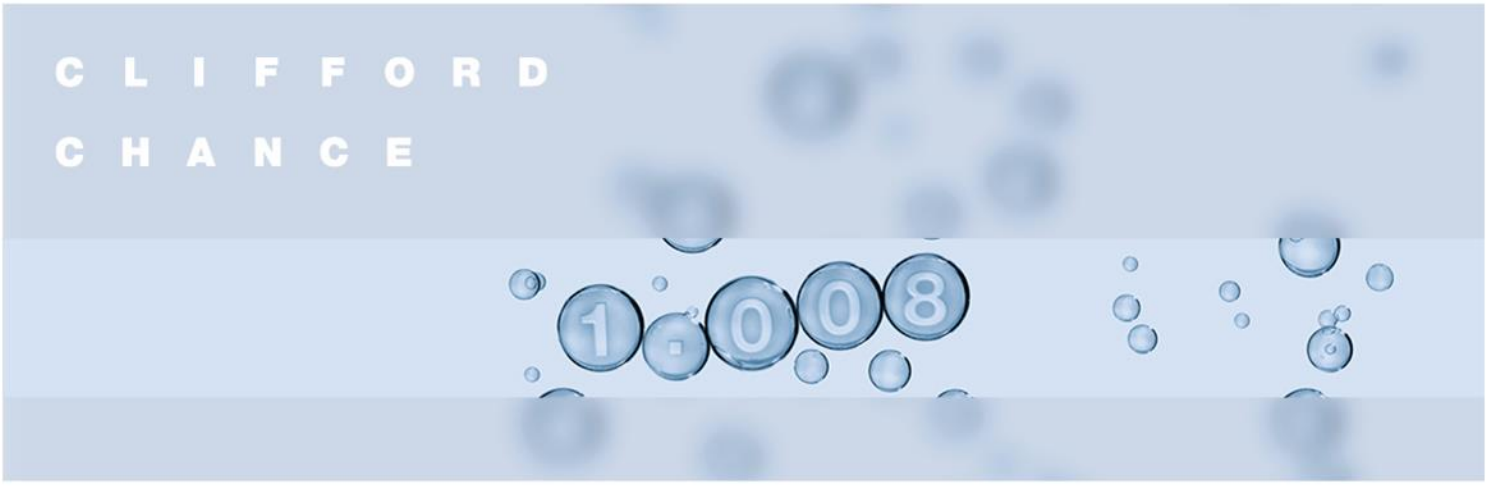

FOCUS ON HYDROGEN: STRATEGY FOR HYDROGEN ENERGY IN THE NETHERLANDS

This client briefing deals with key topics in relation to the development of clean hydrogen in The Netherlands.

Key points

- Goals of the Dutch national hydrogen strategy
- Support schemes for hydrogen
- Targeted sectors/projects
- Transport of hydrogen
- Articulation with CCS projects
- Role of the Netherlands in the global hydrogen market
- Link between national strategy and EU hydrogen policy

NATIONAL HYDROGEN STRATEGY

Date of announcement of the strategy

On 30 March 2020, the Dutch government announced the Dutch national hydrogen strategy (**DNHS**) with a comprehensive policy agenda (*Kamerstuk 32 813, nr. 485*), based on the commitments made in the National Climate Agreement (*Klimaatakkoord*).

Goals of the strategy

The objective of the Dutch government is to support sustainable hydrogen, primarily based on electrolysis using sustainable electricity, but also based on sustainable biogenic feedstocks. "Sustainable" hydrogen (or "clean" hydrogen), within the meaning of the DNHS, not only covers green hydrogen (produced through electrolysis using renewable energy sources) but also blue hydrogen (produced from natural gas with capture of carbon dioxide emissions).

While the objective of the Dutch government is to focus on green hydrogen, the Dutch government sees blue hydrogen as making an optimal contribution to the development of a broader hydrogen system without impeding the growth of green hydrogen.

The following milestones have been set by the Dutch government:

- **2019-2021**: preparatory programme for the roll-out of hydrogen, using a considerable number of ongoing initiatives and projects as a point of departure, to be concluded with an evaluation to inform the further specifications and objectives of the next phases. At the end of 2021, a decision will be made on the final structure of the next phase and the extent of the scaling up beyond 2030.
- **2022-2025**: based on the results of the first phase, particularly if the cost reduction of electrolysis and the commitment of the relevant parties provide a sufficient basis, scaling up to 500 MW of established electrolysis capacity by 2025, in conjunction with the development of the demand for hydrogen and regional infrastructure and the connection of various clusters. In 2025, a decision will be taken on the final structure of the next phase.

