CONCEPT OF A GREEN GAS QUOTA

A GHG reduction quota for the gas sector

Report for Die Gas- und Wasserstoffwirtschaft e.V.

ENGLISH CONVENIENCE TRANSLATION

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SUMMARY

Germany has enshrined the goal of climate neutrality by 2045 in the Federal Climate Protection Act. Gaseous energy sources play a key role in achieving this goal, and hence must be gradually defossilised. The **introduction of a binding and cross-sectoral green gas quota**[1] as a greenhouse gas (GHG) reduction quota is intended to ensure that fossil gases are replaced by climate-friendly alternatives such as hydrogen and biomethane.

Die Gas- und Wasserstoffwirtschaft e.V. has commissioned Frontier Economics to develop a **concept for a green gas quota** (GG quota) that will steadily increase the share of climate-friendly gases such as hydrogen and hydrogen derivatives as well as biomethane from 2025/26 and thus sustainably reduce CO_2 emissions in the German gas market. Our quota proposal is based on the principles of an effective contribution to climate neutrality and fair competition between green gases, securing affordable gas supplies and linking to EU sustainability targets to shape the energy transition in a cost-efficient and targeted manner. Table 1 summarises **the core elements** of the proposed quota design**.**

Table 1 Overview of the core elements of the green gas quota proposal

	Design proposal
General	Participation in the green gas quota is mandatory for distributors ("*Inverkehrbringer"*), mostly gas suppliers, with a geographical focus on Germany and possible future EU expansion. The quota is based on GHG reduction and is tradable, with unrestricted banking and limited borrowing (30% for a period of one year). A penalty of €600/tCO_2 is levied for non-compliance and the quota is cumulative and cross-sectoral.
Origin	Permissible green gases include all renewable and low-carbon gases, including hydrogen derivatives, that meet the national and EU sustainability criteria (e.g. EU Renewable Energy Directive ("RED III") and the Internal Gas Market Directive). The permitted origin of green gases is global, provided that the requirements for mass balancing and certification are met in accordance with EU specifications. In the initial phase, multipliers for green hydrogen and its derivatives can optionally be taken into account.
Utilisation	The blending of green gases with fossil gases is permitted within the technical limits.[2] ETS 1 plants are temporarily exempt from the quota in the initial phase. Certification and tracking are carried out via a mass balancing system and all supply routes are included.

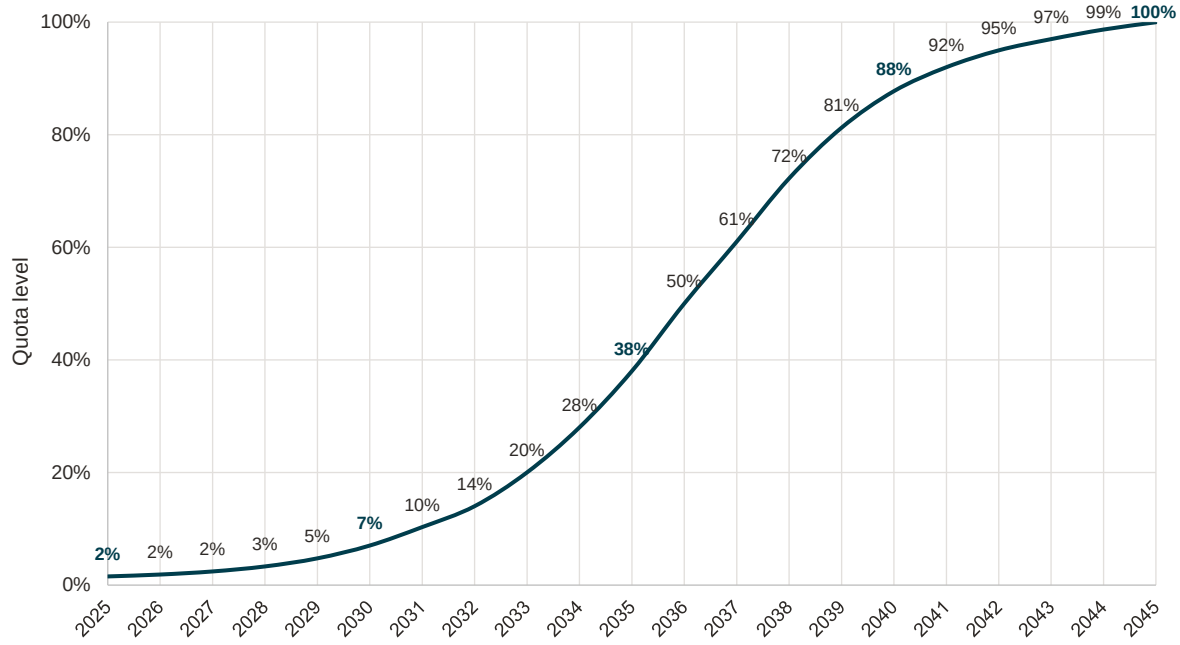
Source: Frontier Economics

1 For the sake of simplicity, the term "green gas" is also used here for low-carbon gases.

2 With regard to biomethane and synthetic methane, blending into the natural gas grid is likely to be unproblematic. For hydrogen, on the other hand, this is only possible with restrictions from a technical point of view.

Our proposed **quota path** (Figure 1) envisages an **ambitious** – but **realistic** by comparison with existing estimates of green gas potential – ramp-up of green gases by 2045. We use the current share of green gases in gas consumption as the starting value, while the target value comprises a quota of 100% green gases in 2045 in line with the German government's current climate protection targets. The S-curve places the focus of the ramp-up on the medium term (2030-2040). This creates a balance between effective incentives (and thus ensures political acceptance) and realistic targets, as the supply of green gas is limited in the short term and the replacement of the last fossil gases (e.g., the material use of natural gas in the chemical industry) is likely to be economically expensive in the long term ("hard-to-abate").

Figure 1 Proposed quota path

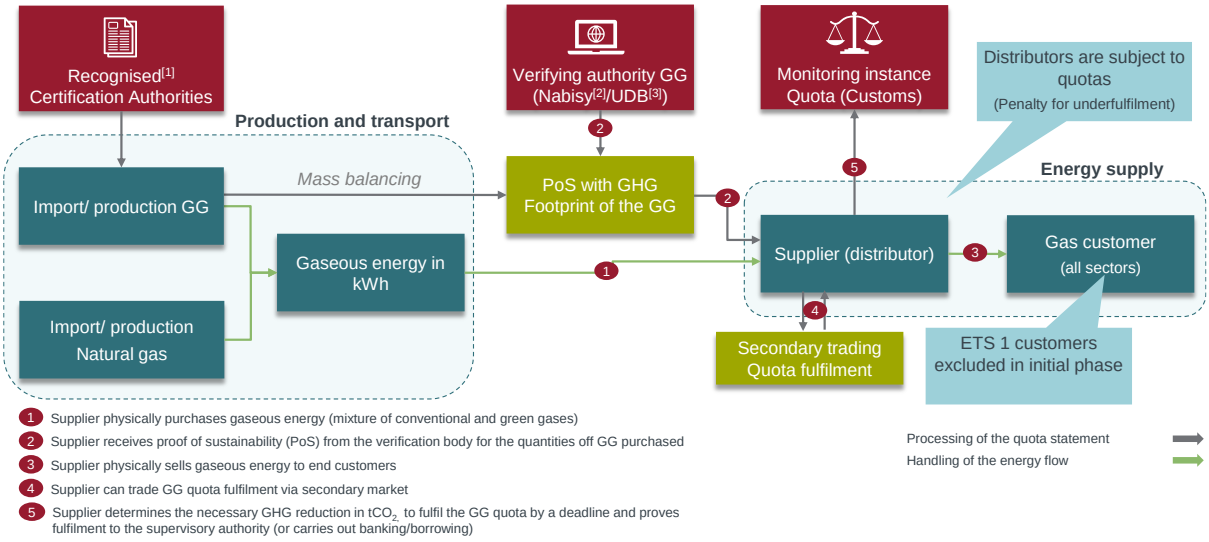


Source: Frontier Economics

The GG quota gradually obliges the gas industry to cover a growing share of gas demand with climate-friendly gases, which requires investments in production, infrastructure and consumption adjustments. To mitigate the associated risks, safeguards such as **regular evaluations and force majeure rules** are planned to address market-related or unforeseeable disruptions without jeopardising the climate targets.

Our proposal for the implementation process of the GG quota (Figure 2) minimises the bureaucratic effort by using **existing institutions and verification processes.** The process includes the monitoring of sustainability criteria along the entire supply chain, tracking via established databases such as the Union Biofuels Database (UDB) and the national biomass database Nabisy, and the trading of surplus quotas on secondary markets. The latter increases the efficiency and flexibility of quota implementation.

Figure 2 Implementation process of the GG quota



Source: *Frontier Economics*

Note: *[1] https://www.ble.de/SharedDocs/Downloads/DE/Klima-Energie/Nachhaltige-Biomasseherstellung/Anerkennung_de.pdf?__blob=publicationFile&v=1 [2] https://nabisy.ble.de/app/start [3] https://wikis.ec.europa.eu/display/UDBBIS/Union+Database+for+Biofuels+-+Public+wiki.*

The proposal for the green gas quota envisages several **implementation phases** to achieve climate neutrality in the gas sector by 2045. A preparatory phase (2025-2026) will be followed by a temporary exemption phase for ETS 1 installations, the introduction of a cross-sectoral quota and, in the long term, a possible expansion of the quota at EU level.

