydrogen", defined as hydrogen produced from any fuel source as long as it meets carbon intensity requirement of 2kg of CO2e per kg of hydrogen. In June 2023, the DOE released an updated Clean Hydrogen Production Standard Guidance, setting a more relaxed clean hydrogen production standard, with lifecycle greenhouse gas emissions of no more than 4kg of CO2e per kg of hydrogen, double the amount of permitted CO2e that was set out in the IIJA. This higher amount of permitted CO2e in the Guidance aligns with the maximum permitted to obtain the 45V Credit under the IRA. This permits hydrogen to be produced from renewables, fossil fuel with carbon capture, utilization, and sequestration/storage technologies, and nuclear

6. If the government hydrogen strategy or policy supports the development of low-carbon hydrogen, to what extent is carbon capture and storage being taken forward?

Carbon capture, utilization, and sequestration (**CCUS**) is still in its nascency due to costs, regulatory uncertainty, infrastructure, and technology needs, but CCUS has been a focus of the EPA at a federal level since 2011 through its Class VI well permitting program. It is not clear at this time how the Trump administration may approach carbon capture, although it is likely to be supportive if it will help grow American production of oil and gas.

Several officials in the Trump administration have shown their support of carbon sequestration, such as Energy Secretary, Chris Wright, affirming that he would work with North Dakota to advance carbon sequestration at his confirmation hearing. EPA Administrator, Lee Zeldin, also pledged to fast-track West Virginia's application for Class VI well primacy, to enable it to issue its own state-based well permits designated for permanent carbon storage deep underground.

As part of the IIJA, Congress took the following CCUS related measures:

- required the DOE to account for and support opportunities for hydrogen production from diverse energy, including fossil fuels with CCUS;
- appropriated $937 million for the DOE to fund carbon capture large-scale pilot projects over FY22-FY25 and an additional $2 billion for the DOE to fund carbon capture demonstration projects over FY22-FY25;
- established a DOE engineering and design program for carbon dioxide transport infrastructure to enable deployment of CCUS technologies and an infrastructure finance and innovation program to provide low-interest loans for carbon dioxide transport infrastructure projects; and
- provided $310 million in grant funding for carbon utilization for use over FY22-FY26.

It is not yet clear how the Executive Order pausing funding under the IIJA may impact the above CCUS related measures.

7. Are there targets for the production of hydrogen?

In 2021, the Biden Administration set a goal of net-zero green gas emissions in the US by no later than 2050 and 100% clean electricity by 2035. Energy Secretary, Chris Wright has denounced the Biden administration's 2021 goal of reaching net zero green gas emissions, but has not commented on the 2035 goal for clean electricity. President Trump's withdrawal from the Paris Agreement also indicates that the current US administration is veering away from clean energy and likely clean hydrogen.

National Clean Hydrogen Strategy and Roadmap

The DOE's strategy targets domestic clean hydrogen production of 10 million tons by 2030, 20 million by 2040, and 50 million by 2050 and a targeted hydrogen production cost of $1 per kg by 2031, with an interim goal of $2 per kg by 2026. In 2024, the DOE revised its targets, indicating that the US is only on track to reach 7 to 9 million metric tons per annum in operational clean-hydrogen production capacity by 2030. Although that is good progress towards 10 million tons, the focus of the Executive Order is more on reducing prices for domestic energy as opposed to reducing carbon emissions, which may possibly curb this progress.

The DOE's 'Pathways to Commercial Liftoff: Clean Hydrogen' released in March 2023, also details the following goals for commercial-scale clean hydrogen production projects in the US:

- near-term expansion (2023-2026): clean hydrogen is expected to replace today's carbon-intensive hydrogen, particularly in industrial/chemicals use cases including ammonia production and oil refining;
- industrial scaling (2027–2034): hydrogen costs are expected to continue to fall, driven by economies of scale and research and development. There will be greater investment in the build-out of new midstream infrastructure which connect a greater number of producers and offtakers and will reduce the delivered cost of hydrogen which will drive clean hydrogen adoption in new sectors (e.g., fuel cell-based transportation); and
- long-term growth (2035+): a self-sustaining commercial market is expected to develop due to availability of low-cost, clean electricity, declining equipment costs, reliable and at-scale hydrogen storage and high utilization of distribution infrastructure.