- **2026-2030**: scaling up to 3-4 GW of established electrolysis capacity, connection to storage sites and expansion of infrastructure, on the condition of additional growth of renewable electricity.

Financial support

The total volume of financial support currently on the table amounts to EUR 10 million in 2021, and thereafter EUR 35 million per year. The aim is to accelerate cost reductions so that a cost-effective roll-out of green hydrogen for CO2 reduction can start as soon as possible.

DESIGN OF THE SUPPORT SCHEMES

Does the strategy focus on supporting the upstream side (H2 production) or the downstream (H2 uses), or both?

The DNHS is focused on a combination of both upstream and downstream. However, in the first phase of development, it is important to reduce the cost of producing sustainable hydrogen. Scaling up production facilities is an important step in this direction. The plans of the companies involved show that – still relatively small – first installations will be realised in industrial clusters where there is already a demand for hydrogen. At a later stage of development, it is likely that a transport network will have added value. Eventually, (seasonal) storage will also be required in salt caverns or empty gas fields. Preparations for the possible realisation of infrastructure and storage capacity will have to be made in view of the processing times.

An interesting note regarding the DNHS in general, is that it is based on a holistic view, whereby the hydrogen infrastructure and transportation network both within the Netherlands and beyond is an integral part of the strategy.

What are the envisaged support schemes?

Support for CO2 reduction in industry

EUR 60 million will be available from the Dutch government in 2021 to promote CO2 reduction measures in industry. This will be spent as follows:

- **Hydrogen**: The Dutch government will provide the following financial support for hydrogen:
  - In 2021, EUR 10 million will be contributed to Demonstration Energy and Climate Innovation subsidy (**DEI+**) of the Dutch Enterprise Agency (*Rijksdienst voor ondernemend Nederland*) and a new tender scheme for both innovation and development of the scaling up of green hydrogen. Projects that apply under this tender scheme may receive a grant of at least 25% of the eligible costs within DEI+.
  - From 2021, a budget of EUR 35 million a year will be available for scaling-up the production capacity for green hydrogen. This will be done by reallocating part of the existing resources for hydrogen pilots within the DEI+. By using part of the resources to support innovative pilots via DEI+ and another part for scaling up, the government aims to achieve a substantial reduction in the costs of green hydrogen in the most cost-effective way. In addition, projects can make use of existing subsidy schemes. The possibilities for this within the state aid framework will be examined by the Dutch government. Within this framework, it may be possible to make use of the possible extension

of state aid for Important Projects of Common European Interest (**IPCEI**).

- **Carbon Capture, (Utilisation) and Storage (CC(U)S)**: EUR 15 million for feasibility studies and pilots to support the application of CC(U)S technologies throughout the whole CC(U)S chain (capture, transport, reuse and storage of CO2) or in parts of the chain.
- **CO2-reduction in industry**: EUR 35 million for pilot and demonstration projects for accelerating cost-effective CO2-reduction in industry, mostly via the DEI+ scheme.

There are some support schemes specifically targeted for the following sectors:

- **Ports and industry clusters**: many of the concrete plans within the clusters involve pilot-demo projects, for which support is provided through the DEI+, among other schemes.
- **Zero-emission urban logistics and heavy transport**: subsidy schemes will be developed for this purpose under the National Climate Agreement.

Consultation on green hydrogen subsidies

The Dutch government has commenced a market consultation, at the initiative of the Ministry of Economic Affairs and Climate, aimed at finding out what conditions a subsidy for green hydrogen production should meet.

In particular, they want to know whether companies that are considering building electrolysers in the coming years and want to take an investment decision about this in the short term – roughly the next two and a half years – would be more interested in a support scheme that falls under the subsidy framework in The Netherlands for renewable energy (**SDE++**), or whether they would prefer an entirely new support scheme.

According to the Ministry of Economic Affairs and Climate, a support scheme outside the SDE++ would in principle offer potential to support an increased subsidy intensity per tonne of CO2 avoided. The downside would be that the support scheme period would be considerably shorter outside the SDE++ scheme, namely approximately seven years instead of fifteen years.

