Setting a binding target for 11% renewable gas

A Gas for Climate policy paper

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GAS FOR CLIMATE
A path to 2050

Guidehouse

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Executive summary

The European Union (EU) aims to cut its greenhouse gas (GHG) emissions by 55% by 2030 compared to 1990 levels and become climate-neutral by 2050.[1] Renewable and low-carbon gases are an important building block to meet these ambitious targets. The recent Gas for Climate Gas Decarbonisation Pathways 2020-2050 report[2] concluded that current EU policies do not support a large scale-up of renewable and low-carbon gases, which are needed alongside increasing shares of renewable electricity to meet these targets. This means additional policy measures need to be put in place to meet the 2030 and 2050 climate targets.

Although renewable and low-carbon gases[3] are being scaled-up gradually, long-term policy incentives and certainty are needed to accelerate developments. Higher carbon prices, an increasing demand for renewable and low-carbon gases, and a supportive policy framework can be expected to create a business case for low-carbon hydrogen in the coming decade. The significantly higher costs for renewable gases require additional policy incentives. A binding target would create certainty for the market to invest in renewable gases.

Gas for Climate calls on the European Commission to include an 11% renewable gas target with a sub-target of 3% for renewable hydrogen and a sub-target of 8% for biomethane in the RED II as soon as possible. This target would mean that at least 11% of all gas[4] consumed in the EU by 2030 must be biomethane or renewable hydrogen. In line with current RED II Article 25 (1), member state shall set an obligation on fuel suppliers to ensure an overall share of renewable gas within the EU gas consumption of at least 11% by 2030.

It makes sense that the EU target of 11% renewable gas is translated into differentiated member state-level obligations, taking into account the different starting points. National sectoral targets could also be considered. Such an approach would guarantee a fair distribution of efforts across the EU and could help to ensure political acceptance of the measure in member states. Leaving the scale-up of renewable gases completely to EU member states could lead to scattered markets with limited competition and trade. An EU target for renewable gases has the benefit of helping to create a pan-European liquid market with relatively low transaction costs, further bringing down the costs for renewable gases. If the market ramp-up is delayed, achieving net-zero by 2050 becomes more challenging and more expensive.

A 11% renewable gas target can effectively deliver at least 40 GW of renewable hydrogen production capacity within the EU by 2030, which the Commission calls for in its recent hydrogen strategy[5], which is about 140 TWh of renewable hydrogen produced from renewable electricity. The renewable gas mandate will lead to about 360 TWh of biomethane produced from biowaste and sustainable, low indirect land use change (ILUC) risk intermediate crops. The 2030 renewable gas target should be implemented with a clear indication that it will be continued and increased after 2030. That indication would provide certainty to producers and to end use sectors about the long-term outlook for renewable hydrogen and biomethane.

1 European Commission, *2030 climate & energy framework*, accessed January 2021, https://ec.europa.eu/clima/policies/strategies/2030_en.
2 Gas for Climate, *Gas Decarbonisation Pathways 2020-2050*, April 2020, https://gasforclimate2050.eu/?smd_process_download=1&download_id=339.
3 Low-carbon gas refers to low-carbon hydrogen while renewable gas refers to both renewable hydrogen and biomethane.
4 Includes final gas consumption, gas for power generation, and gas for feedstock.
5 European Commission, *A hydrogen strategy for a climate-neutral Europe*, July 2020, https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020DC0301&from=EN.

1. Background and Core Objectives

In December 2020, the EU raised its 2030 GHG reduction target to 55% compared to 1990 levels. This significant increase in ambition requires a complete overhaul of the energy system, its infrastructure, and the respective EU policy framework.

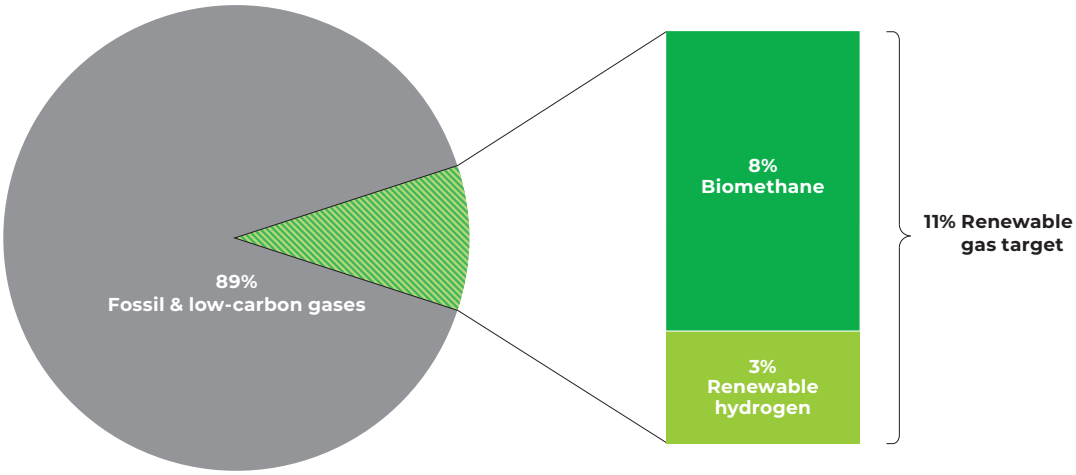
Renewable and low-carbon gases like renewable hydrogen, low-carbon hydrogen, and biomethane play a critical role towards meeting the 2030 GHG reduction targets and achieving net-zero emissions by 2050. These gases are needed for hard-to-decarbonise sectors such as energy-intensive industries and heavy/maritime transport. However, Gas for Climate concluded in its recent Gas Decarbonisation Pathways 2020-2050 report[6] that existing EU energy and climate policies (even when fully implemented by member states) and National Energy and Climate Plans (NECPs) will not be sufficient to lead to a meaningful deployment of renewable and low-carbon gases by 2030 and 2050[7]. With current developments, reducing GHG emissions by 55% by 2030 will be challenging and reaching the 2050 target will become highly unrealistic. Additional measures are needed. Private investments in renewable and low-carbon gases and gas infrastructure require long-term certainty, also beyond 2030. An overall decarbonisation objective with the appropriate regulatory framework for renewable and low-carbon gases, including a clear target for renewable gases would provide investment certainty to energy-using sectors, investors, and project developers, increasing the prospects of meeting both mid- and long-term climate targets.