8. Are there any incentive mechanisms/business models in place to support the production of hydrogen?

The following tax incentives were previously introduced during the Biden Administration:

- in March 2021, the American Jobs Plan included numerous proposals to expand tax credits for clean energy and suggested pairing investment in 15 low-carbon hydrogen demonstration projects with a new tax credit for low-carbon hydrogen production facilities where construction begins before 2026;
- the 45V Credit, which creates a 10-year tax incentive for clean hydrogen of up to $3 per kg with the level of credit provided based on carbon intensity of no more than 4kg of CO2e per kg of hydrogen; and
- in June 2021, the Clean Energy for America Act introduced additional major new tax incentives and credits for investment in clean energy facilities and for the production of electricity from clean energy and clean fuel.

The Executive Order spending freeze of disbursements under the IRA and IIJA may not impact tax credits if such tax credit regimes have been implemented via Congress and the legislative process, of which an executive order should not be able to unilaterally revoke or override.

9. Are there any standards in place for the classification and/or certification of low-carbon or renewable hydrogen?

In June 2023, the DOE set a clean hydrogen production standard, with well-to-gate lifecycle greenhouse gas emissions of ≤4.0 kilograms of CO2e per kilogram of hydrogen, which is consistent with the Inflation Reduction Act's definition of "qualified clean hydrogen."

10. Does the regulatory framework clearly define the regulatory requirements relating to the production, storage, transportation or supply of hydrogen?

No, to achieve the level of hydrogen generation and deployment required to match ambitions, increased investment in research and development is crucial, as well as the introduction of a more robust and hydrogen specific regulatory framework at federal and state level.

11. Are there any foreign investment restrictions related to energy and infrastructure sectors?

The 1988 Exon-Florio Amendment to the Defense Production Act of 1950 empowers the president to block foreign acquisitions of US companies that threaten to impair national security. The president delegated authority to investigate transactions to the Committee on Foreign Investment in the United States (**CFIUS**), as further formalised under the Foreign Investment and National Security Act of 2007. CFIUS established transaction-specific and general Congressional notification requirements relating to national security and specifically included 'critical infrastructure' and 'energy security' within its scope. Transactions that involve foreign governments, a threat to national security, or control of critical infrastructure are compulsorily subject to a 45-day formal investigation, except where the Secretary or Deputy Secretary of Treasury and the lead agency certify that there is no national security threat.

The Mineral Lands Leasing Act of 1920 limits the acquisition of rights-of-way for oil or gas pipelines, or pipelines carrying products refined from oil and gas, across onshore federal lands. These restrictions also apply to acquiring leases or interests in certain minerals (including coal and oil) on onshore federal lands. Citizens of other countries and foreign corporations may have up to a 100 percent stock ownership in a domestic company that owns such rights, interests, or leases, provided that the foreign investor's home country reciprocates with rights to US companies.

12. What international treaties are in place that may offer protection to international investors in hydrogen projects in the jurisdiction?

The US is a signatory to various bilateral investment treaties that are in force, and in addition certain other treaties may contain protections for investors in the US. These can be accessed from the online database maintained by the Trade Compliance Center.

Market developments and opportunities

13. Are there any government grants or other government funding available to hydrogen projects (including for research and development)?

The Trump administration has paused all IIJA and IRA funding disbursements by way of Executive Order. Section 7 of the Executive Order seeks to terminate the "Green New Deal". It is not yet clear how the following grants and funding will ultimately be impacted.