1 Objectives and design principles of the green gas quota

Germany has set itself the goal of achieving climate neutrality by 2045 and has enshrined this in the Federal Climate Protection Act in order to limit the consequences of climate change. Gaseous energy sources, today mainly provided as fossil natural gas, play an important role in Germany's energy supply.[3]

To ensure that climate protection targets can be reliably achieved and that gaseous energy sources have a long-term perspective in the energy mix, the proportion of fossil gases must be successively reduced and replaced by climate-friendly gases ("green gases"). To achieve this, Die Gas- und Wasserstoffwirtschaft e.V. has commissioned Frontier Economics Ltd. to conceptualise a green gas quota ("GG quota") with the following key points:

- A binding GG quota is to be established by 2025/26, which will take effect from 2027 to gradually increase the share of green gases in the German gas market to 100% in 2045.
- Market players who sell fossil gases in various forms (e.g. pipeline gas or LNG) should be obliged to use an increasing proportion of CO_2-reducing gases such as hydrogen, its derivatives and biomethane.
- The GG quota is intended to help reduce annual CO_2 emissions by replacing natural gas with sustainable alternatives.

In the following, we present the **design principles** (section 1.1) on which our quota proposal is based, the **basic concept** of the GG quota (section 1.2) and the **structure** of the study (section 1.3).

1.1 Design principles

We take five criteria into account when designing the quota proposal: Effectiveness / target achievement, cost efficiency, distribution effects, feasibility and acceptance. From this, we derive the following design principles (Figure 3), which form the basis for our green gas quota concept:

- **Effective contribution of the gas industry to the climate neutrality target** – The gas industry potentially plays a decisive role in achieving the German and European climate targets, as gases can increase the resilience of the energy transition and complement electrification paths. Green gases such as hydrogen, synthetic methane and biomethane offer opportunities to replace fossil fuels and significantly reduce CO_2 emissions.[4] The effective use of green gases can therefore lead to lower overall costs of the energy transition – particularly due to the existing gas infrastructure.

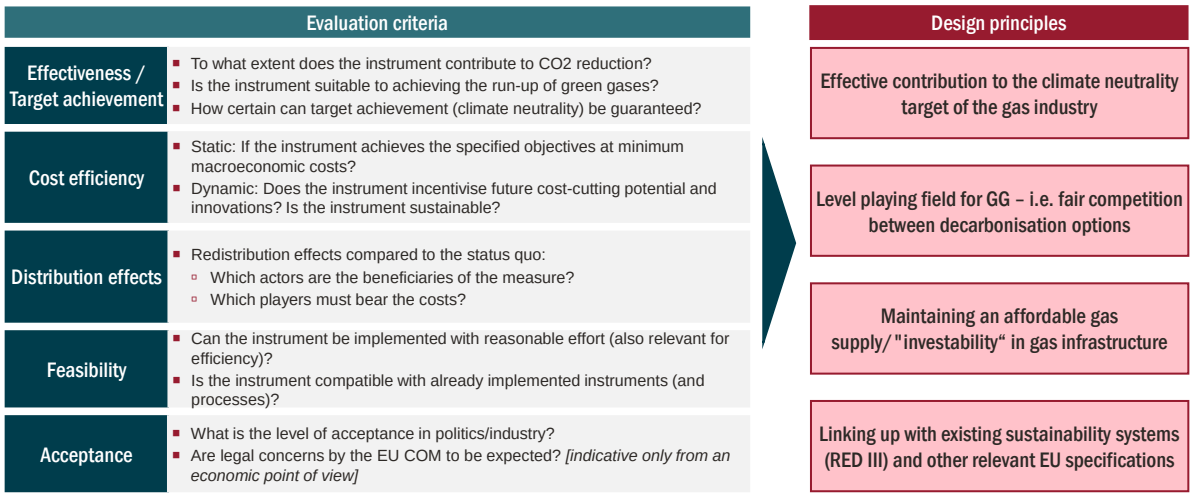
[3] Natural gas provided almost 24% of the primary energy used in Germany in 2022, see https://ag-energiebilanzen.de/daten-und-fakten/bilanzen-1990-bis-2030/?wpv-jahresbereich-bilanz=2021-2030

[4] https://www.frontier-economics.com/media/25cd1ei4/frontier-economics-ensuring-resilience-in-the-european-energy-transition.pdf

- **"Level-playing-field" for green gases, i.e. fair competition between de-fossilisation options** – Fair competition between different de-fossilisation options ensures that technological innovation and market efficiency are promoted. This requires a clear regulatory framework that gives all options equal opportunities and at the same time strengthens long-term security of supply.
- **Maintaining an affordable gas supply and the ability to invest in gas infrastructure** – An affordable gas supply is a decisive factor for the competitiveness of the German economy and for relieving the burden on consumers. At the same time, the ability to invest in gas infrastructure must be guaranteed. Reliable and suitable framework conditions for investments are necessary to adapt existing networks sustainably and make them fit for the future for a climate-neutral energy system. This is particularly relevant in view of the value of the existing gas infrastructure and the role that the utilisation of this infrastructure can play in a cost-effective energy transition.[5]
- **Linking to existing sustainability systems and other relevant EU requirements** – The EU Renewable Energy Directive (RED III for short[6]), the Internal Gas Market Directive[7] and delegated acts as well as the national implementation in laws and regulations form the legal and structural framework for the promotion of renewable energies in the EU. This ensures a consistent, targeted and Europe-wide compatible implementation of the GG quota.

Based on these design principles, we define the key parameters of our proposed GG quota.

Figure 3 Overview of the evaluation criteria and design principles



Source: Frontier Economics

5 See e.g. Frontier Economics on behalf of the Association of Transmission System Operators (2017): The value of gas infrastructure for the energy transition in Germany: https://www.vng.de/sites/default/files/2021-03/fnb-_gas_frontier_economics_gasinfrastruktur_fuer_die_energiewende.pdf

6 Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018, last amended in June 2024, see https://eur-lex.europa.eu/legal-content/DE/TXT/HTML/?uri=CELEX:02018L2001-20240716.

7 Directive (EU) 2024/1788 of the European Parliament and of the Council of 13 June 2024.

1.2 Basic concept

The GG quota proposed in this study obliges the distributors of gases to replace a legally prescribed proportion ("quota") of fossil gases with climate-neutral gases or an equivalent quantity of climate-friendly gases.[8] The quota thus corresponds to a percentage GHG reduction of all gases placed on the market. In line with the long-term climate protection targets, the quota increases over time.

To fulfil the quota, obligated parties can either directly replace the gases they have placed on the market with green gases or access trading products. On this secondary market, obligated parties who have overfulfilled their quota can trade these additional quantities with other obligated parties who, for example, do not fulfil their quota with their own green gas quantities. To create flexibility and scope for optimisation for obligated parties and to cushion short-term (e.g. weather-related) volume risks, quotas can be fulfilled to a certain extent in the following period ("borrowing") or an overfill can be carried over to the next period ("banking").

Compliance with the quotas must be checked regularly. To this end, those obliged to fulfil the quota must prove on a certain date that the quota obligation for the previous period (usually one calendar year) has been fulfilled with permissible green gases (considering trading, banking and borrowing). Otherwise, a penalty must be levied.

In detail, there are many design options for such a green gas quota design, which are discussed in this study and for which recommendations are derived.

1.3 Structure of the study

The rest of the study is divided into the following sections:

- Firstly, we develop proposals for the **key design parameters**, such as the obligated parties, the permitted green gases and the sectors (section 2).
- Based on this design proposal, we derive a proposal for the level of the **quota path** over time and the **quota formula** (section 3).
- In the section 4 we present the basic principles for implementing the GG quota, i.e. the organisation of the **processes and implementation phases**.

[8] A quota of 10% means, for example, that the obligated party provides either 10% of the gas volume through climate-neutral gases (100% GHG reduction compared to fossil gases) or 20% of the gas volume through climate-friendly gases with 50% GHG reduction.

2 Key design parameters

Table 2 summarises the key design parameters of our proposed GG quota. In the following, we present the underlying considerations in detail based on the design principles (section 1.1).

2.1 Quota as a guarantee mechanism

The GG quota is intended to ensure that the gas supply becomes climate-neutral in the long term (see section 1). The quota should therefore be designed as a "**guarantee mechanism**" for a long-term climate-neutral gas industry, which creates the necessary framework for the required long-term investments in production capacities, storage and transport infrastructure as well as the conversion of consumption facilities.

A GG quota is most effective as a guarantee mechanism if the quota is organised across sectors ("cross-sectoral") and is cumulative:

- **Cross-sectoral quota** – Cross-sectoral means that the quota targets apply across all sectors and no sector-specific sub-quotas are set.[9] A cross-sectoral quota enables the obligated parties to reduce emissions where this is most cost-effective. This minimises the economic costs of climate protection, which are generally passed on to consumers, and keeps gas as an energy source as affordable as possible. Such an approach is also more practicable, as sector-specific quotas require detailed regulation and monitoring of each individual sector. A sector-specific approach would also lead to a higher administrative burden for verification and monitoring.

