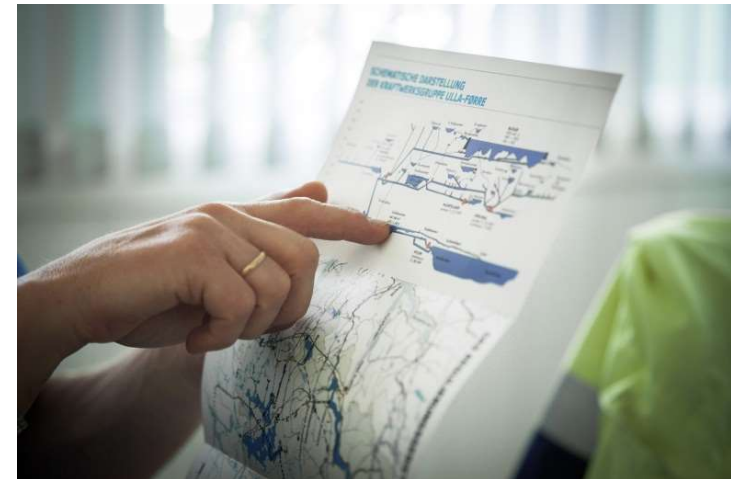


# CONNECTING REALITY WITH CLIMATE GOALS: CASE STUDIES OF GAS DISTRIBUTION SYSTEM PLANNING AND REGULATION

## Country Report Netherlands

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## Background and objectives

- Fossil gas consumption in the EU must decline rapidly to meet energy and climate targets, as well as in the context of energy security concerns, and gas price volatility.
- Declining gas demand will lead to higher grid fees for remaining customers as fewer people use the gas infrastructure, with potential high increases of grid fees.
- Proposals to replace fossil gas with hydrogen face technical and economic challenges, with hydrogen being less efficient and more expensive for heating compared to electrification and district heating.
- Continued investment in gas infrastructure without a decommissioning plan risks stranded assets, as the long lifespans of gas grids do not align with decreasing gas usage and climate targets.
- Regulations are beginning to address these issues, with some countries taking steps towards orderly gas grid decommissioning to manage costs and transition to alternative energy sources efficiently.
- In view of these challenges ahead, the objectives of this country sheet are to
  - provide an overview the status quo of gas consumption and gas distribution networks
  - Outline how regulations related to the gas grid embrace this challenge and identify gaps
  - Highlight opportunities for stakeholders to interact in the process

## Summary of the country report for the Netherlands

- Gas is used extensively in the Netherlands, with gas making up for more than 40 percent of the total primary energy consumption of the country. The gas grid is run by six publicly owned gas distribution system operators (DSOs).
- While the reserves of the Groningen Gas Field have historically empowered the Dutch industry and building sector, making natural gas the backbone of these domains, the Dutch government decided to discontinue production at the Groningen Gas Field. This decision was primarily driven by the occurrence of frequent earthquakes, which raised significant environmental and safety concerns
- The Netherlands have recently adopted key legislations that support the decommissioning of parts of the gas grids:
  - Local heat planning: All municipalities have to develop local decarbonisation plans outlining gas-free heating strategies for each district.
  - The connection of new buildings to the gas network has been prohibited since mid-2018. Furthermore, municipalities are entitled to designate areas where no new gas connections are allowed.
  - The Dutch Parliament has recently adopted changes to the legislative framework that support the disconnection of consumers from the gas grid under certain conditions. In areas in which the municipal heat plans foresee a transition to gas-free districts, disconnection from gas grids is possible with a time frame of 8 years. A condition is that the alternative is cost-effective for consumers..
  - The methodology for depreciating gas grids allows for an accelerated depreciation.

## Content and structure of the country report

- 1. Development of Fossil Gas Consumption + Heating Market/Systems:** This chapter provides an overview of historical trends and current statistics regarding fossil gas usage and the evolution of heating systems.
- 2. Distribution Network - Development and Current State:** This section discusses the infrastructure that supports the distribution of gas, including an assessment of its development over time and its condition today.
- 3. Network Regulation and Costs:** Here, we analyze the regulatory framework governing the distribution network and detail the associated costs of maintaining and expanding this infrastructure.
- 4. Current and Anticipated Role of Alternative Gases:** This chapter evaluates the expected role of alternative gases like biogas and hydrogen in transitioning away from fossil fuels, including current applications and future projections.
- 5. Alignment with Climate Scenarios:** We explore how gas grid planning is aligned with national climate goals, examining scenarios that aim to reduce greenhouse gas emissions.
- 6. Transparency of Information and Stakeholder Input:** The final section discusses transparency and highlights opportunities for stakeholder engagement.