The IIJA includes $65 billion in clean energy investments at the DOE, including $8 billion for a Regional Clean Hydrogen Hubs Program to support the development of hubs for clean hydrogen production, delivery, and end-use in the US (**H2Hubs**). In October 2023, the following seven H2Hubs were selected to receive $7 billion in funding from the IJIMA (to be administered by DOE) to accelerate the commercial-scale deployment of low-cost, clean hydrogen:

- Appalachian Hydrogen Hub in West Virginia, Ohio, and Pennsylvania;
- California Hydrogen Hub in California;
- Gulf Coast Hydrogen Hub in Texas;
- Heartland Hydrogen Hub spanning Minnesota, North Dakota, and South Dakota with potential to expand into neighboring states;
- Mid-Atlantic Clean Hydrogen Hub spanning Delaware River and including Pennsylvania, Delaware, and southern New Jersey;
- Midwest Alliance for Clean Hydrogen spanning Illinois, Indiana, and Michigan, with the potential to expand into other Midwestern states; and
- Pacific Northwest Hydrogen Hub spanning Washington, Oregon, and Montana.

In addition, the DOE has launched other clean hydrogen programs:

- $1 billion for a clean hydrogen electrolysis program;
- $500 million for clean hydrogen manufacturing and recycling R&D activities;
- in March 2024, $750 million in funding for 52 projects across 24 states as part of its Clean Hydrogen Electrolysis Program to reduce the cost of electrolyzers and other clean-hydrogen technologies;
- on January 16, 2025, a $1.66 billion loan to Plug Power Inc to help finance construction of up to six facilities to produce and liquify clean hydrogen fuel using electrolyzer technology; and
- up to $4 million in federal funding to advance clean hydrogen production for R&D projects for solid oxide fuel cell technology to support, among others, hydrogen production and storage.

14. Are there any notable pilot/demonstration projects in place or planned for the production or offtake of clean hydrogen?

There are a number of pilot projects in the US, some of which are outlined below:

- Florida Power & Light completed its pilot clean hydrogen hub in Okeechobee County, Florida in February 2024. The hub is the first clean hydrogen plant of its kind in Florida – it runs off solar energy and will blend 5% hydrogen with natural gas in its pipelines to provide low-cost, clean energy to Florida Power & Light's customers;
- the Yara/BASF ammonia plant in Freeport, Texas, has developed a pilot using low-carbon by-product hydrogen from nearby petrochemical plants instead of natural gas from steam methane reforming;
- Chesapeake Utilities Corporation is piloting hydrogen blending in a combined heat and power plant and is looking to inject hydrogen into its distribution systems in its Florida and Mid-Atlantic territories;
- HyBlend, a DOE-backed project, is marshalling the resources of four national labs to identify technical barriers to injecting hydrogen into gas infrastructure and life-cycle emissions linked to hydrogen-natural gas blends;
- the University of California, Irvine in collaboration with SoCalGas, is running a demonstration project through its Advanced Power and Energy Program to convert excess renewable power to hydrogen and blend it into the natural gas system;
- Shell Hydrogen is delivering up to 51 hydrogen refuelling stations;
- Bloom Energy in California will begin offering electrolyzers alongside hydrogen-powered fuel cells which is expected to produce the lowest cost clean hydrogen through electrolysis and intends to assist hard-to-decarbonise heavy industries in achieving net-zero emissions; and
- SGH2 Energy Global, part of the Solena Group, announced that they had entered into the first long-term green hydrogen offtake agreement in the world under which they agreed to sell 3,850 tonnes a year of carbon-negative green hydrogen to refuelling stations across southern California.

15. Are there any commercial-scale clean hydrogen production projects in development or already operating?

There are currently no existing commercial-scale clean hydrogen production projects operating in the US and President Trump's policies against "Green New Deal" investments in the IIJA has led to more uncertainty in the hydrogen market. There have also been notable cancellation of some projects, such as the cancellation by Air Products of a $4 billion green hydrogen project in Texas, and the cancellation by a Mississippi green hydrogen hub (Hy Stor Energy) of its proposed electrolyzer reservation.