  In addition, a sector-specific quota could be less effective in pursuing the long-term de-fossilisation of the gas sector, as a sector-specific quota – in contrast to a cross-sectoral quota – would not focus on the entire gas sector and therefore could not contribute to the same extent to achieving overarching climate neutrality targets. Nevertheless, individual sectors can be excluded from the scope of the quota if necessary. This is discussed in more detail in section 2.4.

9 This does not mean that the green gas ramp-up is equally fast in all sectors. In sectors with low-cost de-fossilisation potential, fossil gases will be replaced more quickly by green gases and other sectors more slowly. The 100% target in 2045 will achieve complete climate neutrality.

Table 2 Overview of the GG quota proposal

	Parameters	Design proposal
General features	Conditions of participation	Mandatory participation in the quota
	Quota obligated parties	Distributor (based on the definition in the Energy Duty Act)
	Geographical scope	Limited to Germany, later possible expansion to the EU
	Reference value of the quota	GHG reduction rate, with gas consumption as reference value
	Tradability	Tradability envisaged (incl. third parties) - ensured via evidence and quota transfer
	Banking	Banking authorised without restriction
	Borrowing	Borrowing permitted to a limited extent (amount: max. 30% of the obligation, duration: max. 1 year, i.e. for the following period)
	Penalty	600 €/tCO_2 (based on GHG reduction quota for fuels), no subsequent fulfilment obligation
	Sectoral reach / additive vs. cumulative	Cumulative and cross-sector quota
Origin	Permissible green gases	All renewable and decarbonised gases (incl. H2 derivatives)[10]
	Sustainability criteria	In line with national / EU sustainability criteria (EU Renewables Directive, Internal Gas Market Directive and delegated acts, BImSchG, etc.), e.g. minimum GHG savings quotas
	Country of origin	No limit to the permitted countries of origin.
	Multipliers for crediting	*Optional: In the initial phase, multipliers can be applied for the crediting of green hydrogen and its derivatives.*
Utilisation	Blending with fossil gases	Blending of green gases with fossil gases permitted[11]
	Excluded sectors	ETS 1 plants excluded from the quota calculation in the initial phase (until the operation of H2-ready power plants with hydrogen)[12]
	Certification/tracking system	Fulfilment is ensured by means of mass balancing.
	Delivery routes	All delivery routes and gas consumption are included.

Source: Frontier Economics

10 The applicable DVGW regulations must be observed.

11 Technical limits must be considered for blending. Regarding biomethane and synthetic methane, blending into the natural gas grid is likely to be unproblematic. For hydrogen, on the other hand, this is only possible with restrictions from a technical point of view.

12 This means that the gas volumes consumed in ETS 1 are not included in the denominator of the quota. In view of the current plans and assuming the power plant strategy, 2035 appears to be a realistic date for the inclusion of ETS 1 plants in the GG quota (depending on the legislative framework).

- **Cumulative quota** – The quota should be cumulative, so that all green gas quantities are counted, regardless of whether they have already been incentivised directly or indirectly via other funding instruments (e.g. GHG reduction quota in the transport sector, "*THG-Minderungsquote"*). The main argument in favour of this is that it is easier to implement than an additive quota[13], for which a complex tracking system would have to be introduced to ensure that quota gases are not counted elsewhere. The cumulative design of the quota thus reduces the implementation costs compared to an additive quota due to the otherwise complex interaction with other instruments.

  In addition, the cumulative design of the quota ensures that the target of 100% green gases and thus the long-term climate neutrality of the gas sector is achieved. From today's perspective, it is not known which green gases will enter the market in the future via which instruments (such as CO_2 trading, targets of the Buildings Energy Act (GEG), etc.). As a result, it is also not possible to determine a priori the quota for the "residual market", which would have to be addressed by an additive quota.

A cross-sector cumulative GG quota model therefore offers significant advantages overall compared to a sector-specific additive design of the quota:

- **Effective contribution to the climate neutrality target** – By designing the quota as a cross-sectoral and cumulative quota, the quota can be defined in such a way that the gas industry contributes to the long-term target of climate neutrality through a quota level of 100 %, while at the same time avoiding overtaxing the quota.[14] Although a sector-specific additive quota as an incremental quota can also incentivise additional green gases (over and above the existing climate protection instruments), the long-term achievement of climate neutrality in the gas sector (i.e. 100% green gases) would also depend to a large extent on the target achievement of other instruments (e.g. the EU ETS). Therefore, both under-fulfilment and over-fulfilment cannot be ruled out.
- **Maintaining affordable gas supply and investability** – The cross-sector cumulative GG quota ensures that the gas industry fulfils the envisaged climate targets and that this target can be achieved at minimum cost by using green gases first in the sectors where the costs are lowest. A cross-sector quota thus makes a decisive contribution to maintaining an affordable gas supply and offers long-term prospects for the gas industry by securing a sustainable business model.
- **Link to existing sustainability systems and EU requirements** – The cross-sectoral cumulative GG quota can be implemented with reasonable effort for obligated parties, as only the total sales of gas are relevant and no clear demarcation from other instruments is necessary. Regarding the link to existing sustainability systems, the sector-specific additive GG quota is unsuitable, as its implementation would be significantly more complex due to the differentiation of the gases used from other instruments and would

13 In the case of an additive quota, the fulfilment of the quota is clearly differentiated from other instruments, i.e. green gases that are counted towards the GG quota must not be supported by other instruments or counted towards other obligations.

14 The quota would be overridden if it – together with other instruments – led to an overall GG quota of over 100 per cent.

entail high tracking requirements in particular. For example, when using green gases in the ETS sector, it would have to be proven that they were not brought onto the market solely due to CO_2 pricing. In addition, the parameterisation would have to be very granular and precise to achieve the desired effect.

2.2 General design features

In the following, we explain the central general design features that provide the basic framework for the conception of the quota proposal.

- **Participation in the quota is mandatory** – Mandatory participation is necessary for the effective implementation of the quota and the achievement of climate neutrality in the gas sector. Alternative voluntary participation, on the other hand, would not guarantee the achievement of the targets set, would damage political acceptance and thus undermine the effectiveness of the quota.
- **Distributors are best suited as parties liable for the quota** – Linking to the function of the "distributor" ("*Inverkehrbringer"*) from the Energy Duty Act[15] ("EnergieStG") firstly enables a legally secure definition of the party liable for the quota: the addressee of the GG quota is clearly regulated via the tax liability and double taxation is prevented. On the other hand, this minimises the additional bureaucratic burden, as distributors must already record and report the information relevant for determining the quota (the quantity of gas sold) for the tax declaration.
- **The geographical scope of the quota is initially limited to Germany** – the quota thus makes an effective contribution to achieving the climate targets set in Germany by pursuing the goal of complete de-fossilisation of the gas sector. A later extension of the scope of application to the European Union is possible as an option within the framework of the proposed model for the GG quota and would be desirable in the sense of a European level playing field. To this end, our proposal is based on the European sustainability criteria for green gases.
- **The quota is defined as a greenhouse gas reduction quota (in relation to total gas consumption)** – A central design principle of the quota is a secure, effective contribution to climate protection and the de-fossilisation of the gas sector. With a view to this goal, the design as a GHG reduction quota is more expedient than a purely "energy quota"[16], which would be defined based on the (green gas) quantities placed on the market. Furthermore, all gas consumption should be included (i.e. natural gas, biological and synthetic methane, hydrogen (derivatives)) to ensure the widest possible application of the quota and a level playing field for different energy sources.
- **The tradability of the quota should be made possible via proofs and quota transfers** – For the efficient implementation of the quota, it must be tradable. The tradability of the

15 Sec. 8 EnergieStG in general and Sec. 38 EnergieStG for natural gas.

16 In contrast to the GHG reduction quota, an "energy quota" is based on the (energetic) quantities of green gases put into circulation and does not consider the contribution of the green gases used to de-fossilisation.

quota makes it possible for fulfilment to take place in the gas sector where it is most cost-effective. This applies both regarding the procurement of green gases and their utilisation. It follows that, in addition to physical fulfilment, the quota can also be fulfilled on the balance sheet (e.g. through a quota transfer, as with the GHG reduction quota for fuels or proof via "quota certificates").

- **Banking (unrestricted) and borrowing (restricted) permitted** – banking means that quota holders can offset any over fulfilment of their quota today against their targets in later periods. Borrowing enables the subsequent fulfilment of an obligation without a penalty. Both instruments increase the efficiency and stability of the GG quota and are important risk management instruments for quota holders.