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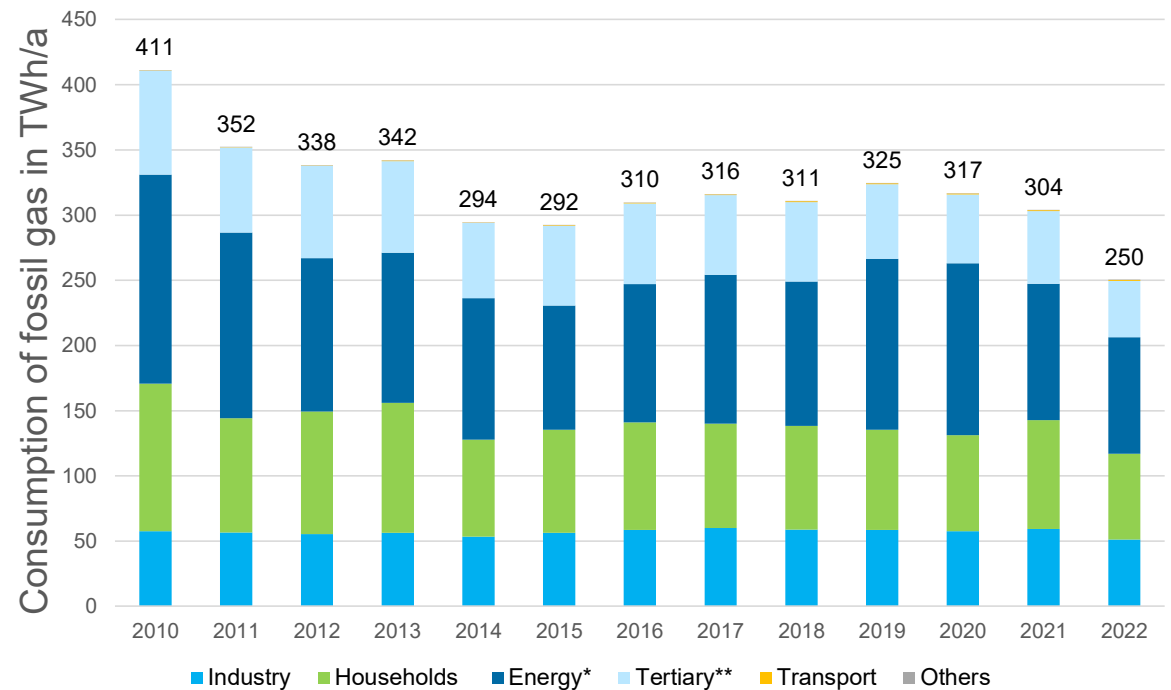
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## Development of fossil gas consumption

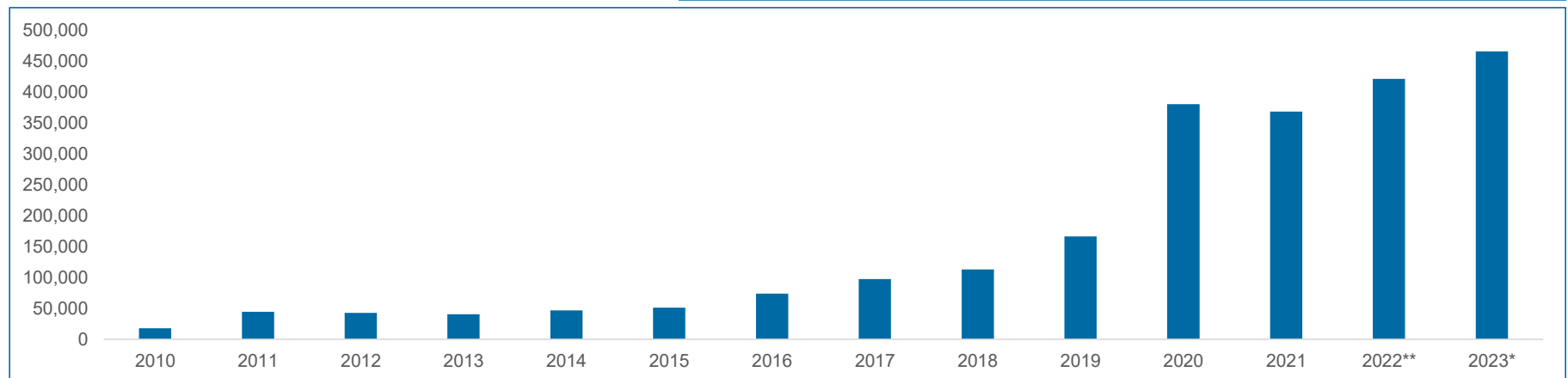
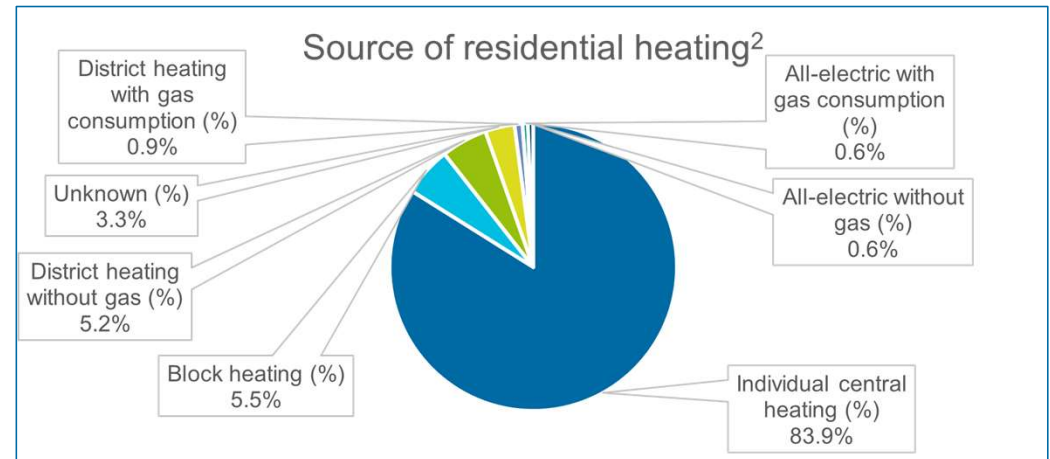
- Gas consumption fell from over 400 TWh/a in 2010 to around 315 TWh from 2014 to 2021.
- Currently approx. 90 % of the around 8 million households and more than 1.1 million commercial buildings are connected to the gas grid. New buildings have been nearly gas-free since 2021.<sup>2</sup>
- The gas transmission network in the Netherlands is approx. 12,000 km long and the distribution networks extend over a length of approx. 124,600 km. This results in a total length of the Dutch gas network of approx. 136,600 km.<sup>3</sup>