As was the case with wind and solar electricity in the past, renewable and low-carbon gases are not cost-competitive, delaying their market ramp-up, which is a prerequisite to realise cost reductions. Recent project developments show costs for low-carbon hydrogen of around €37-€41/MWh, while costs are around €70-€130/MWh for renewable hydrogen and €50-€100/MWh for biomethane.[8] In comparison, natural gas today has a very low cost of around €15/MWh. With the expected increase in renewable and low-carbon gas demand and rising carbon prices, a business case for low-carbon hydrogen can be realised in the short-term, provided the appropriate regulatory framework is put in place to incentivise a switch from grey to low-carbon hydrogen.

6 Gas for Climate, *Gas Decarbonisation Pathways 2020-2050*, April 2020, https://gasforclimate2050.eu/?smd_process_download=1&download_id=339.
7 Gas for Climate, *Gas Decarbonisation Pathways 2020-2050*, April 2020.
8 Gas for Climate, *Market state and trends in renewable and low-carbon gases in Europe,* December 2020, https://gasforclimate2050.eu/?smd_process_download=1&download_id=546.

High costs for biomethane and renewable hydrogen production require additional support schemes to promptly kick-start their market ramp-up and bring costs down. Therefore, Gas for Climate advocates introducing a binding 11% target for renewable gas by 2030 (see Figure 1). This means that 11% of the gas consumed in the EU by 2030 must be renewable hydrogen and biomethane. To ensure a consistent ramp-up of these gases, Gas for Climate proposes to complement the 11% renewable gas target with two sub-targets. At least 3% of gas consumed in 2030 must be renewable hydrogen and at least 8% must be biomethane.

Figure 1.
2030 11% renewable gas target



To account for differences between member state, this EU target could be translated into national targets, to account for differences in starting points. Implementing an 11% target for renewable gases on an EU level, including sub-targets for renewable hydrogen and biomethane, that considers national differences, would be an adequate option to implement the EU's increased ambition. The first Renewable Energy Directive (RED I), which set a clear European target for renewable energy, has proven effective in scaling up renewable power. The same mechanism should be used to scale up renewable gases. By mandating 11% gas consumed from renewable sources by 2030, the European Green Deal[9] can further accelerate the low-carbon transition. A clear target can push renewable gases to take their full role in achieving net-zero emissions by 2050, while providing instant benefits like reduced emission, cleaner air, more jobs, and positioning EU industry as a solid front-runner among growing global markets.

9 European Commission, *A European Green Deal, accessed January 2021,* https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

Increase the likelihood to meet the 55% target by 2030

The increased 2030 ambition level is also reflected in the EU strategies on hydrogen and energy system integration.[10, 11] To realise these additional GHG savings in a cost-effective and timely way, the role of renewable gas in the EU energy system needs to be strengthened. Today, natural gas is commonly used in industry for medium- to high-temperature heat processes. In the buildings sector, natural gas is used in heating boilers. In the transport sector a modest, but increasing amount of natural gas is used, especially in heavy transport.[12] Renewable gases, in particular biomethane, could replace natural gas in these applications without investments in new end-use appliances or networks, which is in contrast to direct electrification. Installing new technologies also requires time, which risks not reducing emissions quickly enough to meet an ambitious 2030 GHG reduction target. As renewable gases are largely compatible with current technologies, they can deliver the instant GHG reductions needed to meet a 55% reduction target.

Put Europe on track to climate neutrality by 2050

When designing a new, ambitious energy and climate framework for 2030, it is important to keep the long-term goal of climate neutrality by 2050 in mind. The energy system for a decarbonised Europe will be based on an interplay between the production of renewable electricity and renewable gases to transport, store, and supply all sectors with green energy at the lowest possible costs. Because the necessary investments are made for 20-60 years, it is important to create long-term planning certainty for investors and end-use sectors. Hydrogen and biomethane costs are relatively high now but can be expected to decrease with economies of scale. Having an 11% target for renewable gases in place at the EU level would lead to investments in more and larger production plants for hydrogen and biomethane, triggering a steep learning curve with gradually decreasing costs. End-use sectors that depend on renewable gases for decarbonisation would benefit from the increased availability of affordable renewable gas.