Is there an H2 'guarantees of origin' scheme in place?

In the Cabinet's Approach to Climate Policy of March 2020, the Dutch government acknowledges the importance of a comprehensive system of Guarantees of Origin (**GoO**) and the need for standardisation of definitions. The Renewable Energy Directive (**RED-II**) requires the development of a GoO system and provides a framework. Such GoO systems do not yet exist in the Netherlands. In the development of the GoO system, coordination is sought by the Dutch legislator with other European countries and the aim is to make maximum use of the European rules and measurement methods.

TARGETED SECTORS AND PROJECTS

Is there a focus on particular sectors?

The Dutch government has targeted the following sectors and projects where hydrogen could play a role in the Dutch National Environment Vision (*Nationale Omgevingsvisie*):

- **Ports and industrial clusters**: Within regional industrial clusters, market participants are preparing for a growing role for hydrogen, with studies, development of business cases and planned investments. Many of the concrete plans within the clusters concern pilot-demo projects, for which support is provided through the DEI+. Some of these projects (Porthos and H-Vision) are further described below.
- **Mobility sector**: The "Covenant on Sustainable Vehicles and Fuels in the Waste Industry" (*Convenant Duurzame Voertuigen en Brandstoffen in de Reinigingsbranche*) was signed by stakeholders in 2020, and supports the use of hydrogen in the waste industry. The waste industry has committed, from 2025 onwards, to only purchase vehicles that run on sustainable fuel or are zero-emission. From 1 January 2030, all new waste vehicles to be purchased will be emission-free (at the tailpipe).
- **Urbanised areas**: Hydrogen may be necessary for the supply of peak energy in heating networks in urbanised areas. Hydrogen is needed in remote areas that are not yet connected to the national power grid, when heat networks or electrification are difficult to achieve. Research with regards to the use of hydrogen in the built environment will be conducted in the upcoming years. However, on the basis of current plans, it is expected that significant volumes of (green) hydrogen will only be available after 2030. Despite this, hydrogen will already be included in the guide for municipalities for making urbanised areas more sustainable and natural gas-free. This will take account of the uncertainty surrounding the availability and price of green hydrogen for these areas.
- **Electricity sector**: Initiatives are now being taken to promote local generation, combined with hydrogen production, usage and storage, in order to contribute to solving and preventing congestion problems in the electricity transportation network and increase the possibilities for integration of renewable energies in a decentralised manner.
- **Agriculture sector**: The agriculture sector offers opportunities for both the generation and use of hydrogen. Farms have many opportunities for the decentralised generation of renewable electricity (wind and solar and industrial buildings). In addition, the use of CO2-free hydrogen for agricultural machinery, tractors and heavy agrologistics provides opportunities for sustainability. Agrologistics represents a quarter to a third of the heavy transport sector. The agribusiness sector has many (SME) parties with a high innovative capacity. In cooperation with regional authorities, small-scale pilots and demos are planned.

Does the government, or national players, have any views on the role hydrogen can play in sector coupling?

Sector coupling plays a role in the DNHS and the following projects are operational/in the pipeline:

- **H-VISION**: Reducing CO2 emissions by businesses in the port of Rotterdam, by producing blue hydrogen on a large scale and applying it in industrial processes. Industry uses a lot of hydrogen, especially for high temperature processes, by burning natural gas. In the plans, the CO2 released in this process will be captured and transported to empty gas fields under the North Sea.
- **NORTH SEA ENERGY**: System integration in the North Sea: electrification of oil and gas platforms, reuse of empty gas fields for underground storage of CO2 and use of gas infrastructure to transport wind energy in the form of hydrogen, which is much cheaper and more efficient than transport by electricity cables.
- **VOLTACHEM**: Industrial and knowledge partners of "**TNO**" (the Netherlands Organisation for applied scientific research) are working in open innovation on the use of sustainable electricity for the electrification and thus decarbonisation of the chemical industry. This involves the conversion of sustainable hydrogen into fuels and chemicals (Power2Hydrogen), of electricity into heat (Power2Heat) and conversion into chemicals (Power2Chemicals).
- **HYDROGEN FROM OFFSHORE WIND/HYDROGEN FARM**: A test station in Lelystad will be expanded with TNO test facilities to investigate how the electricity grid can be kept stable if large amounts of electricity and hydrogen are produced from 2030 onwards by wind farms in the North Sea. The main focus lies on applications of hydrogen for the agricultural sector.