### Natural gas consumption in the Netherlands by sector<sup>1</sup>



## Development of heating systems

- Currently, around 90% of heating systems are operated with gas.<sup>1</sup>
- In 2023, more than 450 thousand heat pumps were installed in buildings<sup>2</sup>
- Heat pump sales increased strongly in 2020 and remain at a high level



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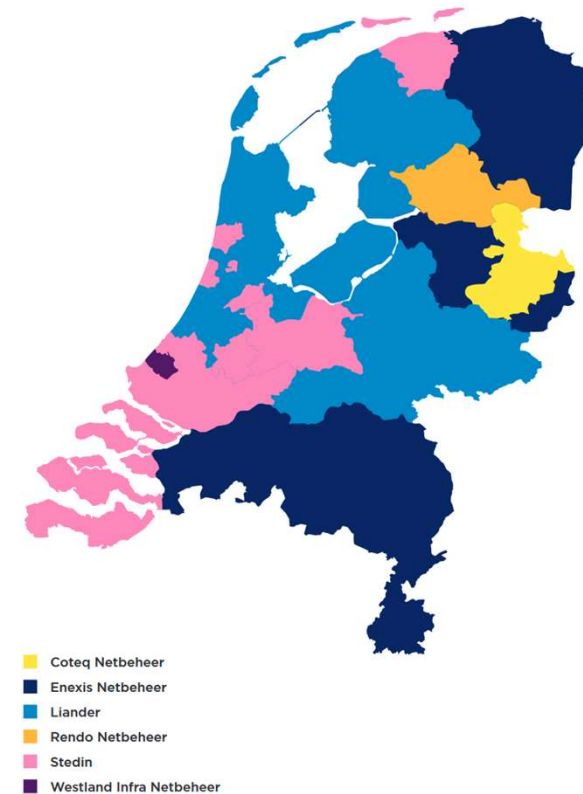
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## Map of network operators (Status May 2019)

- In the Netherlands there is one state-owned transmission system operator (TSO) called Gasunie Transport Services B.V. (GTS) and six regional distribution system operators (DSOs).<sup>1,2</sup>
- DSOs operate in a regulated market. They are supervised by the Consumer and Market Authority (ACM). The ACM sets upper limits for grid charges for gas and electricity and compares the performance and efficiency of the different DSOs.<sup>2</sup>
- The sizes of the areas differ greatly in some cases, as shown in the chart. This also applies to the length and number of connection points of the networks. Liander and Enexis each have over two million consumption points while Westland Infra has only about 50,000.<sup>3</sup>

Areas of the gas distribution system operators<sup>1</sup>



## Gas transmission and distribution network

- The only TSO Gasunie operates a gas transmission network with a total length of approximately 15,500 km, mainly in the Netherlands and Germany.<sup>1</sup>
- The transmission network in the Netherlands is approximately 12,000 km long, while the distribution networks have a length of approximately 124,600 km. This results in a total length of approximately 136,600 km. All DSO networks are connected to the gas transmission network of Gasunie.<sup>1</sup>
- No data are available on recent network developments.