10 European Commission, *A hydrogen strategy for a climate-neutral Europe*, July 2020, https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020DC0301&from=EN.
11 European Commission, *Powering a climate-neutral economy: An EU Strategy for Energy System Integration,* July 2020, https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020DC0299&from=EN.
12 Natural & bio Gas Vehicle Association (NGVA Europe), *2019 in numbers: gas in transport – the choice of European consumers*, February 2020, https://www.ngva.eu/medias/2019-in-numbers-gas-in-transport-to-satisfy-european-consumers/

2. The role of renewable gases towards climate neutrality

Renewable gases have different roles in a decarbonised energy system and the wider economy as they provide:

- Storable and dispatchable renewable energy alongside wind and solar PV;
- Heat to buildings that have gas grid connections, including using hybrid heating solutions;
- High temperature heat and feedstock in energy-intensive heavy industry;
- Energy-dense fuel for heavy and long-distance road transport and shipping;
- Feedstock for synthetic kerosene for aviation;
- Cross-sectoral advantages in terms of waste management, promotion of (soil) biodiversity, and negative emissions;
- Future-proof jobs and foster rural economies.

The following sections highlight the value of renewable hydrogen and biomethane as well as key barriers currently still hindering the realisation of their potential.

2.1 Renewable hydrogen is a cornerstone of long-term decarbonisation

Hydrogen is enjoying renewed and rapidly growing attention in Europe and around the world. In its European hydrogen strategy, the Commission refers to hydrogen as *"essential to support the EU's commitment to reach carbon neutrality by 2050 and for the global effort to implement the Paris Agreement while working towards zero pollution."* The strategy also defines an *"objective to install at least 40 GW of renewable hydrogen electrolysers by 2030 and the production of up to 10 million tonnes of renewable hydrogen in the EU"*. The establishment of the European Clean Hydrogen Alliance[13], bringing together industry, national and local public authorities, civil society and other stakeholders to accelerate hydrogen technologies, reiterates the growing importance of hydrogen within the EU. hydrogen within the EU.

13 European Commission, *European Clean Hydrogen Alliance*, accessed December 2020, https://ec.europa.eu/growth/industry/policy/european-clean-hydrogen-alliance_en.

On a national level, renewable hydrogen has enjoyed a recent surge of interest: six member states have set individual 2030 renewable hydrogen ambitions while the Polish national hydrogen strategy is expected to be published in February 2021. Existing national plans add up to about 26 GW (see Table 1), which is around two-thirds of the European ambition of at least 40 GW by 2030.[14] Countries outside the EU such as Morocco, Australia, Ukraine, China and South Korea have announced renewable hydrogen ambitions.[15] However, in the EU and global energy system, hydrogen plays only a small role, and it is still largely produced from fossil fuel.

Table 1.
2030 electrolysis capacity ambition per member state and the EU

	Germany	NL	France [16]	Spain	Portugal	Italy	EU
Electrolysis capacity (GW)	5	3-4	6.5	4	3	5	at least 40

Hydrogen can be used as a feedstock and a fuel. It is storable and has many possible applications across the industry, transport, power and buildings sectors. Most importantly, hydrogen does not emit CO_2, and no air pollution occurs when it is used. Thus, it offers a solution to decarbonise industrial processes and economic sectors where reducing carbon emissions is both urgent and hard to achieve. All this makes hydrogen essential to support the EU's commitment to reach climate neutrality by 2050 and the global effort to implement the Paris Agreement.

To enable the benefits of renewable hydrogen, a market needs to be established. Today, demand for renewable hydrogen is still limited because of high production costs. Current hydrogen use in the EU amounts to 339 TWh,[17] which is grey hydrogen based on natural gas. Renewable hydrogen production today is confined to some smaller pilot plants. Around 90% of the hydrogen used in the EU is produced in captive processes, meaning that natural gas is supplied to a site where the hydrogen is produced and used, mostly in refineries, ammonia plants (often as part of a fertiliser plant), or methanol plants. Costs for grey hydrogen production through steam methane reforming are around €28/MWh, €37-€41/MWh for low-carbon hydrogen and €70-€130/MWh for renewable hydrogen.[18]

14 Ludwig-Bölkow-Systemtechnik GmbH, *International Hydrogen Strategies*, published on behalf of the World Energy Council Germany, September 2020, https://www.weltenergierat.de/wp-content/uploads/2020/09/WEC_H2_Strategies_finalreport_200922.pdf.
15 Ludwig-Bölkow-Systemtechnik GmbH, *International Hydrogen Strategies*, published on behalf of the World Energy Council Germany, September 2020.
16 The French hydrogen strategy allows decarbonised electricity (which can be understood as including nuclear-based electricity) and renewable electricity for hydrogen production via electrolysis. Hydrogen produced from nuclear electricity does not count as renewable hydrogen.
17 Fuel Cells and Hydrogen 2 Joint Undertaking, *Hydrogen Roadmap Europe*, 2019, https://www.fch.europa.eu/sites/default/files/Hydrogen%20Roadmap%20Europe_Report.pdf.
18 Gas for Climate, *Market state and trends in renewable and low-carbon gases in Europe*, December 2020, https://gasforclimate2050.eu/?smd_process_download=1&download_id=546.

The recently published hydrogen strategies by the EU and several member states aim to support the market ramp-up of renewable hydrogen, while acknowledging the need for low-carbon hydrogen to help increase demand across Europe. From an overall GHG emissions reduction approach it makes sense that initial commercial-scale renewable hydrogen projects are developed alongside low-carbon hydrogen projects; this will help to create sufficient hydrogen supply and allow demand sectors to start using it at some scale, providing the basis for technological development towards larger and cheaper electrolysers. In terms of infrastructure, blending hydrogen in the existing gas grid is often considered as a transitional way to quickly scale-up hydrogen supply. Repurposing the existing gas infrastructure to transport hydrogen saves costs. The costs for repurposing are estimated to be 10%-35% of a newly constructed hydrogen pipeline.[19] A general political recognition of using the existing gas infrastructure to efficiently decarbonise a part of the European economy is advisable.