  Without banking and borrowing, the prices for green gas quota fulfilment can fluctuate significantly over time:

  - In the event of sector-wide over fulfilment in one period, the quota prices without banking would fall sharply (possibly even to zero). A good example of this is European emissions trading (EU ETS). Towards the end of the second trading period (2008-2012), there was a surplus of emission allowances because of the 2008/09 economic crisis. As companies were unable to transfer the surplus certificates to the 3rd trading period (2013-2020), there was an oversupply, which caused the price of CO_2 certificates to fall below €5/t CO_2.
  - Conversely, quota prices can rise sharply (close to the penalty, see below) if there is a short-term (e.g. weather-related) shortage of green gases across the market. One example of this is the GHG reduction quota for fuels: In 2022, the price of GHG allowances temporarily rose to over €400/t CO_2 (and was therefore close to the penalty of €600/t CO_2).[17] This development was favoured by increased demand for CO_2 certificates because of the tightening of the quota targets. The increasing supply of charging current certificates and the fraud scandal surrounding emission reduction certificates (so-called "UERs") from China led to a sharp drop in prices to below €100/t CO_2 in 2024.[18]

  Banking and borrowing stabilise the prices for green gas quota fulfilment. This reduces the price risk for the obligated parties and creates a more stable framework for investment framework in green gas production, which requires the most stable possible cash flows to be financed.

  This is particularly relevant for the gas sector, as the temperature-dependent demand for gas can fluctuate greatly between years.[19] In addition, gas demand is highly seasonal,[20] meaning that the total gas demand for a year cannot be predicted until the end of

17 https://www.emobility.energy/thg/thg-quote-preisentwicklung.

18 https://www.now-gmbh.de/wp-content/uploads/2024/09/NOW-Factsheet_THG-Quotenhandel.pdf

19 For example, Germany-wide gas consumption fell by around 17 % from 2021 (1029 TWh) to 2022 (850 TWh), see https://www.bundesnetzagentur.de/DE/Gasversorgung/a_Gasversorgung_2024/start.html

20 Around 30% of gas demand from households in which gas is primarily used for heating purposes occurs in the months of November and December, see https://www.smard.de/page/home/topic-article/211814/214592

December at the earliest (for standard load profile customers who are only metered annually, it may even be much later once the consumption meters have been read) and therefore cannot be planned in the long term.

To ensure the long-term effectiveness (in terms of the contribution to the de-fossilisation of the gas sector) and credibility of the GG quota, the permitted borrowing should be limited both in terms of quantity (e.g. to 30%) and duration (max. 1 year, i.e. to the following period).

- **High penalty (€600/tCO_2) creates strong incentives to fulfil the quota** – The penalty is intended to ensure that obligated parties have an incentive to fulfil the quota. This means that the penalty should be higher than the price premium for green gases compared to fossil gases. Our proposal envisages a relatively high penalty of €600/tCO_2, based on the penalty for the GHG reduction quota in the fuel sector (see Section 37c (2) BImSchG). This roughly corresponds to a price premium for climate-neutral green gases of approx. 120 €/MWh, which is significantly higher than the premiums currently traded on the market for green gases (such as climate-neutral biomethane).[21]

  In the event of non-fulfilment and payment of the penalty, there is no subsequent fulfilment obligation. This is intended to prevent obligated parties from being disproportionately burdened by excessive prices in the event of a physical shortage of green gases.

- **The green gas quota is defined cumulatively and across sectors** – The proposal provides for the quota to be defined across sectors. At the same time, the quota is defined cumulatively, i.e. the green gases used to fulfil the quota obligation may also be supported by other instruments (see section 2.1). This design allows the quota to be defined in such a way that the long-term goal of climate neutrality in the gas industry can be achieved with a quota level of 100 %. At the same time, the cumulative approach prevents the quota from being overridden, which could lead to a de facto quota fulfilment of over 100 % if the quota were designed additively. In addition, the cumulative design of the quota reduces the implementation costs compared to an additive quota, in which quota gases may not be offset elsewhere, due to the otherwise complex interaction with other instruments (with various arbitrage options).

2.3 Origin of gases

In the following, we look at design aspects relating to the origin of the gases used to fulfil the quota:

- **All renewable and decarbonised gases (incl. H2 derivatives)** permitted to meet the quota – A key design principle is to ensure a level playing field for different climate-friendly gases that can contribute to the de-fossilisation of the gas sector. In addition to renewable ("green") gases, this also includes low-carbon gases and hydrogen derivatives, including synthetic methane. The only prerequisite is that existing sustainability criteria, from RED

[21] 123 €/MWh = 600 €/tCO_2 * 0.2 tCO_2/MWh. At the end of 2024, the short-term price for climate-neutral biomethane was €120/MWh, while natural gas in the THE market area was around €40-50/MWh (data source: Energate). The price premium for green gas was therefore in the order of €70-80/MWh and thus significantly below the penalty of €123/MWh.

III, the Internal Gas Market Directive and delegated acts (e.g. for low-carbon gases and electricity-based green gases ("RFNBOs")), are complied with and that this is documented by recognised sustainability certificates.

This means, for example, that electricity-based green gases are only permitted as a quota fulfilment option if they achieve a GHG saving of at least 70% (compared to the fossil emission reference value).[22] The requirements from the EU regulation also apply to decarbonised ("blue") gases.[23] A wide range of compliance options enables obligated parties to fulfil the quota at the lowest possible cost and thus keep gas affordable. In addition, the achievability of the quota targets is improved: those obliged to fulfil the quota can switch to other green gases (within the scope of technical restrictions) if the planned fulfilment option is temporarily not available in the expected quantity, e.g. because of a low biomass yield.

- **Green gases should be recognised regardless of their country of origin** – Limiting the countries of origin for green gases that demonstrate to meet the sustainability requirements makes no sense – neither economically nor in terms of the desired de-fossilisation of the gas sector. Limiting the geographical origin would reduce the cost efficiency of quota fulfilment, as potentially more favourable fulfilment options from third countries would be excluded from the outset. This particularly applies to Germany as a net importer of energy and gases. A regional restriction to domestic green gases would also contradict the EU internal market rules and RED III, which in principle permits global imports if they fulfil the EU sustainability criteria.[24] Appropriate measures must also be taken to prevent fraud.
- **Optional**: In the initial phase, **multipliers** can be applied for the crediting of green hydrogen and its derivatives – In line with the technology-open design, our proposal for the GG quota does not provide for sub-quotas for certain green gases. However, it would be possible to optionally add multipliers for individual technologies, e.g. green hydrogen and its derivatives (including synthetic methane), which can be used, particularly in the initial phase, to give technologies in the market ramp-up a stronger lever in quota fulfilment and thus prepare for the fulfilment of the quota, which will increase sharply in the 2030s.[25]

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22 For biogas/biomethane used in new plants (from 1 January 2021), the GHG reduction compared to fossil fuels must be at least 70%, as is the case for RFNBOs. For older plants, on the other hand, a GHG reduction of 60% is set as the minimum value. According to the transitional provisions in RED III, special sustainability criteria apply to biomethane produced from waste or residues.

23 See Directive (EU) 2024/1788 and the anticipated methodology for calculating the GHG reduction of "low-carbon fuels".

24 EU regulations currently allow the import of biomethane via the gas grid from the EU gas grid recognised as a single mass balance area. In the future, this could be extended to other neighbouring countries if a cooperation agreement is concluded between the EU Commission and the country concerned in which the gas grid is recognised as a separate mass balance area and the sustainability system is recognised as compliant with EU legislation. Gas grids that are not connected to the EU grid could also be recognised as a separate mass balance system, which would allow the import of bio-LNG by ship. For third countries without a co-operation agreement, the import of locally processed bio-LNG is possible.

25 Quota models are generally not suitable for incentivising the ramp-up of individual technologies, as quota prices (i.e. the willingness to pay for a green product) can fluctuate significantly. This results in a high liquidity and market risk for new

For example, renewable fuels of non-biogenic origin (green hydrogen and its derivatives, such as synthetic methane) could be counted towards the GHG reduction quota for fuels with a factor of 3.[26] The application of such multipliers should be limited to the initial phase, as otherwise the climate neutrality of the gas sector and a level playing field for green gases would not be achieved in the long term.

2.4 Use of gases

Finally, we look at aspects relating to the use of green gases:

- **Blending with fossil gases permitted** – To fulfil the quota obligation, it should also be possible to blend green gases with fossil gases.[27] This regulation makes economic sense as it utilises the existing natural gas infrastructure and increases the efficiency of quota fulfilment. Excluding the blending of green gases would make fulfilment more difficult, particularly in the initial phase, as separate infrastructures are still lacking. The resulting additional costs would make achieving the quotas more expensive and reduce efficiency.

  The sustainability properties for both certified decarbonised and renewable gases in gas mixtures are tracked via a RED III-compliant mass balancing system (see details below).
- **ETS 1 installations are excluded from the quota in the initial phase** – The proposed concept for the introduction of a GG quota provides for a transitional phase in which ETS 1 sectors (electricity/heat generation and industry) are excluded from the quota. Immediate inclusion could overburden the ETS 1 sector and jeopardise the competitiveness of industry. The GG quota would also increase the electricity generation costs for gas-fired power plants that are subject to ETS 1 and could therefore lead to an increase in the price of electricity, which politicians have recently tried to avoid with measures such as the abolition of the Renewable Energy Sources Act ("*Erneuerbare-Energien-Gesetz"*, "*EEG"*) levy and the electricity price brake.[28] The corresponding proof of the quantities supplied to ETS 1 sectors must be provided by the distributors.[29]

  To secure investment incentives and ensure the efficiency of the GG quota, we recommend defining a clear trigger for the inclusion of ETS 1 plants in the scope of the quota. As such, we propose the operation of the "H2-ready" power plants with hydrogen

investments. Price control instruments (such as premiums or contracts for difference or CfDs) are therefore more suitable for the ramp-up of individual technologies.