Distribution network operator	Gas pipeline length [km]	Connection points
N.V. Rendo	3,492	104,062
Coteq	4,389	140,165
Liander	35,303	2,256,085
Enexis B.V.	52,152	2,485,126
Stedin B.V.	28,257	2,149,088
Westland Infra	1,039	53,646
GTS	12,000	1,100
<b>Total</b>	<b>136,632</b>	<b>7,189,272</b>

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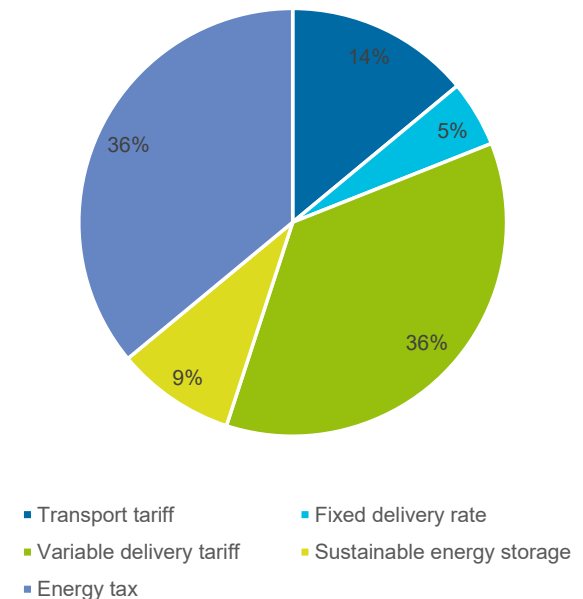
## Gas grid regulation

- Network development: Gas and electricity networks in the Netherlands are divided between transmission system operators (TSOs) and distribution system operators (DSOs). TSOs are owned by the Dutch State, while DSOs are controlled by regional and local governments.<sup>1</sup>
- Network regulation: According to the Gas Act (Gaswet) gas DSOs are prohibited from connecting new buildings to the gas grid (prior to this, DSOs were obliged to connect all buildings on request). In addition, municipalities can designate areas without new gas connections. For existing buildings that are located in areas designated by a municipality as a location for a district heating system, as defined by the Heat Act, or another non-gaseous infrastructure that can meet the expected heat demand, the connection requirement does not apply.<sup>1</sup>
- Grid charges: Grid charges are regulated by the Gas Act. They are determined on the basis of a cost-plus approach (costs + efficiency/quality factor + adjusting for inflation + ceiled revenues) and are regulated by the regulatory authority ACM. In 2021, the gas grid charges were responsible for 19% of the total gas price in the Netherlands.<sup>1</sup>
- Depreciation: In the current regulatory period (2022-2026), DSOs are permitted to depreciate investments in their grids to a greater extent. Assets in the infrastructure are no longer depreciated on a linear basis but on a degressive basis (while retaining the depreciation periods). This is intended to align the costs with the actual use of the network, with connection points expected to decrease in the medium term. Furthermore, gas DSOs receive compensation for the costs of dismantling the gas distribution networks and for removing connection points.<sup>2</sup>
- Disconnection fee: Gas DSOs used to charge homeowners a fee of several hundred Euros for removing gas connections in buildings until March 2021. This fee was seen as a barrier and at odds with climate goals. Consequently, it was decided to shift the cost burden to society. The new procedure which socialises these costs came into effect on February 1, 2024.<sup>3</sup>

## Gas grid charges and green gas

- Currently, there is no "producer tariff" for injecting green gas into regional distribution networks. Green gas producers do not incur additional costs for using their connection, aside from the monthly connection fee.<sup>1,2,3</sup>
- ACM ensures that network operators with above-average costs for green gas injection receive compensation for the extra expenses incurred. However, the method doesn't specify which network operator receives the revenue when multiple regional operators are involved, a matter falling under ACM's jurisdiction, possibly requiring regulation adjustments.<sup>1,2</sup>
- Network operators must cover the (efficient) costs associated with enabling green gas production, with revenue determined by ACM. The current regulatory framework may not always align with green gas injection, and different tariff structures exist for regional and national networks.<sup>1,2</sup>
- Ahead of the next regulatory period (from 2027), ACM will conduct an integrated assessment of costs incurred by green gas producers in the network, exploring how these costs can be best compensated. They will also consider the introduction of a producer tariff in regional distribution networks, aligning with the societal goal of advancing the energy transition.<sup>1,2</sup>
- In 2021, the gas grid charges accounted for 19 % of the total gas price in the Netherlands.<sup>2</sup>