There are however a number of projects into which investment has begun and for which development is in progress, including

- the seven H2Hubs, all of which have received federal award money by DOE as of January 2025 to begin phase 1 of their project plans:
    1. Appalachian Hydrogen Hub in West Virginia, Ohio, and Pennsylvania, awarded $30 million out of the total federal cost share of up to $925 million, in order to take advantage of the region's ample low-cost natural gas;
    2. California Hydrogen Hub in California, awarded $30 million out of the total federal cost share of up to $1.2 billion, in order to leverage California's clean energy technology to produce hydrogen exclusively from renewable energy and biomass and to decarbonize public transportation, heavy duty trucking and port operations;
    3. Gulf Coast Hydrogen Hub in Texas, centered in the Houston region and stretching across the Texas coast, awarded $22 million out of the federal cost share of up to $1.2 billion, using hydrogen for fuel cell electric trucks, industrial processes, ammonia, refineries and petrochemicals and marine fuel, with plans to develop salt cavern hydrogen storage, a large open access hydrogen pipelines, and multiple hydrogen refueling stations;
    4. Heartland Hydrogen Hub in Minnesota, North Dakota, and South Dakota with potential to expand into neighboring states, awarded $20 million out of the total federal cost share of up to $925 million, that will help decarbonize the agricultural sector's production of fertilizer and decrease the regional cost of clean hydrogen, with unique opportunities of equity ownership with the Mandan, Hidatsa and Arikara Nation and to local farmers and farmer co-ops through a private sector partnership;
    5. Mid-Atlantic Clean Hydrogen Hubspanning Delaware River and including Pennsylvania, Delaware, and southern New Jersey, awarded $18.8 million out of the total federal cost share of up to $750 million, to help unlock hydrogen-driven decarbonization in the Mid-Atlantic while repurposing historic oil infrastructure and using existing rights of way;
    6. Midwest Alliance for Clean Hydrogen spanning Illinois, Indiana, and Michigan, awarded $22.2 million out of the total federal cost share of up to $1 billion, with the potential to expand into other Midwestern states, which will enable decarbonization through strategic hydrogen uses including steel and gas production, power generation, refining, heavy-duty transportation, and sustainable aviation fuel; and
    7. Pacific Northwest Hydrogen Hub spanning Washington, Oregon, and Montana, awarded $27.5 million out of the total federal cost share of up to $1 billion, with plans to produce clean hydrogen exclusively via electrolysis;
- a $2 billion investment by Fidelis New Energy into the state of West Virginia for a lifecycle carbon neutral hydrogen production facility (The Mountaineer GigaSystem) and net-zero hydrogen powered data centers (The Monarch Cloud Campus);
- Mitsubishi Power Americas and Magnum Development's jointly-developed Advanced Clean Energy Storage project in Utah, which has been issued a $504.4 million loan guarantee by the DOE, aiming to build an electrolysis and energy storage facility for 1,000 megawatts of clean power, partly by putting hydrogen into underground salt caverns;
- Bakken Energy and Mitsubishi Power America's acquisition and redevelopment of a synthetic natural gas plant in North Dakota into a blue hydrogen production facility, with the aim of connecting the hub by pipeline to other hubs throughout the US;

- a 20 megawatts electrolyser plant in Florida that will produce 20,000 tonnes per year of hydrogen from solar power;
- a 5 megawatts proton exchange membrane electrolyser project in Washington State that will provide renewable hydrogen for the Douglas County Public Utility District (Douglas County PUD) in Washington; and
- Intermountain Power Agency's replacement of its coal units at the Intermountain Power Plant with a gas turbine combined cycle technology, which will initially be capable of utilizing 30% renewable hydrogen as a clean energy fuel and will reach 100% renewable hydrogen capability by 2045. This plant will supply stored renewable power to the Los Angeles basin and other power users throughout California and Utah.

