Fit for 55 Package and Gas for Climate

Making 2030 EU climate targets achievable with a clear role for renewable and low-carbon gases

November 2021

GAS FOR CLIMATE
A path to 2050

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Key policy recommendations

The Gas for Climate (GfC) and European Hydrogen Backbone (EHB) consortia have been presenting an evolving and comprehensive proposal for net-zero greenhouse gas (GHG) emissions in the European Union (EU) by 2050. Since our first analysis in 2018, we have been working towards a European market for renewable and low-carbon gases with a focus on minimising overall societal costs and maximising the efficacy of the energy transition. Infrastructure development will be a crucial part of this transition. Our study on a European Hydrogen Backbone showed that the first stages of a European dedicated hydrogen pipeline network could start emerging by 2030, supporting the integration of renewable and clean energy via both onshore and offshore hydrogen networks.[1] As such, we welcome the level of ambition of the Fit for 55 package. However, our in-depth analysis shows that we can proceed even faster with decarbonisation efforts. To achieve that quicker decarbonisation, the Fit for 55 proposals need to further clarify the role of renewable and low-carbon gases by 2030.

Compared to the European Commission's (Commission's) targets and modelling scenarios, we see more renewable gas being available by 2030 (11% share of total gas demand vs. estimated 9.4% share by the Commission). Most notably,[2] we argue that renewable and low-carbon gases can spur faster decarbonisation in the iron and steel industry (54 TWh hydrogen demand vs. 0 TWh), aviation (14% share of sustainable aviation fuels (SAF) vs. 5% SAF target), a larger role for bio-liquified natural gas (LNG) in maritime (47 TWh vs. 4 TWh) and hydrogen for high temperature industrial heating (52 TWh vs. 17 TWh). Additionally, biomethane should have a firm role in decarbonisation as we illustrate in this paper (GfC forecasts biomethane demand of 160 TWh in the power and buildings sector, 179 TWh in transport and 22 TWh in industry by 2030). To accelerate the development of renewable and low-carbon gases in Europe and the energy transition, we propose the following **key policy recommendations:**[3]

1. **A political commitment to the role of gas infrastructure and renewable and low-carbon gases in meeting EU climate goals is needed now. Otherwise, we risk missing the 2030 goals.** Across the economy, we are at a crossroads that will determine the direction of the decarbonisation efforts in many areas, and European gas infrastructure is instrumental in supporting the transition. Although we welcome the level of ambition of the Fit for 55 package, the proposals need to further clarify the role of renewable and low-carbon gases in the decarbonisation of specific sectors, including iron and steel, maritime, aviation, and (high temperature) heat. Similarly, the upcoming *Hydrogen and decarbonised gas market package* has to enable the speedy transition of the gas infrastructure.

2. **A binding renewable gas target should be added to the Renewable Energy Directive (RED) II revision, and biomethane production using sequential cropping[4] techniques should be incentivised.** We have previously called on the Commission to include a binding 11% renewable gas target in the RED II revision.[5] This target could result in at least 140 TWh of renewable fuels of non-biological origin (RFNBO) and about 360 TWh of biomethane produced from biowaste and sustainable low indirect land use change (ILUC) risk intermediate crops under the sequential cropping regime by 2030. Sustainable sequential cropping should be encouraged under the RED II revision as a part of a renewable energy sub-target that is not capped (Annex IX Part A). These targets would provide certainty to producers and end-use sectors about the long-term outlook for RFNBO and biomethane and

[1] Guidehouse, "Extending the European Hydrogen Backbone," prepared for the European Hydrogen Backbone, April 2021, available at: https://gasforclimate2050.eu/wp-content/uploads/2021/06/European-Hydrogen-Backbone_April-2021_V3.pdf.

[2] The GfC and EHB demand estimations are listed first in the parenthesis; the demand estimation based on Fit for 55 targets or Commission modelling is provided second in the parenthesis.

[3] This section summarises our key policy recommendations based on our assessment presented in this paper. We aim to provide constructive feedback on the Fit for 55 proposals to accelerate the EU's decarbonisation and to ensure the development of renewable and low-carbon gases, critical in this transition, is not impeded. Our analysis focuses on the legislative proposals released as part of the July 2021 Fit for 55 package and is tentative to the second wave of legislation scheduled for December 2021.