Gas price composition (2021)\*<sup>2</sup>



\*The transport tariff and the fixed delivery rate are the network components on the energy bill

## Possible future development of grid charges

- According to Natuur & Milieu, almost 90 percent of buildings are expected to be off gas by 2035. This transition will vary depending on the neighbourhood or commercial area. Natuur & Milieu therefore believes that a customised approach at neighbourhood and regional level is most effective.<sup>1</sup>
- ACM forecasts a decline in gas network use due to the energy transition, which will lead to the decommissioning and removal of parts of the gas infrastructure, especially in areas where households are switching to alternative energy sources. According to ACM, the lower utilisation of the gas grids is likely to lead to an estimated increase in gas grid fees of 1.4 to 3.6. This estimate does not reflect any form of stranded assets as ACM believes that it is unlikely that the concept of stranded assets will apply to gas networks by 2050, as these networks will continue to play a role in energy supply as long as there are users willing to pay tariffs.<sup>2</sup>
- Even if demand for the gas network declines, some demand for a gas distribution network will persist in 2050. However, as users switch to alternative heat sources, costs will be spread over a shrinking user base, affecting tariff regulation. Due to safety and regulatory considerations, unused gas connections and networks will eventually need to be removed, at an estimated cost of €1.5-3.5 billion for gas connections and €3.5-8.2 billion for gas grids by 2050. The pace of removal remains uncertain, with few significant removals expected in the current regulatory period (2022-2026).<sup>2</sup>

## Heat planning

- The Dutch National Climate Agreement aims to completely phase out the use of natural gas in the building sector by 2050. By 2030, around 1.5 of the 8 million residential buildings are to phase out fossil gas as a source for heating.<sup>1</sup>
- According to the National Climate Agreement all municipalities are required, to establish decarbonisation plans (local heat visions called “Transitievisie Warmte” or TVW). Municipalities had to submit their first plans by 2021. The plans had to include alternative heating strategies for each district, without the use of natural gas. The process had to be participatory, involving stakeholders such as district heating companies, housing corporations, and utilities. For areas where the phase-out of gas will occur before 2030, municipalities will identify the most suitable climate-friendly alternative to natural gas. It is important to note that the TVW is not legally binding, meaning residents are not obligated to follow it when selecting a heating system.<sup>1</sup>
- Municipalities must develop individual neighbourhood implementation plans (called “Wijkuitvoeringsplannen” or WUP) based on the TVW. Each neighbourhood has to have plans for alternative heating technologies including a timeline for implementation; the process should be participatory. The main criterion for determining which alternative heating technologies are to be used is economic efficiency.<sup>1</sup>
- According to modelling work by the Netherlands Environmental Assessment Agency (PBL), electric heat pumps are the most economical option for approximately one-third of buildings, district heating for another third, and biogas (biomethane) for the remaining third. However, the use of biogas (biomethane) requires the continued operation of at least parts of the gas distribution network.
- The Programme for Natural Gas Free Districts (PAW) aims to encourage the adoption of alternative heating systems by providing financial support for the phase-out of gas-based heating technologies. Municipalities can apply for additional funding to facilitate the transition.<sup>1</sup>

## Gas boiler regulations

- Since July 2018 the Gas Act (Gaswet) has prohibited gas DSOs from connecting new buildings to the gas grid, connection is only possible in exceptional cases (prior to this, DSOs were obliged to connect all buildings on request). Municipalities can also designate areas without new gas connections.<sup>1,2</sup>
- Furthermore, the Netherlands have introduced a local planning approach to phase-out the use of gas for heating at district level. The government is supporting municipalities to become gas-free through the Programme for Natural Gas Free Districts (see above).<sup>1</sup>
- In 2022 the Dutch government announced that hybrid heat pumps will become the standard heating system for residential buildings from 2026. It is unknown at the time of publication of this report if these plans will be implemented by the new Dutch government.<sup>2</sup>



## Addressing vulnerable energy consumers and broader social justice concerns

- The legislative framework foresees that decommissioning of gas grids is organized at district level, thus transforming whole districts to gas-free districts at a time. This way it is avoided that consumers remain connected with very low connection densities.<sup>1</sup>
- The framework considers the costs for consumers, thus mandating cost-effectiveness of the alternatives to gas.<sup>1</sup>