16. Have there been any hydrogen-related disputes in your jurisdiction?

As of January 2025, there appear to be no material disputes related to the use of clean hydrogen at a Federal-level in the US. There are various reports of potential litigation against the 45V Credit by industry participants allegedly disputing the provisions that require hydrogen producers to use new sources of clean electricity to run their plants instead of existing power sources already connected to the grid network. Although President Trump has postponed another IRA tax credit, the 45Z Clean Fuel Production Credit, by 90 days for a holding period for public comment, no decisions have been made regarding the 45V hydrogen production tax credit as of January 2025.

Last updated April 2025

Uzbekistan

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Policy and regulation

1. Is there a government hydrogen strategy or policy?

Although not adopted yet, the National Strategy for Renewable and Hydrogen Energy Development of Uzbekistan is currently in the pipeline.

In particular, on 9 April 2021, the President of Uzbekistan issued a milestone resolution No. PP-5063 "On Measures for the Development of Renewable and Hydrogen Energy in the Republic of Uzbekistan" (**"Resolution No. 5063"**). In accordance with Resolution No. 5063, the President established the Interdepartmental Commission for the Development of Renewable and Hydrogen Energy, which has been tasked with assisting ministries and agencies in conducting necessary research, training, and professional development of personnel in the renewable and hydrogen energy sectors as well as developing the draft National Strategy for Renewable and Hydrogen Energy Development (the **"Strategy"**). The Strategy remains at the draft stage and is not publicly available yet.

The Resolution of the President of Uzbekistan No. PP-436 "On Measures for Improving the Effectiveness of Reforms Aimed at Transition of The Republic of Uzbekistan to "Green" Economy by 2030" dated 02 December 2022 recognized the Ministry of Energy of the Republic of Uzbekistan as the authorized body for the wide introduction of renewable energy sources and hydrogen energy and instructs the Cabinet of Ministers to approve a plan of measures for the development of renewable energy sources and hydrogen energy in the country.

As part of the reform for transitioning to a liberalized wholesale energy market, in February 2025, Uzbekistan has adopted a Regulation No. 91 "On the Procedure for Licensing Activities in the Electric Energy Sector" which recognizes the activities for the production of electric energy from hydrogen as a licensable activity, thus, entities producing power from hydrogen shall obtain a license from the Energy Market Development and Regulatory Agency of the Republic of Uzbekistan.

On a project pipeline note, JSC Uzkimyosanoat and ACWA Power through the project company, ACWA Power UKS Green H2, pioneer the construction of the first green hydrogen project with the first phase including an integrated renewable hydrogen production facility consisting of a 20 MW electrolyser fed by greenfield 52 MW wind power plant to produce around 3,000 tonnes of renewable hydrogen per year. When both phases are realized in full, 2.4 GW of wind energy will power the production of 500,000 tonnes of green ammonia per year.[105]

In addition, in 2024, Fergana Oil Refinery, one of the largest hydrocarbon processing facilities in Uzbekistan, announced the acquisition of the hydrogen production assets at the Refinery by Air Products (USA). The acquisition includes a methane steam reforming unit capable of processing both natural gas and liquefied natural gas. These assets, combined with the two variable pressure adsorption units originally supplied by Air Products to the Refinery, are expected to ensure the hydrogen production sufficient both for the Refinery needs and for the commercial purposes[106].

2. What are the key goals and commitments included in the strategy/policy?

Although the draft Strategy is not publicly available yet, the Government has already disclosed some of its main short-term goals to develop the hydrogen deployment. In the Development Strategy of New Uzbekistan, enacted under the Presidential Decree No.60 on 28 January 2022, the Government sets out the objective to decrease its hydrocarbon dependence by increasing the share of renewable energy sources, including the hydrogen energy, to 25% by 2026. In particular, in respect of hydrogen, the Government's measures include:

- a hydrogen research programme with a programme budget of UZS 10 billion (~816 mln USD) and creation of technology for producing, storing, and transporting hydrogen energy on the basis of four new scientific projects; and
- arranging scientific internships for 20 young scientists and specialists at leading foreign research centres and universities in the field of hydrogen energy.