What is the government's view on helping to build a hydrogen market between private players?

The Northern Netherlands region provides an example of a model for public and private sector collaboration in the hydrogen sector that the Dutch government sees as essential to shaping the energy transition. The EU's Fuel Cells and Hydrogen Joint Undertaking has designated the northern part of the Netherlands as Europe's first Hydrogen Valley.

In order to accelerate the development of the Hydrogen Valley, government bodies and businesses in the Northern Netherlands have published The Northern Netherlands Hydrogen Investment Plan. A total investment of 9 billion euros will help to build out the hydrogen ecosystem through 2030, secure around 66,000 existing jobs in the field of gas infrastructure and mobility and create approximately 25,000 (in 2030) and 41,000 (in 2050) new jobs in maintenance and operations.

The development of the Hydrogen Valley will be executed in two phases:

- **Phase 1 (2020-2025)**: 35 projects and over EUR 850 million of planned investments to mature and scale up the Northern Netherlands to between 5 to 10 PJ of hydrogen capacity per annum (see box for example projects)

Hydrogen Valley Phase 1 projects

Production

- Eemshydrogen
- DJEWELS 1 and 2
- HyNetherlands phase 1
- GZI Next Emmen

Infrastructure

- hydrogen backbone Northern Netherlands
- HyStock storage

End-use cases

- BioMCN
- Holthausen
- Magnum Power Station
- SkyNRG
- Hydrogen Hoogeveen
- HEAVENN

- **Phase 2 (2025-2030)**: 10 long-term projects to expand the Northern Netherlands hydrogen ecosystem to 100 PJ per annum of hydrogen capacity by 2030. 75% to be green hydrogen (6 GW equivalent) and 25% blue hydrogen production. Large projects will drive integrated hydrogen ecosystems (e.g. NortH2, HyNetherlands phase 2 and 3, H2M) while domestic and cross-border connections will connect the Northern Netherlands to European offtake markets.

In both phases, government financial support and regulatory actions – e.g. to mandate hydrogen usage, expand offshore wind capacity and synchronize cross-border investments and regulatory frameworks – will be necessary for successful implementation.

On a smaller scale, various groups of stakeholders are working on innovative ways of using hydrogen: municipalities, SMEs, citizens, grid operators and farms etc. Here, economic opportunities are linked to local strategies for sustainability.

TRANSPORT OF HYDROGEN

Is developing an H2 transport backbone part of the national plan?

Hydrogen projects in the Netherlands, up to 2025, are primarily local in scope, with the hydrogen produced being transported by infrastructure within a specific cluster. After 2025, scaling up of electrolysis to GW scale is planned, and national infrastructure in the form of a hydrogen backbone is desirable for the transportation of hydrogen.

Does the national regulatory framework allow the transport of H2 in existing gas transmission networks?

The Ministry of Economic Affairs and Climate will investigate, together with Gasunie (the Dutch gas TSO) and TenneT (the Dutch electricity TSO), which parts of the existing gas network can be used to transport hydrogen. This study, called "HyWay 27", should provide the necessary information for a timely decision to be made about the realisation of infrastructure for the transport and storage of hydrogen.

HYDROGEN AND CCS

National strategy on CCS (Carbon Capture and Storage)

CCS is seen as a crucial part of DNHS. A big leap forward in the development of CCS in The Netherlands was made in 2020, when CCS became part of the subsidy framework in The Netherlands for renewable energy, the SDE++.

The Dutch government has set out the following targets with regard to CCS:

- Realisation of at least one large-scale CCS project (2-4 Mton/year) in the period 2023-2025, with CO2 capture in industry at one or more-point sources and storage under the North Sea in, for example, one or more empty natural gas fields (the Porthos project);
- Realisation of 7 Mton/year CCS in the period after 2025;
- Cost reduction of CCS;
- Reduction of process risks and environmental impact;

- Social acceptance of CCS.

To facilitate international research into CCS, the Netherlands participates in and makes funding available to the European research programme ACT (Accelerating CCS Technologies).

Is a regulatory framework for CCS already in place?