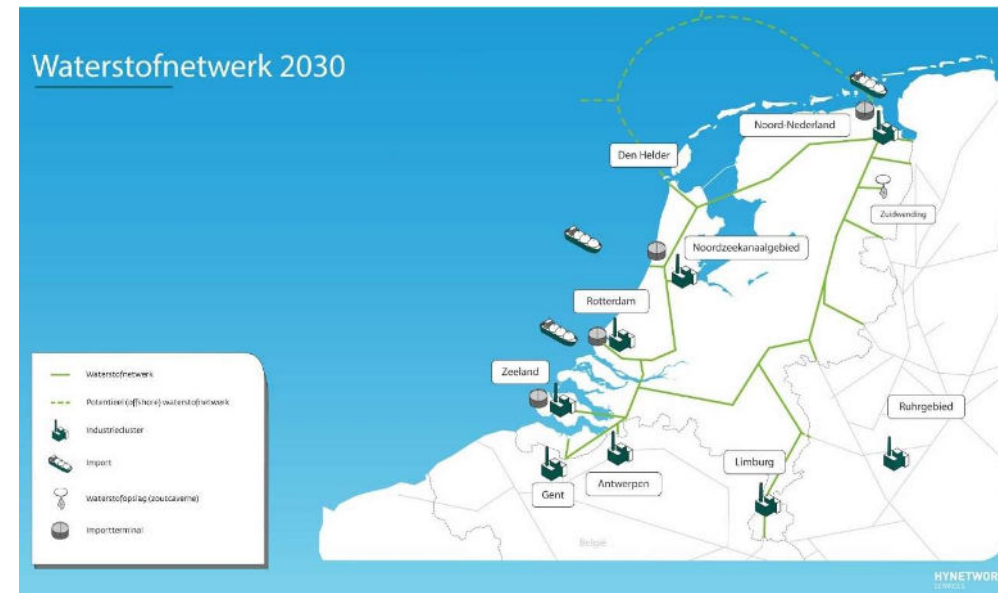
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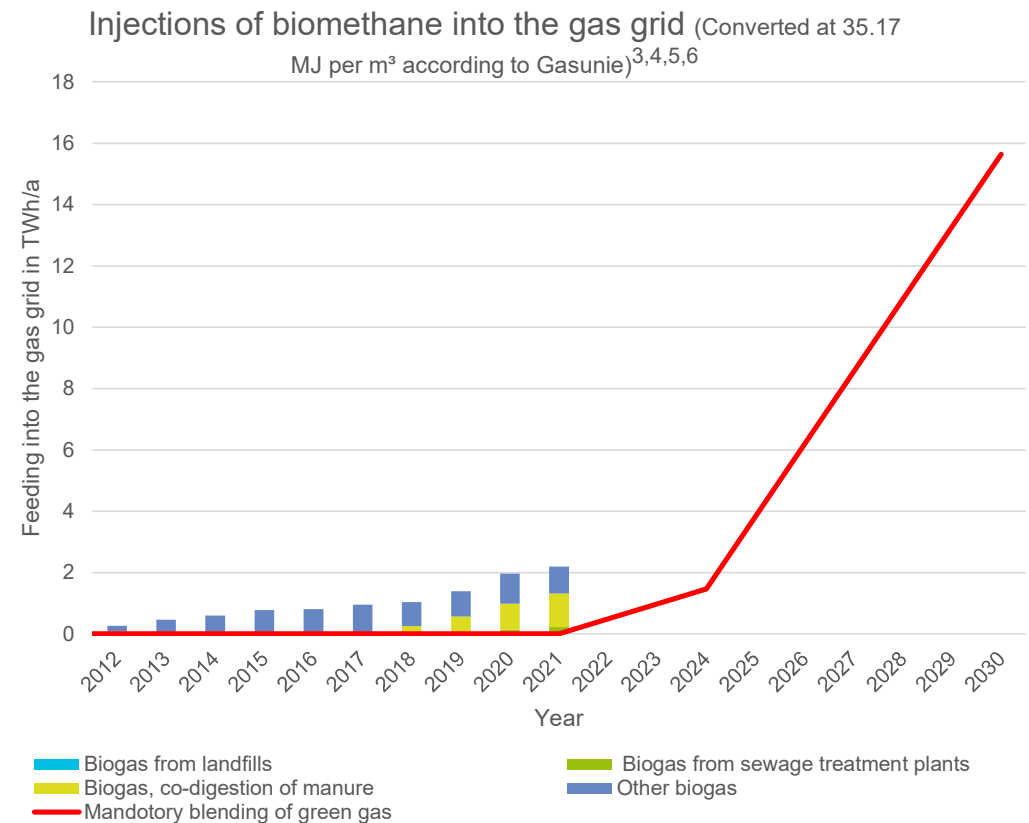
# Hydrogen