3. Which industry sectors are most likely to be affected by hydrogen deployment?

The Government views hydrogen as a long solution in tackling the fossil fuel dependence of the state and reduction of carbon emissions in the chemical industry. Therefore, the power sector, i.e., generation of electricity, and the chemical industry are expected to be mostly affected by hydrogen deployment.

105 https://www.acwapower.com/news/acwa-power-breaks-ground-on-green-hydrogen-project-in-uzbekistan
106 Source; The Fergana Oil Refinery official website - https://www.fnpz.uz/ru/press-tsentr/novosti/981-air-products-i-saneg-obyavlyayut-o-sdelke-po-priobreteniyu-aktivov-na-summu-140-millionov-dollarov-ssha-v-uzbekistane?highlight=WzIwMjNd

4. Who are the main regulators for the hydrogen market?

Although, at present, there is no state regulator governing exclusively the hydrogen market, the Ministry of Energy and the Ministry of Economy and Finance of the Republic of Uzbekistan are public bodies regulating the development of the "green" economy of the country.

Resolution of the President of Uzbekistan No. PP-436 envisages that the Ministry of Energy is the authorized body for the development of "green" energy and implementation of renewable energy sources and hydrogen energy. The Resolution also states that the Ministry of Economy and Finance is the authorized body for coordination of activities on promotion of "green" economy and implementation of "green" growth principles.

In addition, as stated above, the Interdepartmental Commission for the Development of Renewable and Hydrogen Energy is authorized to assist ministries and agencies in conducting necessary research and training in the renewable and hydrogen energy sector. Also, the National Research Institute for Renewable Energy Sources under the Ministry of Energy is tasked with developing legal acts and standards in the hydrogen and renewable energy sectors.

5. Does the government hydrogen strategy or policy support the development of both low-carbon (blue) hydrogen and renewable (green) hydrogen?

Currently, it is yet unknown whether the draft Strategy supports both low-carbon (blue) hydrogen and renewable (green) hydrogen.

However, based on the existing legislation and policy, we understand that "green" hydrogen is in the focus of the Government's attention. Last year, the Ministry of Energy of Uzbekistan negotiated the development of a pilot "green" hydrogen project with the leading investor from Saudi Arabia, ACWA Power. This project is in the construction phase now and the EBRD is offering a financial package of US$ 65 million to ACWA Power UKS Green H2 for the development, design, construction and operation of the hydrogen facility[107].

6. If the government hydrogen strategy or policy supports the development of low-carbon hydrogen, to what extent is carbon capture and storage being taken forward?

N/A.

7. Are there targets for the production of hydrogen?

The Government has not officially announced any indicative targets for hydrogen production. The pilot project with ACWA Power is expected to produce 3,000 tons of hydrogen per year. When both phases of the project are realized in full, 2.4 GW of wind energy will power the production of 500,000 tonnes of green ammonia per year.

8. Are there any incentive mechanisms/business models in place to support the production of hydrogen?

At present, there are no incentive mechanisms/business models in place that specifically apply to the hydrogen production. It is expected that the Strategy will reflect the incentive mechanism specific for the hydrogen industry.

Law of the Republic of Uzbekistan No. 539 "On the Use of Renewable Energy Sources" dated 21 May 2019 and the Tax Code of Uzbekistan (2020) provide tax incentives in respect of renewable energy sources, however, currently, it is unclear as to what extent such incentives apply to hydrogen projects in Uzbekistan since the definition of "renewable energy sources" in the Law No. 539 is rather restrictive (i.e., renewable energy sources are defined as "energy from the sun, wind, earth heat (geothermal), natural movement of water streams, biomass that naturally regenerates in the environment").