The various hydrogen strategies foresee subsidy schemes, e.g. contracts for difference, to offset the high production costs and create demand. While subsidies are a great way to foster innovation and demonstrate technologies at scale, they rely on government budgets, provide only limited long-term planning certainty, and do not incentivise cost reductions. A binding target is not paid for by government budgets; rather it is paid by gas consumers, which increases the stability of the system and the predictability for investors. While a binding target may initially increase costs for market participants, it will lead to lower costs by creating a large and growing market.

2.2 Biomethane can realise instant GHG savings and a more circular energy system

Biomethane has multiple benefits. It is a renewable gas resulting in high GHG savings due to the short carbon cycle of biomass feedstock. It is fully compatible with the existing gas grid, can improve waste management, supports rural economies and has the ability to generate negative emissions.[20] The ability to create negative emissions is significant because almost all authoritative climate change scenarios show that the world needs substantial negative emissions to achieve net-zero GHG emissions and keep global temperature increase well below 2°C.

Biomethane production through anaerobic digestion is a proven and market-ready technology with little associated technological risks. Biomethane production through gasification, while less mature than anaerobic digestion, can produce biomethane at a larger scale. Biomethane can be made available quickly, provides storable and dispatchable energy and allows for the decarbonisation of high temperature heat.

19 Guidehouse, *European Hydrogen Backbone*, July 2020, https://gasforclimate2050.eu/?smd_process_download=1&download_id=471.

20 For example, when combined with carbon capture and storage from carbon soil sequestration linked to biomass cultivation intensification.

Europe has seen a continued growth in the number of biogas plants over the past decade. Most biogas plants are used to produce electricity and heat while a small but growing share is used to generate biomethane, which is afterwards injected into the gas grids. In 2018, about 16,700 biogas plants and 473 biomethane plants were in operation across the EU.[21] Some EU member states have already implemented policies supporting the production and use of biomethane. For instance, France has set a 10% target of green gases in gas demand by 2030, with intermediate volume targets. This favourable framework has helped to increase biomethane production, bringing the number of biomethane plants from 17 in 2015 to 172 in 2020 and annual production from 83 GWh to 1,200 GWh. Since 2019, Italy has seen a boost in new biomethane investments, with about 40 new plants expected to become operational during 2020. On the contrary, Germany, the largest player in the EU with around 200 biomethane plants, has seen growth flattening due to changes in its national support scheme. These developments highlight that if a supporting policy regime is put in place, biomethane will scale-up quickly, and so do the associated GHG savings.

Biomethane still faces numerous barriers for its scale-up, most importantly the lack of proper incentives for production and use. Such incentive could be a high CO_2 price, a proper implementation of the waste hierarchy or the fact that the EU vehicle emission reduction regulations only consider tailpipe emissions rather than 'well to tank' emissions. Another barrier is lack of local and regional coordination for biomass procurement. Hence, the current scale-up of biomethane is limited to just a few member states. While Germany still has most of the plants, exponential growth in production capacity occurs in mainly France, Italy and Denmark due to favourable regulatory frameworks, including clear targets. Other countries offer no or limited support for biomethane. The scattered scale-up of biomethane due to different approaches by member states presents a key barrier to realising its full potential. A harmonised EU policy in the form of clear targets, taking into account the regional differences in sustainable biomass potential, is required to ensure that biomethane can be scaled up and can deliver its societal value in decarbonising the EU energy system at the lowest possible cost.

21 Gas for Climate, *Market state and trends in renewable and low-carbon gases in Europe*, December 2020, https://gasforclimate2050.eu/?smd_process_download=1&download_id=546.

3. Designing the renewable gas target

The proposed target is a demand target, requiring that at least 11% of gas consumed in the EU by 2030 must be either biomethane or renewable hydrogen. The general target is supported by binding sub-targets for renewable hydrogen and biomethane to ensure an accelerated and consistent market ramp-up across the EU: at least 8% of the gas consumed in the EU by 2030 must be biomethane and at least 3% must be renewable hydrogen. The sub-targets reflect the potential for biomethane from sustainable biomass and renewable hydrogen from additional renewable electricity capacity. The specific targets for each member state can vary from the EU targets based on the different starting points. The rationale for the renewable gas target setting as well as the proposal regarding the obligated party and implementation is described in the following sections.

3.1 Balanced target setting

Based on comprehensive analyses, Gas for Climate's Gas Decarbonisation Pathways 2020-2050 study[22] foresees rapidly growing demand for renewable and low-carbon gases in the short- to mid-term given an enabling policy regime. As laid out in Chapter 1, a clear 2030 target can create the certainty and predictability required for long-term investments in renewable gas production, infrastructure, and end-use applications.

Gas for Climate expects a larger role for biomethane in 2030 due to its advanced market ramp-up and full compatibility with the gas grid compared to renewable hydrogen—provided a supportive policy framework is in place. Around 0.5% (23 TWh) of the gas consumed in Europe is biomethane (and ~4% or 170 TWh is biogas); renewable hydrogen's share is negligible.[23] The biomethane share could be increased to 3% in the short-term if part of the existing biogas plants is upgraded to produce biomethane.[24] A 2030 sub-target of 8% for biomethane that includes a clear trajectory beyond 2030 would send a strong signal for investments in biomethane production plants. The Gas Decarbonisation Pathways 2020-2050 study[25] concluded that, considering the potential of sustainable biomass,[26] these new investments could increase the share of biomethane by at least another 6 percentage points by 2030. By picking the easiest opportunities (upgrading biogas plants) and raising the ambition level to incentivise investments in new plants (sub-target of 8% for biomethane) the biomethane share can reach 8%-10% by 2030.