26 See Sec. 3 of the 37th BImSchV.

27 Technical limits must be considered for blending. Regarding biomethane and synthetic methane, blending into the natural gas grid is likely to be unproblematic. For hydrogen, on the other hand, this is only possible with restrictions from a technical point of view.

28 The merit order system in the electricity market means that power plants are utilised based on their variable electricity generation costs (marginal costs): The power plants with the lowest marginal costs (e.g. renewable energies) are used first, followed by more expensive ones such as coal and gas-fired power plants. Price-setting gas-fired power plants are often used when demand is high, as they have higher marginal costs compared to other generation technologies; their price then determines the market price for all electricity volumes fed into the grid (uniform market clearing price). Rising gas procurement costs due to the GG quota obligation can therefore lead to higher electricity prices in these market situations.

29 Due to the limited number of customers from the ETS-1 sector, the costs are likely to be manageable.

envisaged in the German government's power plant strategy. In view of the current plans and assuming the power plant strategy, 2035 appears to be a realistic date for the inclusion of ETS 1 plants in the GG quota. However, this depends on the legislative framework.

- **The quota obligation can also be fulfilled on a balance sheet basis (mass balancing)** – Purely physical fulfilment, i.e. supplying all customers with a certain proportion of green gas corresponding to the quota, is conceptually possible but impractical. Therefore, fulfilment should be based on the balance sheet, i.e. the quota only needs to be fulfilled on average across all gas deliveries. We propose mass balancing for tracking the sustainability criteria and quota fulfilment. In this case, the proof of sustainability (PoS) is linked to the physical product and is passed on along the entire supply chain (i.. the proof of sustainability cannot be traded separately, as is the case with proof of origin in the book & claim system). Basically, linking the certificate to the physical product makes it more difficult to trade and therefore reduces the cost efficiency of quota fulfilment.[30] Mass balancing is based directly on the EU requirements (Art. 30 (1) RED III) and strengthens the credibility and connectivity of the quota system.
- **All consumption (including for material use) and all supply routes to the end consumer are considered for the quota** – Due to the link to the energy tax and the resulting, legally secured definition of distributors, all supply routes to the end consumer are considered. In addition, all gas consumption (including that for material use) is included in the GG quota.

  Although the extension to all supply routes may reduce practicability and increase the implementation costs of the quota, restricting the quota to certain supply routes, such as pipeline-based gas supplies via the natural gas grid, would also incentivise people to switch to other supply routes that are not subject to the quota. Restricting the supply routes may therefore be detrimental to the objective of the quota's effective contribution to the de-fossilisation of the gas sector.

[30] Difficult tradability results in additional transaction costs for quota trading and/or certain cost optimisation potentials for fulfilment through trading are not realised.

3 Quota trajectory and calculation method

In this chapter, we present the proposed **quota path (section 3.1)** and derive the **formula** used to calculate the quota obligation or fulfilment **(section 3.2)**

The quota path we propose envisages an ambitious but realistic ramp-up of green gases by 2045 in view of the **green gas potential (section 3.3).** We propose an S-curve for the quota trajectory, which creates a balance between effective incentives, political acceptance and realistic targets. We use the current share of green gases in gas consumption as the starting value; the target value is a quota of 100% green gases in 2045, in line with the German government's current climate protection targets.

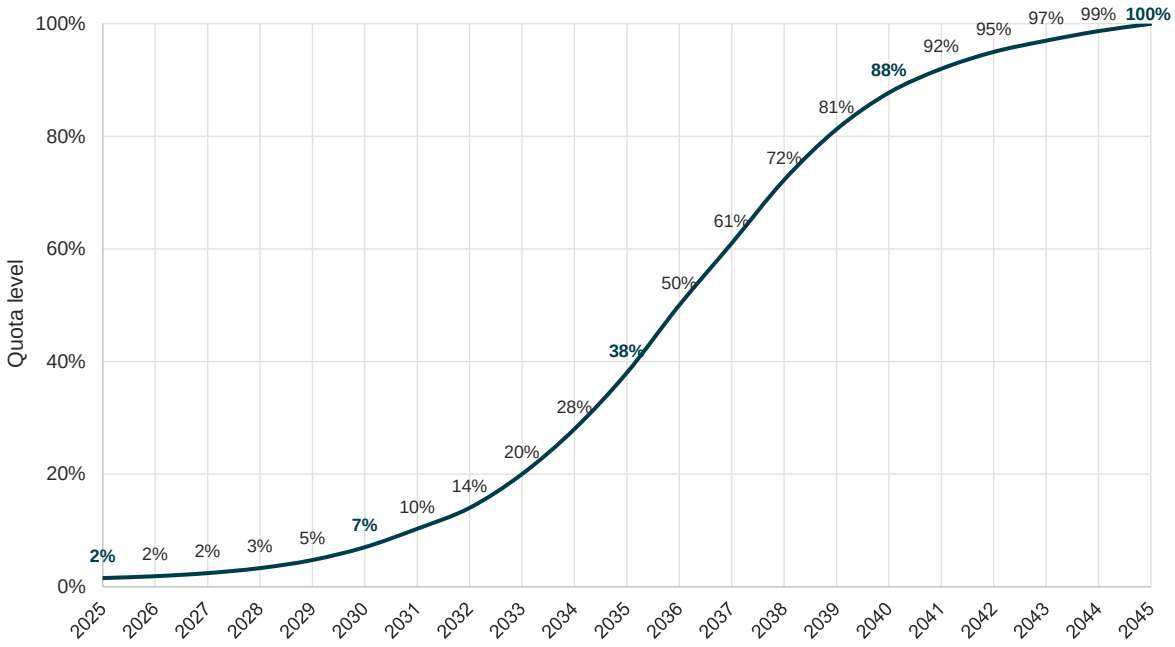
The GG quota gradually obliges the gas industry to cover a growing share of gas demand with climate-friendly gases, which requires investments in production, infrastructure and consumption adjustments. To mitigate the associated risks, safeguards such as **regular evaluations and force majeure rules** are provided to address market-related or unforeseeable disruptions without jeopardising the climate targets (**section 3.4)**

3.1 Quota trajectory

Figure 4 shows the proposed S-curve quota trajectory. Economically, the S-curve makes sense for the design of the GG quota, as it focusses the ramp-up on the medium term (2030-2040). In this way, incentives are already set in the short term to make longer-term investments, but without straining the fulfilment risk in the short term, which would lead to enormous fulfilment costs. As the proposed GG quota allows unrestricted banking, the obligated parties can also place more green gases on the market in the short term than required to fulfil the quota to anticipate the stronger ramp-up in the medium term. This will also incentivise investment in GG infrastructure in the short term.

At the same time, the S-curve prevents the expansion of green gas infrastructure from being completely postponed to the long term, as a significant part of the green gas ramp-up must already take place in the medium term. In addition to ensuring effective incentives, this also secures the political acceptance of the quota.

Figure 4 Proposed quota trajectory



Source: Frontier Economics

The proposed quota trajectory is also based on a comparison with the expected green gas potentials (see section 3.3). This comparison helps to quantitatively validate the proposed quota trajectory:

- **The supply of green gas is limited in the short term** – Biomethane is needed to ramp up the supply of green gas in the short term; a key lever for this is the conversion of further plants from biogas to biomethane. Regarding hydrogen, on the other hand, only limited quantities are expected in the short term, resulting from individual (smaller) projects that are already in the planning stage. However, larger (infrastructure) projects, particularly for the import of green or blue hydrogen, are not realistic in the short term and without the development of a significant import infrastructure. Hydrogen derivatives such as synthetic methane, on the other hand, can utilise the existing LNG import and natural gas distribution infrastructure, which is why their supply availability is not dependent on the development of a hydrogen infrastructure.
- **In the medium term, the expansion of production capacities and infrastructure (especially transport and storage) for green gases must gain significant momentum to achieve the climate targets in the long term** – the realisation of large electrolysis projects and the creation of import capacities are essential for green hydrogen. A significant increase in available green gases is possible if the development and connection to the European hydrogen network is successful. Various projects, for example for the construction of import terminals for green ammonia in Hamburg and

Brunsbüttel[31] , show that the expansion of infrastructure will pick up speed in the medium term.

- **In the long term, the increase in the quota should level off from an economic point of view**, as the replacement of the last "hard-to-abate" fossil gases (e.g. the material use of natural gas as a carbon source in the chemical industry) is likely to be economically expensive. This particularly affects regions that are not connected to the hydrogen core network or end applications with particularly high conversion costs from natural gas to hydrogen.