In addition, general investment legislation allows the Government of Uzbekistan to provide a special tax regime (e.g., exemption from payment of certain taxes, application of reduced tax rates etc.) for a foreign investor under an investment agreement with the Government to the extent permitted by the Tax Code.

9. Are there any standards in place for the classification and/or certification of low-carbon or renewable hydrogen?

To date, there are no existing standards in place for the classification of hydrogen. As stated above, under Resolution No. 5063, the National Research Institute for Renewable Energy Sources under the Ministry of Energy of the Republic of Uzbekistan is tasked with developing legal acts and standards in the hydrogen and renewable energy sectors.

107 Source: The EBRD official website - https://www.ebrd.com/home/news-and-events/news/2024/ebrd-supports-first-renewable-hydrogen-project-in-central-asia.html

10. Does the regulatory framework clearly define the regulatory requirements relating to the production, storage, transportation or supply of hydrogen?

No, as stated above, the relevant regulatory framework and laws are currently under development.

11. Are there any foreign investment restrictions related to energy and infrastructure sectors?

There are no foreign investment restrictions related to energy and infrastructure sectors. Some power related activities (e.g., production of electric energy from hydrogen) are now recognised as licensable activities, thus, the entities are required to obtain the relevant license from the Energy Market Development and Regulatory Agency of the Republic of Uzbekistan.

12. What international treaties are in place that may offer protection to international investors in hydrogen projects in the jurisdiction?

Uzbekistan is a signatory to the Energy Charter Treaty (1994), the Convention on the Settlement of Investment Disputes between States and Nationals of Other States (ICSID Convention, 1965), the EC-Uzbekistan Cooperation Agreement (1996) and the US-Central Asia TIFA (2004) which offer protection to international investors implementing projects in Uzbekistan.

In addition, Uzbekistan has signed a number of bilateral investment treaties with more than 50 countries and almost all of them are currently in force.

Market developments and opportunities

13. Are there any government grants or other government funding available to hydrogen projects (including for research and development)?

Resolution No. 5063 established the National Research Institute for Renewable Energy Sources under the Ministry of Energy of the Republic of Uzbekistan and the Research Center for Hydrogen Energy. In accordance with Resolution No. 5063, the Ministry of Economy and Finance of the Republic of Uzbekistan is instructed to provide necessary funds for financing the activities of the Institute starting from 2022 in the annually approved parameters of expenditures of the state budget of Uzbekistan.

Resolution No. 5063 also provides for development of the program for financing of the costs arising from the implementation of research projects in the renewable and hydrogen energy sectors.

In addition, Resolution No. 5063 envisages attracting international research grants to the Center.

14. Are there any notable pilot/demonstration projects in place or planned for the production or offtake of clean hydrogen?

On 23 February 2024, the President of Uzbekistan adopted a resolution approving a "pilot" project for design, construction, and operation of a hydrogen plant by a Saudi investor ACWA Power through its project company ACWA Power Uzbekistan Hydrogen Holdings LTD in a joint venture with JSC Uzkimyosanoat (an entity uniting chemical enterprises in Uzbekistan). In accordance with the resolution, the hydrogen plant is expected to produce 3,000 tons of "green" hydrogen annually. Under the pilot project, Uzkimyoimpex LLC (an export and import agent in the chemical industry of Uzbekistan) shall offtake "green" hydrogen generated at the hydrogen plant.

15. Are there any commercial-scale clean hydrogen production projects in development or already operating?

In accordance with the publicly available sources, at present, there is only one commercial hydrogen project at the development stage in Uzbekistan, which is the aforementioned project involving ACWA Power. In addition, as mentioned above, upon the acquisition of the hydrogen production assets at Fergana Oil Refinery by Air Products, the assets are expected ensure the hydrogen production hydrogen both for the Refinery needs and for the commercial purposes.

16. Have there been any hydrogen-related disputes in your jurisdiction?

To date, no hydrogen-related dispute has been recorded in Uzbekistan..

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