- The Dutch government has developed the "Government Vision on Hydrogen", which emphasises the role of a national hydrogen infrastructure.<sup>2</sup>
- Gasunie was commissioned in June 2021 to convert parts of its fossil gas network to hydrogen infrastructure. To realise this vision, Gasunie established a wholly owned subsidiary, Hynetwork Services, which will take responsibility for the development of the Dutch hydrogen network.<sup>1,2</sup>
- The planned hydrogen network has an ambitious mission: to connect the major industrial regions of the Netherlands, including Rotterdam, Zeeland, the North Sea Canal area, Northern Netherlands and Southern Limburg. This will be achieved by building a pipeline network of about 1,200 km, which will be developed step by step until 2030. Connections to hydrogen storage and import sites, as well as to neighbouring countries such as Belgium and Germany, are also an integral part of the network.<sup>2</sup>
- It is estimated that about 85% of the national hydrogen network will consist of rededicated gas pipelines.<sup>2</sup>
- The goal is to have the national hydrogen network fully operational by 2030.<sup>2</sup>
- The Climate Agreement sets out that the Netherlands should have at least 3-4 GW of electrolysis capacity by 2030. The aim is to increase this capacity to 8 GW by 2032 (Waterstof: de energie van de toekomst? | ID.nl)



## Biomethane

- As a substitute for fossil gas, the development of CO<sub>2</sub>-neutral gases such as green gases and green hydrogen is envisaged. The climate agreement therefore set the target of producing around 19.5 TWh of green gas by 2030. To boost demand for green gas, the government agreed on a blending obligation in the coalition agreement. This obligation increases to a total of 15.6 TWh in 2030.<sup>1</sup>
- In 2022, about 2.25 TWh of green gas was injected into the gas grid. In comparison, the total Dutch gas consumption in 2022 was about 303 TWh.<sup>3</sup> Injected green gases therefore contributed to the total gas consumption in 2022 by less than 1%.
- However, the target of 19.5 TWh of green gas in 2030 is only feasible under certain conditions (it represents an eightfold increase with respect to 2022 levels). The results of a scientific study show that if the production of green gases is not promoted more than it currently is by policy, there will neither be sufficient green gas production capacity to produce 19.5 TWh of green gas in 2030 nor enough local biomass residual flows for green gas production.<sup>2</sup>



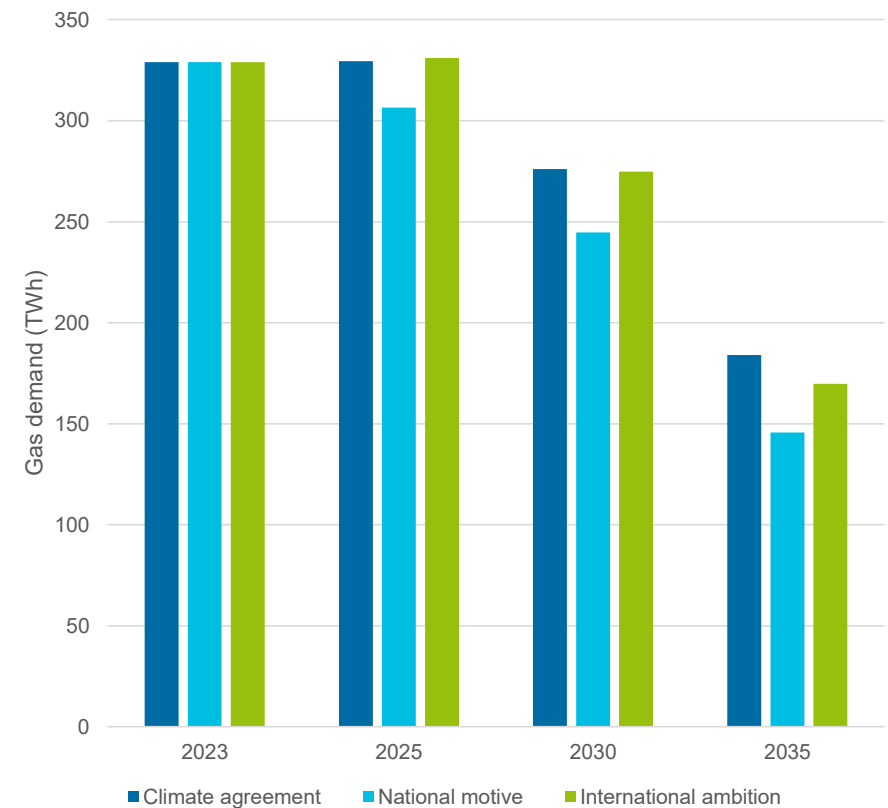
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## Climate Scenarios and fossil gas demand