3.2 Calculation formula

The GG quota is designed as a GHG reduction quota (see section 2.2). Figure 5 summarises the formulas relevant to the quota:

- **The obligation of the parties subject to the quota** (in tonnes of CO_2) is derived from the quota level in t and the sales of gases multiplied by the CO_2 intensity for fossil natural gas (0.24 tCO_2/MWh, including upstream emissions[32]). In addition, the CO_2-savings "borrowed" in the previous year are added to the obligation.
- The **green gas certificates** (in tonnes of CO_2) **submitted** by obligated parties are calculated from the sales of green gases permitted for the quota and the associated CO_2 savings (defined in RED III and the Internal Gas Market Directive) compared to the fossil reference value. In addition, the "excess" CO_2 savings (banking) achieved in the previous year and the quantities acquired from other obligated parties via "quota trading" are added to the green gas certificates.
- The difference between the obligation in period t (including any borrowing from period t-1) (1) and the green gas certificates submitted in period t (including any banking from period t-1) (2) results in the total banking (if difference > 0) or borrowing (if difference < 0) in period t.

Quota obligated parties fail to meet their obligation in year t if the obligation (considering any borrowing or banking from the previous period t-1) is missed by more than the permitted 30% borrowing. In this case, a penalty in the amount of the shortfall in year t (in tCO_2) * €600/tCO_2 is due (see text box for a sample calculation).

31 See: https://www.hafen-hamburg.de/de/presse/news/erstes-terminal-fuer-gruenen-ammoniak-kommt-nach-hamburg/ or https://www.rwe.com/presse/rwe-ag/2022-03-18-import-von-gruener-energie-rwe-errichtet-ammoniak-terminal-in-brunsbuettel/

32 See Commission Delegated Regulation (EU) 2023/1185 of 10 February 2023, Annex 1, Section B (https://eur-lex.europa.eu/legal-content/DE/TXT/HTML/?uri=CELEX:32023R1185#anx_1): the value for natural gas is 66.0 g CO_2/MJ (calorific value), which corresponds to 0.2376 t CO_2/MWh (calorific value). RED III also specifies reference values, but these are not directly linked to a specific fossil fuel (such as natural gas), but to the intended use (heat generation, transport applications and electricity generation). The procedure in RED III is impractical for the GG quota, as the use of GG molecules would then have to be tracked and does not fit in with the objective of the GG quota, which is the long-term replacement of fossil gases.

Figure 5 Calculation formulae for quota obligation and fulfilment

Quota obligation of an obligated party in year t (i = gases used, j = permissible gases for quota fulfillment):

(1) $\text{Quota obligation}_t \ [\text{t CO}_2] = \text{GG quota}\alpha_t * \sum_i(\text{Gas sales}_{i,t}[\text{MWh}] \times \text{CO2}^{\text{ref}}[\text{t CO}_2/\text{MWh}]) + \text{borrowing}_{t-1}[\text{t CO}_2]$

Origin of GG proofs:

(2) $\text{GG\_proofs}_t[\text{t CO}_2] = \sum_j(\text{Gas sales}_{j,t}[\text{MWh}] \times (\text{CO2}^{\text{ref}} - \text{GHG} - \text{emissions}_j)[\text{t CO}_2/\text{MWh}]) + \text{banking}_{t-1}\ [\text{t CO}_2]$

Usage of GG proofs:

(3) $\text{Quota obligation}_t - \text{GG\_proofs}_t[\text{t CO}_2] = \text{banking}_t\ [\text{t CO}_2]\ (\text{if} < 0)\ \text{or}\ \text{borrowing}_t\ [\text{t CO}_2]\ (\text{if} > 0)$

With:

1. $\sum_i(.)$: sum of all gases distributed
2. $\text{Gas sales}_{i,t}$: Distributed volume of gas i in year t [MWh(heating value)] (including distributed GG)
3. CO2^{ref}: fossil reference value of gas [t CO_2/MWh(heating value)]
4. $\text{GHG} - \text{emissions}_j$:Greenhouse gas emissions of GGj (see RED III Annexes V und VI) [t CO_2/MWh]
5. banking_t : credited GG-proofs in year t
6. borrowing_t: underfulfilled quantity of GG proofs in year t

Source: Frontier Economics

3.3 Green gas potentials

To check the plausibility of the quota ramp-up, we compared the green gas volumes required to fulfil the quota obligation with expected GG potentials to subject the GG quota to a "stress test".

To this end, the total future demand for gases must first be taken into account, which is in the denominator of the quota and therefore influences the number of green gases required to fulfil the quota. For our estimates, we have assumed an almost constant course of gas demand until 2045 based on the network development plan of the European gas transmission system operators (TYNDP 2024, Distributed Energy scenario). This is a conservative assumption in this sense, as other studies, such as the BWMK long-term scenarios[33], forecast significant declines in gas demand in some cases (resulting in small quantities of green gas required to fulfil the quota).

33 https://www.bmwk.de/Redaktion/DE/Schlaglichter-der-Wirtschaftspolitik/2024/04/05-neue-langfristszenarien-fuer-die-energiewende.html

Calculation example for quota fulfilment

With a quota of 20% and total gas sales (fossil and renewable) of 10 TWh per year, the party obliged to fulfil the quota must provide evidence of a GHG reduction of 20% * 10,000,000 MWh * 0.2376 tCO_2/MWh = 475,200 $tCO_{(2)}$. If the CO_2 intensity of the green gases introduced is reduced by 90% compared to the fossil benchmark, for example, this means that approx. 2.2 TWh of green gases must be placed on the market in order to fulfil the quota.

However, if the obligated party only places 1 TWh of green gases on the market (again assuming a 90% reduction in CO_2 intensity), this leads to an under fulfilment of the quota of 261,360 tCO_2 (475,200 tCO_2 - 0.2376 tCO_2/MWh * 1,000,000 MWh * 90%). After deducting the permitted borrowing of 30% (i.e. 30% * 475,200 tCO_2 = 142,560 tCO_2), an underfulfilment of 118,800 tCO_2 remains, on which the party obliged to fulfil the quota must pay a penalty of €600/tCO_2, resulting in a total payment of around €71 million.

For the plausibility check of the required quantities of GG in such a "stress test" scenario, we have chosen an optimistic scenario for the supply-side quantities with the TYNDP 2024 Global Ambition scenario to approximate the "potential" for green gases.[34]

The comparison shows that the supply volumes for hydrogen, biomethane and synthetic methane are sufficient to fulfil the GG volumes required to meet the quotas (under the assumptions mentioned). For example, the modelling of the TYNDP 2024 envisages GG volumes of 164 TWh (2030) and 787 TWh (2040) on the supply side for the reference years 2030 and 2040 respectively. In both reference years, this exceeds the GG volumes of 39 TWh (2030) and 766 TWh (2040) required to fulfil the quotas, assuming almost constant future gas demand. A comparison with the potential volumes from a study conducted by Frontier Economics on behalf of DVGW in 2022[35] confirms this.[36]

34 A bottom-up modelling of the technical GG potentials (i.e. based on weather and location profiles as well as import capacities) was not carried out for this study.

35 See here: https://www.dvgw.de/medien/dvgw/forschung/berichte/g202116-1-dvgw-verfuegbarkeit-kostenvergleich-h2.pdf

36 With a view to the short term (especially 2030), we have also cross-checked the supply volumes from the TYNDP 2024 with those from project databases. The 10 GW target set by the German government for 2030, assuming an electrolysis efficiency of 69% and 4,000 full-load hours, results in a supply volume of 28 TWh of hydrogen. The volumes reported for biomethane in 2030 in the TYNDP 2024 Global Ambition scenario are comparatively conservative - the BDEW estimates that 100 TWh of biomethane could be fed into the gas grid in Germany every year by 2030. In addition, the TYNDP scenario also underestimates the short-term potential for synthetic methane: according to a study by the European Biogas Association (2024), production capacity in Germany was already 68 GWh/a in 2023 and could increase further to around 100 GWh/a by 2030. In Europe, production capacity is expected to increase from just under 500 GWh/a to over 2.5 TWh/a in the same period.

3.4 Regular evaluation and force majeure

The GG quota imposes an increasing and long-term obligation on the gas industry to cover gas demand with climate-friendly gases over time, which is only possible through an expansion of production capacity for green gases, a far-reaching conversion and expansion of the infrastructure (e.g., hydrogen core network, hydrogen storage and import terminals) and changes on the part of gas consumers (such as a conversion of industrial processes from natural gas to hydrogen).

This far-reaching transformation of the entire gas sector, in combination with high, incentive-compatible penalties if targets are not met, means a high risk for the gas industry: a sector-wide failure to meet the GG quota by 1 percentage point (e.g., achieving the GG quota of 9% instead of the prescribed 10%) would mean a penalty for the sector of around €1.1 billion.[37]

Such material, long-term risks to the physical availability of an energy source (such as biomethane and green hydrogen) cannot be influenced or mitigated by the quota holders, or only to a limited extent.[38] Therefore, safety mechanisms must be established in the design of the GG quota that address both short and long-term market shocks with appropriate measures, but without enabling circumvention or softening the objectives pursued with the quota (Figure 6):

- **Regular evaluation** (at least every 5 years) of whether the future quota path is appropriate and fits in with infrastructure development and the physical availability of green gases. In laws with obligation systems, such as the Federal Immission Control Act or associated ordinances, dates are usually set in advance at which the legal requirements are reviewed and at which the federal government can be authorised to make adjustments. This is intended to ensure that the measures are in line with climate targets and technological developments. If, for example, the Federal Government determines that the structural requirements (such as the planned development of the import infrastructure) do not match the future course of the quota, the future quota should be readjusted or temporarily frozen at the current level.