Yes – the Netherlands has implemented the EU 2009/31/EC CCS-Directive into the Mining Work Act (*Mijnbouw wet*).

Are there CCS projects in operation or in the pipeline?

The most advanced major project under development is the Port of Rotterdam CO2 Transport Hub and Offshore Storage project (the Porthos project). A cooperation between Energy Beheer Nederland, Gasunie and the Port of Rotterdam, it aims to store an annual amount of 2.5 million tonnes of CO2 from industry in empty gas fields beneath the North Sea as of 2024. Four companies (Air Liquide, Air Products, ExxonMobil and Shell) are known to have applied for a total of EUR 2 billion from the SDE++ subsidy scheme for the next 15 years.

There are other projects either in development or in operation:

- **CATO Programme**: Dutch CCS research programme
- **AVR**: start with the construction of a large-scale CO2 capture installation
- **HVC**: pilot plant for capture from bio-energy plant
- **OCAP**: CO2 is captured at Shell Pernis and at Alco in Rotterdam
- **WarmCO2**: CO2 and heat from Yara in Terneuzen is led to the adjacent glasshouse horticultural area.

THE NETHERLANDS IN THE GLOBAL HYDROGEN MARKET

Exporter, transit, importer

While countries with cheap renewable energy sources focus on the export of hydrogen, the Netherlands will take a transit position. Thanks to its favourable location with its ports, extensive gas network and storage capacity, the Netherlands can continue to fulfil a hub function for energy in the future. Its proximity to Germany in particular will be a major contribution to the great demand that will arise. Likely, a big part of that demand will have to be met by imports entering Europe via the Netherlands.

Strategy of cooperation with other countries

Because of the hub position that the Netherlands will most likely fulfil, the Dutch government intends to work closely with other countries. An international strategy has long been part of the Dutch approach. The focus lies on Europe, but the Netherlands is also actively participating in global initiatives.

In the HY3 project, announced in January 2020, the German and Dutch governments agreed on how Dutch and German offshore wind can help in scaling up green hydrogen production, which would then be channelled through Dutch gas pipelines and be available to Dutch and German industries.

In addition, together with Austria, the Dutch government took the initiative in the Pentalateral Forum (Benelux, Germany, France, Austria and Switzerland) to develop common approaches on critical issues, such as standards, market incentives and market regulation, in anticipation of discussions at EU level.

The Dutch government wants to put hydrogen prominently on the international agenda. The North Sea Wind Power Hub project (with the Netherlands, Germany and Denmark) is a good example. The Netherlands also takes an active part in wider international initiatives, such as the International Partnership for Hydrogen and Fuel Cells in the Economy (IPHE), IEA, Clean Energy Ministerial and Mission Innovation.

COORDINATION WITH EU STRATEGIES

How does the national strategy intersect with EU plans?

The Dutch government has actively engaged with the European Commission in its work to establish an optimal EU hydrogen policy. By this means, the Netherlands wants to make clear to the Commission what the Netherlands sees as a desirable EU hydrogen policy. This concerns points such as common standards for sustainability, safety, quality, mixing of hydrogen in gas networks, flexible market regulation that offers sufficient scope for market creation and adequate stimulation of innovation (compared to China, Japan and the US).

Furthermore, the Netherlands wants to establish standards regarding sustainability and quality standards in relation to hydrogen at an EU level. In particular, regarding the development of the GoO system, the Dutch legislator is coordinating with the EU and other member states.

As part of the Dutch government's commitment to research, development and demonstration of green hydrogen, one possibility being considered is the implementation of a new Important Project of Common European Interest (**IPCEI**). IPCEI is an EU instrument for rolling out projects with high societal value in which governments can provide more support than within the usual frameworks. The National Climate Agreement states that the Netherlands, in the context of IPCEI, is committed to a strong role for green hydrogen in Europe. The process surrounding the design of IPCEI is still under development, and the Netherlands is closely involved in this process.

Various Dutch industrial parties have expressed interest and are currently working on concrete proposals. In the second half of 2020, the Dutch government organised an "open call" to identify which Dutch projects (production and marketing of green hydrogen) can contribute substantially to a leap in scale in the European context. One of the conditions will be to work together with companies from other European Member States.

ABOUT

Focus on Hydrogen is a Clifford Chance briefing series covering hydrogen-related developments globally. 1.008 is the standard atomic mass of hydrogen.

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