22 Gas for Climate, *Gas Decarbonisation Pathways 2020-2050*, April 2020, https://gasforclimate2050.eu/?smd_process_download=1&download_id=339
23 Gas for Climate, *Market state and trends in renewable and low-carbon gases in Europe*, December 2020, https://gasforclimate2050.eu/?smd_process_download=1&download_id=546
24 Gas for Climate, *Gas Decarbonisation Pathways 2020-2050*, April 2020.
25 Gas for Climate, *Gas Decarbonisation Pathways 2020-2050*, April 2020.
26 Around 350-370 million dry tonnes per Gas for Climate, *The optimal role for gas in a net-zero emissions energy system*, March 2019, https://gasforclimate2050.eu/wp-content/uploads/2020/03/Navigant-Gas-for-Climate-The-optimal-role-for-gas-in-a-net-zero-emissions-energy-system-March-2019.pdf.

The EU strategy on energy system integration also considers a "share or quota only for renewable hydrogen"[27] to support the market ramp-up. A sub-target for renewable hydrogen of 3% avoids major compatibility issues with the transport infrastructure and most end-use applications.[28] During the 2020s, pipeline transport can take the form of hydrogen blended in natural gas or pure hydrogen transported via the first dedicated pipelines. Most end-use applications, e.g. boilers in buildings, can cope with small fractions of hydrogen. Blending higher shares of hydrogen may require upgrades to current gas infrastructure and end-use applications to avoid compatibility issues. Industrial feedstock consumers have limitations in what percentage of hydrogen they can take in and the (unpredicted) variations they can accept.[29]

3.2 Including the target in the REDII

EU renewables targets are set in the RED. Including the proposed 11% renewable gas target and the sub-targets for biomethane and renewable hydrogen as a revision to the RED II is the preferred option. Gas for Climate proposes that the 11% target for renewable gas should be implemented as a consumption target to be met by economic operators which can be gas suppliers, similar to the existing renewable fuels target as part of the RED II. Member states should have the option to further define the gas consumption target, e.g. set specific consumption targets per end-use sector. Gas suppliers can meet the obligation by starting to produce renewable gas themselves, by sourcing renewable gas from others, or by purchasing renewable gas certificates to green their supply. Certificates should ensure that for each quantity of renewable gas that counts towards the target, somewhere in the EU a corresponding quantity of renewable gas is put on the market, like the certification system in place for green electricity. For renewable hydrogen, additionality is an important criterion. The exact definition regarding additionality of renewable hydrogen will be defined in a delegated act to the RED II, expected in 2021. As the obligated party is the fuel supplier, the place of consumption is relevant to meeting the target. Therefore, physical imports of biomethane and renewable hydrogen from within the EU as well as outside the EU should count towards the target, as is already the case for imports of renewable fuels to fulfil the existing 14% renewable fuels target in transport (RED Article 25 (1)) and imports of renewable electricity (Article 11 (2)) as part of RED II. Gas for Climate calls upon the Commission to propose a revision of RED Article 11 (2) to include physical imports of renewable gases. A possible article to be included in the RED II could read like this:

27 European Commission, *Powering a climate-neutral economy: An EU Strategy for Energy System Integration*, July 2020, https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020DC0299&from=EN.
28 GRTgaz et al, *Technical and economic conditions for injecting hydrogen into natural gas networks,* June 2019, https://www.grtgaz.com/fileadmin/plaquettes/en/2019/Technical-economic-conditions-for-injecting-hydrogen-into-natural-gas-networks-report2019.pdf.
29 Marcogaz, *Overview of available test results and regulatory limits for hydrogen admission into existing natural gas infrastructure and end use*, 2019, https://www.marcogaz.org/app/download/8105290863/TF_H2-427.pdf?t=1574766383.

Possible article to include in RED II

To mainstream the use of renewable gases in the energy system, each member state shall set an obligation on economic operators to ensure an overall share of renewable gas as part of total EU gas consumption of at least 11% by 2030 in accordance with an indicative trajectory set by the member state and calculated in accordance with the methodology set out in Article 26. The Commission shall assess the obligation, with a view to submitting, by 2025, a legislative proposal to increase the 11% target in the event of further substantial costs reductions in the production of renewable gases, where necessary to meet the Union's international commitments for decarbonisation, or where justified on the grounds of a significant decrease in energy consumption in the Union.

To calculate the minimum share referred to in the first subparagraph, member states shall take into account only renewable hydrogen and biomethane.

Within the minimum share referred to in the first subparagraph, the contribution of biomethane as share of EU gas consumption shall be at least 8% in 2030 while the contribution of renewable hydrogen as share of EU gas consumption shall be at least 3% in 2030.

Gas from renewable sources produced in a third country and physically imported to the EU shall be taken into account for the purposes of calculating the renewable energy shares of the member state.