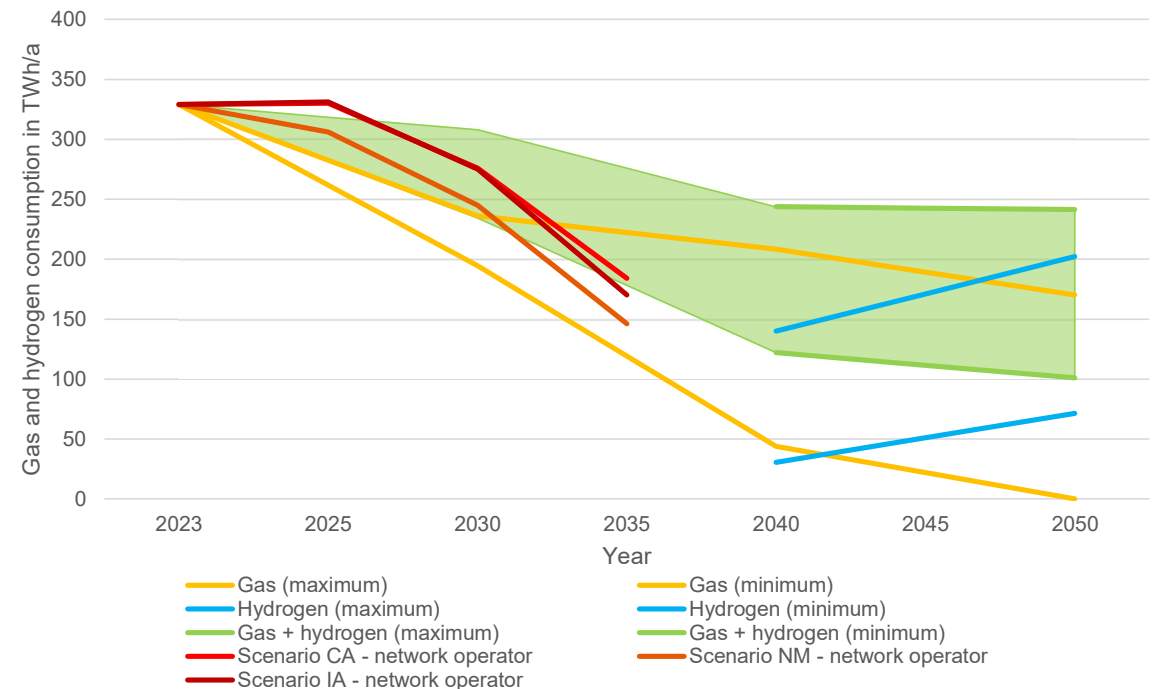
- Gasunie Transport Services (GTS) is responsible for the operation of the national gas transport network. The GTS is mandated by the Gas Act to regularly prepare an Investment Plan (IP). This plan lists upcoming expansion and replacement investments with justifications. Both the Ministry of Economy and the ACM (Authority for Consumers and Markets) review the IP.<sup>1</sup>
- Investment plans are revised, discussed and published every two years. The scenarios outlined in these plans are based on the climate agreement ratified on 28 June 2019, which involved the government, various market participants and social organisations. In addition to the climate agreement scenario, two other scenarios have been formulated: National Motivation and International Ambition.<sup>1</sup>
- The figure shows the forecast gas demand in the Netherlands, which was taken into account by the network operators in the latest report. The demand will gradually decrease in the 3 scenarios until 2035.<sup>1</sup>



## Climate Scenarios and gas demand

- There are several studies on the future development of fossil gas and hydrogen demand in the Netherlands, considering the climate targets. The figure shows the corridor of the projected future development of gas and hydrogen demand in the Netherlands and the assumptions of the gas network operators.
- Gasunie has projected three scenarios for gas and hydrogen demand that predict a decline in demand for fossil gas. The climate scenarios focus mainly on the years 2040 and 2050 and show an overall decrease in gas demand and an increase in hydrogen demand, resulting in a lower total demand for both gases.

### Climate Scenarios and gas demand - Netherlands



Future gas and hydrogen demand in the Netherlands based on different scenarios that aim to achieve the climate targets of the country and projected developments of the gas network operators. (The values in the green corridor do not correspond solely to the sum of the maximum values for gas and hydrogen. Instead, the green corridor represents the range of the total sum of hydrogen and gas within the same scenario for different scenarios. Included scenarios: Decentralised Initiative, National Leadership, European Integration, International Trade, Adapt and Transform<sup>1,2,3,4</sup>)

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## Public information and opportunities for stakeholder involvement

- In the Netherlands, the management of the gas transport system is overseen by a national transmission system operator (TSO), Gasunie Transport Services B.V. (GTS), and six regional distribution system operators (DSOs). Each year, these network operators publish information on the updated network tariffs, thus ensuring transparency for consumers.<sup>1</sup>
- In the Netherlands, the next regulatory period will start in 2027. Consequently, the main recommendations need to be addressed by then.<sup>2</sup>
- The network areas where gas is distributed are open to the public. In addition, each network operator publishes their respective investment plans, providing an insight into the planned developments and improvements within their specific network. This approach aims to keep stakeholders informed about ongoing activities and future initiatives in the Dutch gas distribution infrastructure (GTS 2022).<sup>1</sup>
- The grid areas of the distribution system operators are public. Investment plans are published by each network operator.

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