- **Force majeure rules** come into force in the event of unforeseeable, unavoidable events that prevent the current quota fulfilment. Force majeure rules only apply in the event of force majeure that prevents quota fulfilment. This could be, for example, the failure of a critical green gas import infrastructure or a crisis in an important country of origin. In this

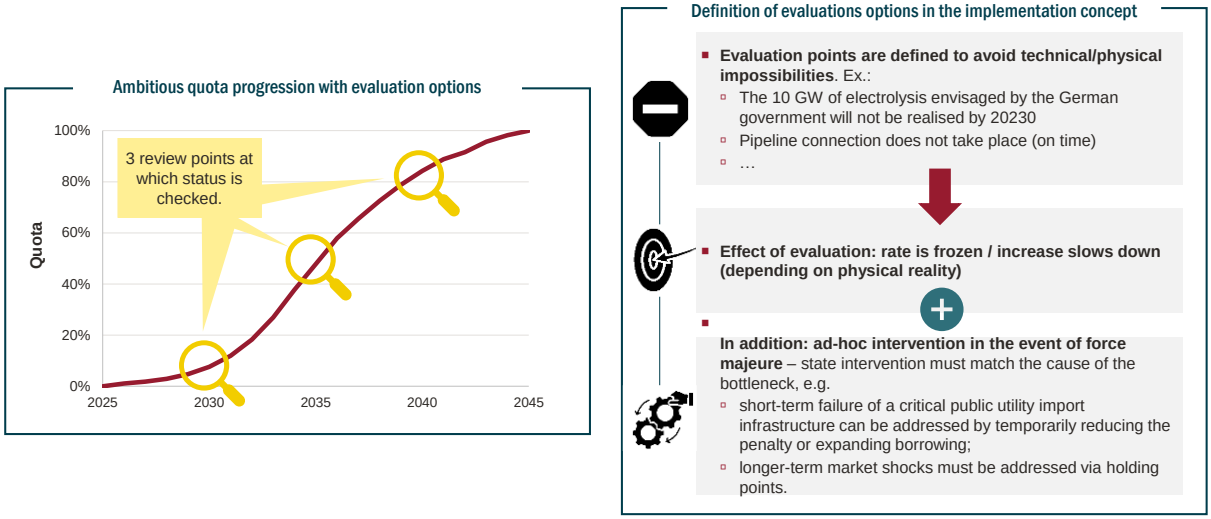
37 With a gas demand of around 800 TWh, the 1 percentage point shortfall corresponds to a shortfall in green gas of 8 TWh (= 8 million MWh). With a CO2 intensity of 0.2376 tCO_2/MWh, the penalty of €600/tCO_2 corresponds to around €140/MWh. The total penalty is therefore around € 140/MWh * 8 million MWh = € 1.12 billion.

38 For example, distributors cannot set up their own import infrastructure (or are not allowed to do so due to unbundling regulations in the case of regulated pipelines). In principle, distributors can protect themselves against long-term market risks through hedging, e.g. by trading derivatives such as futures/forwards. This works for established energy sources (such as electricity and gas) for which long-term standard products are traded in a liquid market. However, this is not the case for green gases, or only to a very limited extent.

case, appropriate measures could be taken by the legislator/regulator, such as a temporary reduction in the penalty or an extension of the permitted borrowing.

These rules are particularly necessary because our concept proposes a long-term and ambitious increase in quotas that is secured by a high penalty to ensure a long-term switch to 100% climate-neutral gases. However, this results in additional risk positions for distributors in the event of short-term disruptions. As additional risks are always associated with the costs of hedging them, the above measures are intended to ensure that "unnecessary" risk costs for achieving the target are avoided as far as possible.

Figure 6 Definition of evaluation times



Source: Frontier Economics

4 Implementation of the green gas quota

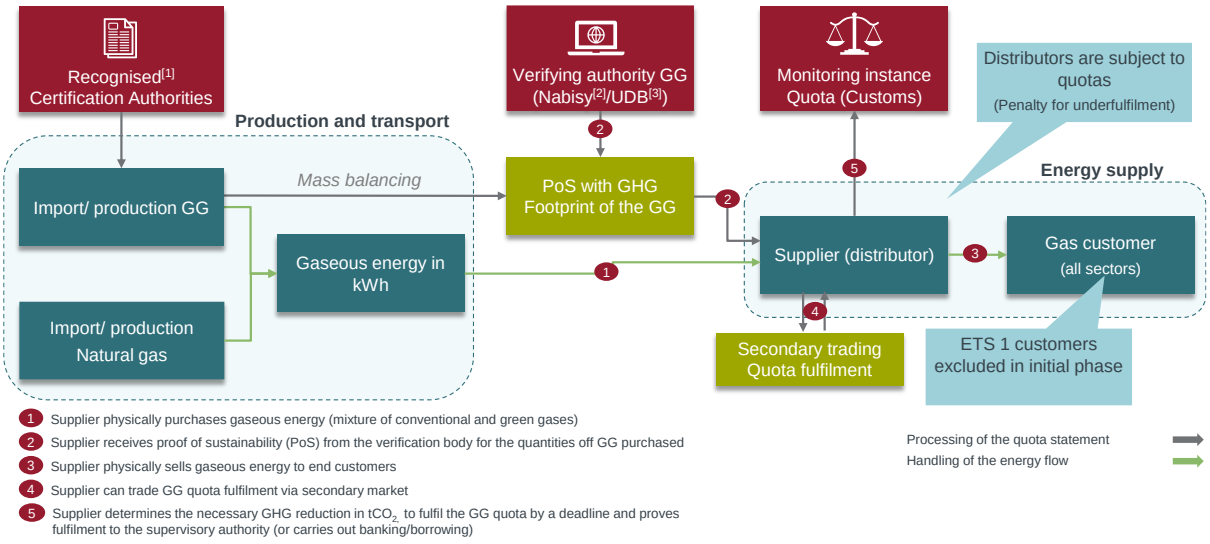
Our proposal for the **implementation process** (**section 4.1**) of the GG quota aims to minimise the additional bureaucratic burden by using existing institutions and verification processes as much as possible. The process includes the monitoring of sustainability criteria along the entire supply chain, tracking via established databases such as Nabisy and the trading of surplus quotas on secondary markets, which increases the efficiency and flexibility of quota implementation.

The proposal for the GG quota provides for several **implementation phases (section 4.2**) in order to achieve complete de-fossilisation of the gas sector by 2045. A preparatory phase (2025-2026) will be followed by a temporary exemption phase for ETS 1 installations, the introduction of a cross-sectoral quota and, in the long term, a possible expansion of the quota at EU level.

4.1 Process design

Our proposal for the implementation process (Figure 7) aims to ensure that the GG quota involves as little additional bureaucracy as possible and that quota fulfilment is reliably verified. For this reason, we rely on already established institutions and review processes wherever possible.

Figure 7 Proposed process design at a glance



Source: *Frontier Economics*

Note: *[1] https://www.ble.de/SharedDocs/Downloads/DE/Klima-Energie/Nachhaltige-Biomasseherstellung/Anerkennung_de.pdf?__blob=publicationFile&v=1, [2] https://nabisy.ble.de/app/start [3] https://wikis.ec.europa.eu/display/UDBBIS/Union+Database+for+Biofuels+-+Public+wiki*

- **Step 1: Production, transport and sale to supplier** – Green gases and fossil gases are produced domestically or imported. A recognised certification body[39] checks whether the producers of the green gases comply with the European and national sustainability criteria (see section2.3). The green gases produced are transported onwards via various delivery routes (such as pipelines and tankers) and may be stored temporarily before final use. For example, the green gases are mixed with fossil gases ("blending") when they are fed into the gas pipeline network.

- **Step 2: Compliance with sustainability criteria via mass balancing system** – Compliance with sustainability criteria is tracked along the entire supply chain (production, storage and transport). Art. 30 (1) of RED III requires a mass balancing system for this purpose.[40] The proofs of sustainability ("PoS") are linked to the physical product and are passed on along the entire supply chain (i.e. the proofs of sustainability cannot be traded separately, such as guarantees of origin).