As the potential for renewable gases varies across member states, individual targets for member states may differ. A flat target would not properly reflect the different starting points in terms of current shares of renewable gases in various member states. Countries such as Denmark and Sweden already have a relatively high share of renewable gas, while many other countries have renewable gas shares close to zero. Significant investments would be required from those member states to comply with the 11% target. In contrast, member states with a high share of renewable gas need to make little investments. Considering the significantly deviating impact, a flat 11% target may result in opposition from member states that are burdened with substantial investments to meet the target. Apart from the different starting points, the process of setting national targets could consider national GDP, the availability of sustainable biomass, solar and wind potential, and national climate and energy strategies. A similar approach is used in the governance regulation defining the so-called backup benchmarks for member states' contributions to the EU renewable energy target.

While there is an overall 32% renewable target for the EU, the back-up trajectories for each member state differ significantly. These expected contributions range from 10% in Malta to 49% in Sweden. France is an example of how such an approach could work in the context of renewable gas. To better understand the national potential for biomethane, the French energy regulator (CRE) has tasked the network operators to develop a techno-economic potential map for 500 zones across France.[30] Other countries could use this type of zoning approach to get a more complete picture of the quantities and costs for grid-injected biomethane throughout the EU. Member states could also set dedicated sector targets—e.g. a hydrogen target for industry or heavy transport.

On top of setting differentiated targets, funding from the EU will further increase the political acceptance of a binding renewable gas target. The EU Council recently agreed on the upcoming Multiannual Financial Framework (MFF, ~ €1,000 billion from 2021 to 2027) and the Next Generation EU fund (€750 billion). An estimated €550 billion will be set aside for climate action, compared to €210 billion in the previous MFF, accounting for 30% of the overall budget. Part of the funds could be used to incentivise investments in renewable gases, support research and development or reduce cost for the end consumer.

The political messaging on the long-term outlook for renewable and low-carbon gases in the EU energy system is important. The experience of the EU RED biofuels mandate, which has been constantly subject to fierce debate since 2008, shows that investors will shy away from large investments in bioenergy unless unambiguous political support is provided that 'bioenergy done right' can, under the right sustainability conditions, be a valuable and affordable contribution to the decarbonisation of the EU energy system.

30 Gas for Climate Newsletter, July 2020, https://gasforclimate2050.eu/?smd_process_download=1&download_id=474.

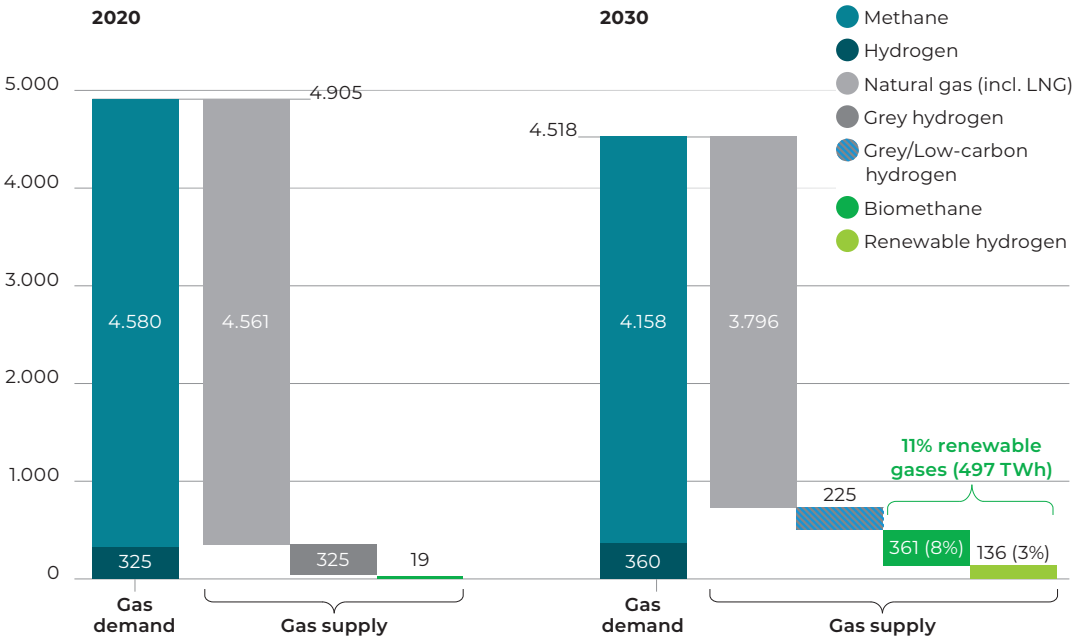
4.
Impact assessment

The impact assessment's aim is to better understand the rationale behind the proposed binding target for renewable gas and its implications on the cost-effectiveness of GHG reductions and on energy supply and demand by 2030.

4.1 Energy demand and supply

Our scenario,[31] which is in line with achieving the EU target to reduce GHG emissions by 55% by 2030 compared to 1990 levels, forecasts a decreasing gas demand from 4,905 TWh in 2020 to 4,518 TWh in 2030 (see Figure 2). The reduction in gas demand is induced by increased energy efficiency through building retrofits and partial electrification across sectors.

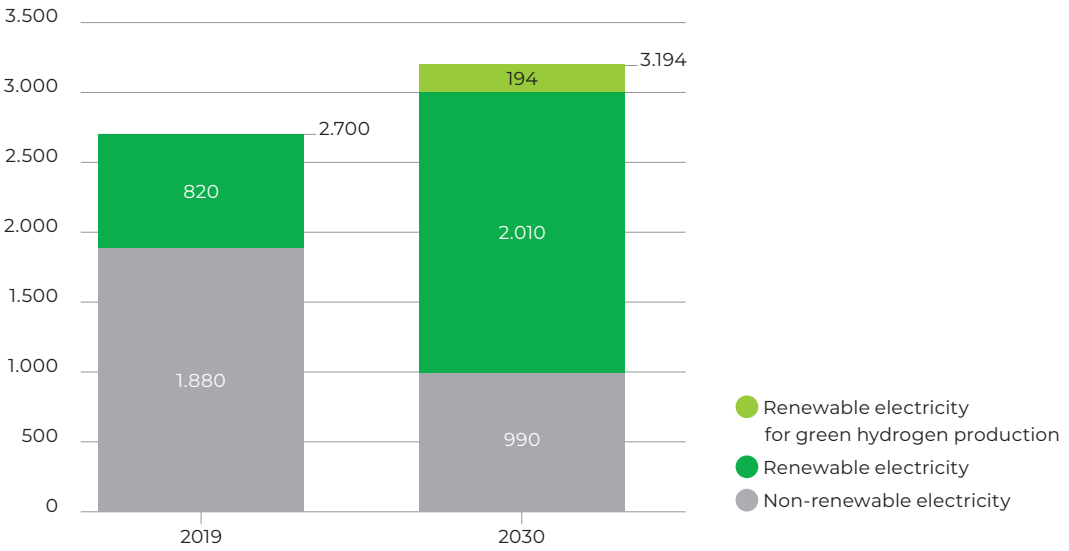
Figure 2.
Gas supply and demand in 2020 and forecast for 2030 for EU 27 + UK[32] (in TWh)



31 The 2030 scenario is largely based on the Accelerated Decarbonisation Pathways scenario in the Gas for Climate *Gas Decarbonisation Pathways 2020-2050* report.
32 Gas for Climate, *Gas Decarbonisation Pathways 2020-2050*, April 2020, https://gasforclimate2050.eu/?smd_process_download=1&download_id=339.

Introducing an 11% target for renewable gases would translate into 497 TWh of renewable gases (361 TWh biomethane, 136 TWh renewable hydrogen) by 2030. The 136 TWh of renewable hydrogen reflect the Commissions' ambition of at least 40 GW of electrolysis capacity installed by 2030, which could produce around 112 TWh[33] of renewable hydrogen. Assuming an electrolysis efficiency of 70% the renewable electricity required to produce 136 TWh of renewable hydrogen is around 194 TWh. According to the recent impact assessment by the Commission, the electrification of transport and low-temperature heat is forecast to increase final electricity demand from around 2,700 TWh in 2019 to approximately 3,000 TWh in 2030.[34] To meet the growing demand while reducing GHG emissions, electricity generation from renewables has to grow substantially. In 2019, around 30% of electricity produced in the EU was renewable.[35] The Commission's calculations in its recent impact assessment show that this share must rise to around 67% by 2030 to meet the 55% GHG emissions reduction target. Annual renewables deployment must double from its 2010-2019 average of 46 TWh per year in 2019-2030 to meet the growing electricity demand and EU targets. To reach a 67% share of electricity from renewables by 2030 given the extra increase in electricity demand, renewables must grow at least by 100 TWh/year from 2019 to 2030. Looking at historic growth rates in EU member states, only a few countries—Denmark, Portugal, Germany, and Ireland—have seen sufficiently robust growth to meet the EU 2030 target.[36] Overall, more than 1,000 TWh of additional electricity production from renewable sources is needed by 2030 to meet the Commissions target. On top of that, 194 TWh renewable electricity, reflecting the sub-target of 3%, is required for renewable hydrogen production. A small fraction of the renewable hydrogen is likely to be produced from otherwise curtailed electricity, limiting the need for new renewable generation capacity.

Figure 3.
Total electricity production in 2019 and forecast for 2030 for EU 27 + UK (in TWh)



33 Assuming an electrolyser efficiency of 70% and 4,000 full load hours.
34 European Commission, *Impact assessment accompanying the document stepping up Europe's 2030 climate ambition - investing in a climate-neutral future for the benefit of our people,* August 2020, https://ec.europa.eu/clima/sites/clima/files/eu-climate-action/docs/impact_part2_en.pdf.
35 Eurostat, *Electricity generation statistics – first results*, accessed January 2021, https://ec.europa.eu/eurostat/statistics-explained/index.php/Electricity_generation_statistics_%E2%80%93_first_results#Production_of_electricity.
36 Agora Energiewende and Sandbag, *The European Power Sector in 2019: Up-to-Date Analysis on the Electricity Transition*, March 2020, https://www.agora-energiewende.de/fileadmin2/Projekte/2019/Jahresauswertung_EU_2019/172_A-EW_EU-Annual-Report-2019_Web.pdf

Gas for Climate fully supports increasing electrification across sectors to reduce GHG emissions. However, there are concerns regarding the feasibility of steep electrification and the required ramp-up of renewable power by 2030. Without the large scale-up of biomethane, meeting the 2030 GHG reduction target will heavily rely on the rapid expansion of renewable power, which may be risky because only Denmark, Portugal, Germany and Ireland have shown to be capable to deliver a sufficiently large increase in renewable power.