  In Germany, the Federal Office for Agriculture and Food ("*Bundesanstalt für Landwirtschaft und Ernährung"*, "BLE") is the central authority responsible for monitoring and managing sustainability certificates for liquid and gaseous biomass. The BLE manages the Nabisy database[41], in which sustainability certificates are created, checked and rewritten. In addition, a Union database (UDB[42]) has been set up at EU level, which enables the tracing of liquid and gaseous renewable fuels and recycled carbonaceous fuels. There is therefore already a comprehensive tracking infrastructure for green gases that can be used to implement the GG quota.[43]

- **Step 3: Supply to end customers and physical fulfilment of the quota** – Green and fossil gases are usually sold to end customers by the suppliers subject to the quota[44] as a mixture, transported via the gas distribution infrastructure and consumed. Suppliers

39 List of recognised certification bodies according to § 42 Biokraft-NachV or BioSt-NachV: https://www.ble.de/SharedDocs/Downloads/DE/Klima-Energie/Nachhaltige-Biomasseherstellung/Anerkennung_de.pdf?__blob=publicationFile&v=1

40 The mass balance is essentially a database in which physical delivery quantities are recorded over time. Each processing step (e.g. blending or extraction) must be documented. For mixtures, information on the sustainability properties, the GHG savings and the respective delivery quantity must remain clearly assigned. The sum of the deliveries that are removed from a mixture must correspond to the same sustainability characteristics and quantities as the sum of the added deliveries. If quantities are transferred to another economic operator, the information on sustainability and GHG emissions must also be transferred. Economic operators must ensure that the mass balance is complete, transparent and verifiable. The data must also be protected against unintentional changes or loss. See https://www.umweltbundesamt.at/fileadmin/site/publikationen/rep0851.pdf, p. 51.

41 https://nabisy.ble.de/app/start

42 https://wikis.ec.europa.eu/display/UDBBIS/Union+Database+for+Biofuels+%28UDB%29+-+About

43 A standardised balancing framework and data exchange is required for the smooth processing of the quota, see https://www.dena.de/biogaspartner/infocenter/workshop-nachweisfuehrung/.

44 In the case of natural gas, the energy tax is generally incurred by the supplier (last trading stage) as the distributor, see BEHG draft of 5 November 2019 (printed matter 19/14746).

receive sustainability certificates from upstream producers/traders for the green gases they place on the market. This is stored in the Nabisy database and/or the UDB.[45]

- **Step 4: Secondary market / quota trading** – If a supplier subject to a quota obligation cannot physically fulfil the quotas in full itself, it is possible to offset them on the secondary market. This enables effective and efficient implementation of the quota obligation. Companies with lower costs for GHG reductions can generate quota surpluses and sell these to companies with higher abatement costs, thereby reducing the overall costs of reducing emissions. Analogue to the GHG reduction quota in the transport sector, it should be regulated by law that third parties can participate in trading.[46] Tradability also ensures that the GHG reduction of the gas industry can be achieved even if individual companies are unable to physically fulfil their obligations.

  There are two possible organisational forms for the secondary market (assuming appropriate legal regulations):

  - **Bilateral quota transfer** – Suppliers can transfer surplus quota to other quota holders. In this case, only the fulfilment of the obligation, but not the obligation itself, is transferred to a third party (i.e. if the quota seller defaults, the quota buyer remains responsible for the ultimate fulfilment). Brokers and aggregators can provide support, bring buyers and sellers together and thus facilitate quota trading. This corresponds to the organisation of the GHG reduction quota for fuels.[47]

  - **Trading platform** – As an alternative to the bilateral model, quota trading can be conducted via multilateral trading platforms (similar to CO_2 certificate trading on the EEX energy exchange). Here, several buyers and sellers come together on a central trading platform and trade standardised products (e.g., 1 tonne of CO_2 quota fulfilment per year t, t+1, etc.). The fundamental differences to bilateral quota trading are product standardisation, price transparency and the anonymity of buyers and sellers (as the platform handles the settlement).

  A multilateral trading platform has significant advantages over the bilateral transfer of quotas: transaction costs are generally reduced (particularly in view of the high number of quota holders in the gas sector) and long-term hedging against price risks is made easier due to product standardisation. In addition, trading platforms enable the entry of pure traders, which increases the liquidity of quota trading. However, platform solutions

45 Details on the design of the interface between Nabisy and UDB are still to be finalised.

46 In the case of the GHG reduction quota for fuel, for example, there are extra contracts for non-quota obligated parties that enable third parties to participate in the quota, see: https://www.zoll.de/DE/Fachthemen/Steuern/Verbrauchsteuern/Treibhausgasquote-THG-Quote/Quotenverpflichtung/Erfuellung-Quotenverpflichtung/Erfuellung-Nichterfuellung-Uebertragung-Quotenverpflichtung/erfuellung-nichterfuellung-uebertragung-quotenverpflicht

47 https://www.zoll.de/DE/Fachthemen/Steuern/Verbrauchsteuern/Treibhausgasquote-THG-Quote/Quotenverpflichtung/Erfuellung-Quotenverpflichtung/Erfuellung-Nichterfuellung-Uebertragung-Quotenverpflichtung/erfuellung-nichterfuellung-uebertragung-quotenverpflichtung_node.html

require corresponding regulatory adjustments (possibly also a decoupling of the certified sustainability of the green gas from the physical product after the delivery to Germany has been fully proven in compliance with the existing sustainability provisions) and the detailed implementation still needs to be analysed in more detail.

- **Step 5: Proof and verification of quota fulfilment** – Gas suppliers (as distributors within the meaning of the Energy Duty Act) must prove by 31 July of the following year[48] that they have fulfilled the statutory GG quota in the previous calendar year. This is done by submitting proof of sustainability and calculating the GHG reductions achieved (as a percentage of the gas volumes placed on the market). The monitoring body, e.g. customs (already responsible for processing the GHG reduction quota for fuel), checks the evidence and verifies that all requirements have been met

  If the quota has not been met (taking into account banking and borrowing, see section 3.2 and there is no case of hardship (see force majeure rule in section 3.4), a penalty of €600/tCO_2 will be charged.

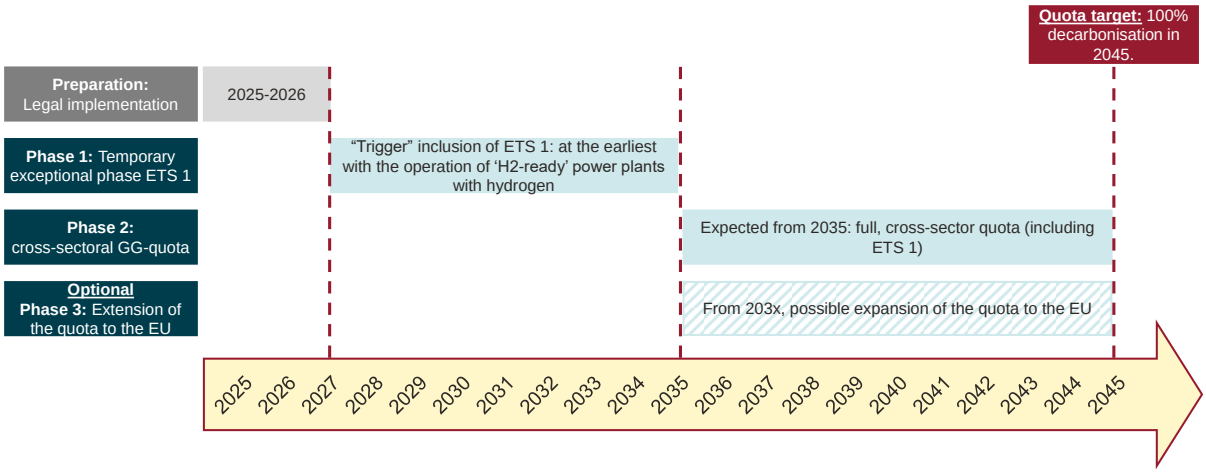
4.2 Implementation phases

The proposal for the GG quota envisages several implementation phases in order to achieve the overarching goal of complete de-fossilisation of the gas sector by 2045 through the use of green gases (seeFigure 8)

- **Preparation: Legal implementation (expected 2025-2026)** – In the preparation phase, the legal basis for the implementation of the new regulations will be created. This includes the drafting and adoption of the necessary laws and ordinances that define the framework conditions for the subsequent phases. The aim is to fulfil all legal requirements by the end of 2026 to enable a smooth start to the GG quota in 2027.
- **Phase 1 (expected from 2027): Temporary exemption phase ETS 1 plants** – In the first phase, a temporary exemption will be granted for ETS 1 plants. The trigger for the inclusion of ETS 1 plants is the operation of "hydrogen ready" power plants with hydrogen. In view of the current plans and assuming the power plant strategy, the year 2035 appears to be a realistic date for the inclusion of ETS 1 plants in the GG quota. The exact date depends on the legislative framework.
- **Phase 2: Cross-sectoral quota** – In phase 2, a full, cross-sectoral quota is introduced, which also includes ETS 1 installations. This phase marks the transition to a comprehensive system that includes all relevant sectors.
- **Prospective phase 3: Extension of the quota to the EU possible** – In addition to extending the quota to all sectors, it is also possible to extend the quota to the European Union as an optional extension in the medium to long term. This phase is optional and depends on the progress and acceptance of the GG quota.

[48] Based on the deadlines in Section 7 BEHG. By this deadline, distributors who are subject to national certificate trading for fuel emissions must report their fuel emissions to the competent authority (UBA).

Figure 8 Implementation phases of the GG quota



Source: Frontier Economics

Note: The exact timing of the inclusion of ETS I installations depends on the legislative framework.

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