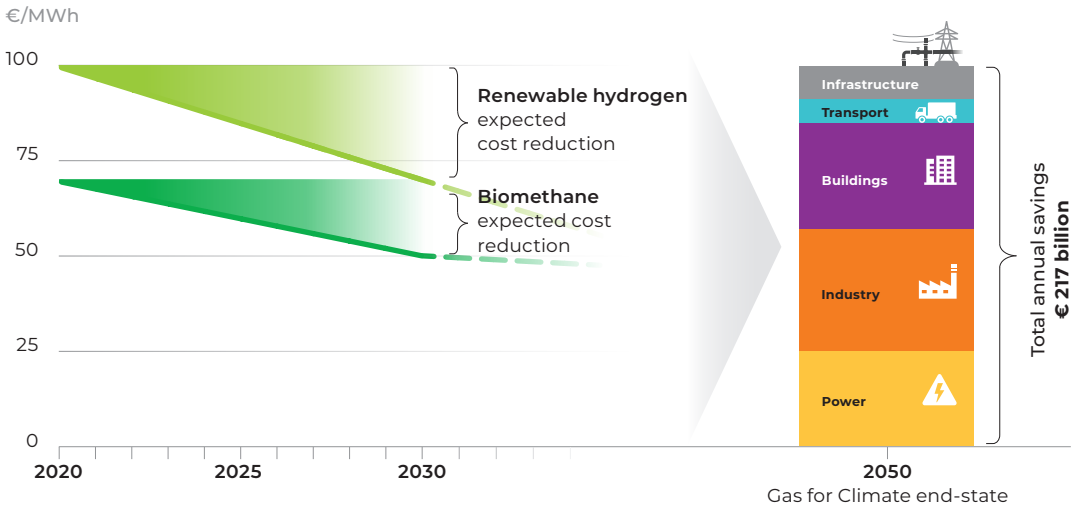
4.2 Cost effective GHG reduction

A binding target for renewable gases provides long-term certainty for investors and incentivises cost reductions. While a binding target may initially increase costs for certain market participants, namely gas consumers, it will lead to lower overall societal costs by creating a large and growing market. A full cost assessment of the expected incurred costs for gas consumers would require further analysis that surpasses the scope of this paper, as effects on additional needs for electricity scale-up and electricity infrastructure development would have to be taken into account, thoroughly quantified and assessed. Yet, these expected incurred costs need to be weighed against the substantial costs reductions of biomethane and hydrogen that are expected by an 11% renewable gas target, as it will drive down their costs and therefore help to deliver climate neutrality at the lowest societal costs as we analysed in previous Gas for Climate studies.

Gas used in existing gas infrastructure is indispensable to achieve cost-effective full decarbonisation. Not scaling up renewable and low-carbon gas will lead to unnecessary costs. Using existing gas infrastructure also helps create public acceptance of the energy transition by avoiding unnecessary new overhead powerlines. The societal savings of using existing infrastructure and realising the benefits of renewable and low-carbon gases amount to over €200 billion annually by 2050 in comparison to a minimal gas scenario (see Figure 4). Savings arise from lower costs for insulation and heating technologies in buildings (€61 bn/year), using hydrogen transported through gas infrastructure to decarbonise high temperature industrial heat and feedstock (€70 bn/year), lower energy costs in transport (€14 bn/year), deployment of gas-fired dispatchable power as compared to more expensive solid biomass-fired dispatchable power (€54 bn/year) and efficient use of energy infrastructure (€19 bn/year).[37]

37 Gas for Climate, *The optimal role for gas in a net-zero emissions energy system,* March 2019, https://gasforclimate2050.eu/wp-content/uploads/2020/03/Navigant-Gas-for-Climate-The-optimal-role-for-gas-in-a-net-zero-emissions-energy-system-March-2019.pdf

Figure 4.
Gas target will lead to cost reduction for biomethane and renewable hydrogen in the short- to mid-term and substantial societal cost savings in the long-term



Renewable gases are still in an early market phase characterised by relatively high costs and small production capacity. A market ramp-up of novel technologies, supported by clear policy targets, usually stimulates a steep learning curve bringing down costs. Up to 2030, biomethane will need to play a dominant role in the gas transition. The market ramp-up will allow for a drop in pricing in biomethane whilst in that period also renewable hydrogen can develop further with expected fast reduction in cost. Together this will lead to a large uptake of both renewable gases by 2050. Costs for biomethane are decreasing with economies of scale and innovation and are expected to drop to as low as €47MWh in 2050.[38] The cost of biomethane also involves the cost related to enhancement of sustainable farming, soil enhancement, waste management and increased biodiversity. Should those cost be vectored out of the energy price (i.e. paid for in a different way) then the energy cost price of biomethane will come down significantly. The reduction in cost of renewable hydrogen production is driven by the availability and declining costs of renewable power, increasing electrolyser efficiency and declining CAPEX due to economies of scale and technology learning. Maturing the electrolyser sector requires projects on the 100 MW to 1 GW scale, which is a scale jump of 1-2 orders of magnitude from current levels. Estimations for renewable hydrogen production costs for 2050 are as low as €17/MWh.

If the market ramp-up of renewable gas is delayed, it will be more difficult and more expensive to fully decarbonise the EU energy system by mid-century. Gas for Climate has shown that decarbonising on the basis of a smart combination between large quantities of renewable electricity with renewable and low-carbon gas delivers climate neutrality at the lowest overall societal cost. Societal savings of over €200 billion annually in the long-term can be achieved if biomethane and renewable hydrogen are ramped-up. Therefore, it is time to act now and implement a 11% renewable gas target that provides instant benefits including reduced emission, cleaner air, more jobs and long-term societal cost savings.

38 Gas for Climate, *Market state and trends in renewable and low-carbon gases in Europe*, December 2020, https://gasforclimate2050.eu/?smd_process_download=1&download_id=546.

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