[4] Sequential cropping is where a second crop is grown before or after the harvest of the main crop on the same agricultural land. An example of sequential cropping is growing a cereal, such as triticale, as the main crop for food production and silage maize for energy production.

[5] Including a sub-target for biomethane (8%) and RFNBO (3%). Source: Guidehouse, *Setting a binding target for 11% renewable gas,* prepared for Gas for Climate, January 2021: https://gasforclimate2050.eu/wp-content/uploads/2021/01/Gas-for-Climate-Setting-a-binding-target-for-11-renewable-gas.pdf.

promote the greening of the gas networks, which are significantly behind the decarbonisation of the electricity system.

3. **Timely adaptation of the regulatory framework in favour of rapidly establishing a European Hydrogen Backbone, including both onshore and offshore hydrogen pipelines, will be pivotal in meeting the RFNBO targets set out in Fit for 55.** The RFNBO targets will require large parts of the EU to be interconnected by 2030 already, even faster than currently envisioned by the EHB. First movers need to be supported and incentivised to start developing this network in regional networks as the basis for a pan-European hydrogen backbone. Ultimately, the backbone can ensure hydrogen price convergence across Europe, improve energy system resilience, and facilitate physical flows of hydrogen from renewable-rich regions to renewable-poor regions. Offshore pipelines will also be needed to efficiency transport hydrogen produced on the sea.

4. **Further scale-up of renewable and low-carbon gases needs to be supported by the implementation of the Union database and an adequate mass balance system. Gas Guarantees of Origin (GOs), compatible with the Union database, should become the main instrument to carry information, including sustainability characteristics.** A robust and transparent cross-border trade will be imperative for the scale-up of renewable and low-carbon gases. The Union database and GOs (as a preferred way to trace sustainability information, enable trade and provide robust accounting mechanism) will have a critical role in this development. In the implementation of the proposed mass balancing system, renewable and low-carbon gases injected into the gas grid should be allowed to be withdrawn flexibly if the grid is interconnected. This would mean that injected gases can be freely produced and consumed across the EU as it constitutes a fully interconnected gas grid. Stricter mass balance requirements (e.g. requiring booking of actual cross-border capacities) are undesirable because they would present an undue burden on renewable and low-carbon gas producers, consumers, and transporters. Related to the above, a clear mechanism at the EU level is needed to allow renewable and low-carbon gases from the grid to be used in the EU emissions trading system (ETS) to drive demand for renewable and low-carbon gases at scale.

5. **Sustainable biogas should be treated on a basis of achieved GHG emissions reduction instead of feedstock origin under the Energy Taxation Directive (ETD). We propose that only one category for sustainable biogas be created with a tax floor of €0.15/GJ (€0.54/MWh) in 2033.** Taxing sustainable biogas that can achieve 50%-80% emissions reduction[6] at the same rate as fossil fuels is counterproductive to achieving the EU's climate targets.

6. **Article 11 of the RED II should allow for certified renewable gas projects outside of the EU to count towards the EU RED II revision target instead of only renewable electricity projects. Further, bio-LNG infrastructure should be supported by concrete deployment targets, as is the case for electricity and hydrogen (Alternative Fuels Infrastructure Regulation, AFIR). Finally, economic operators that supply renewable *energy* and not only renewable *electricity* should be able to receive credits that can offset requirements under the overarching transport target (RED II).** Different decarbonisation options are treated inconsistently in the proposed Fit for 55, effectively distorting the level playing field. Correcting such instances is required to meet EU climate targets efficiently.

7. **The use of renewable and low-carbon gases to decarbonise the buildings sector should be further developed. Our research shows that biomethane has higher societal value when used directly in building heating & cooling (H&C) as compared to district H&C. In the buildings sector, biomethane should be preferentially allocated for direct use.** The current natural gas infrastructure reaches 100 million homes in the EU and this infrastructure can be used for an effective and speedy transition. The GfC vision presents an ambitious and viable decarbonisation alternative based on energy efficiency improvements, hybrid heat

[6] European Commission, *DIRECTIVE (EU) 2018/2001 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 11 December 2018 on the promotion of the use of energy from renewable sources (recast), Annex VI*, available at: https://ec.europa.eu/info/sites/default/files/amendment-renewable-energy-directive-2030-climate-target-with-annexes_en.pdf

pump setups, and the use of biomethane. Beyond buildings, biomethane can be used to decarbonise industry and transport and as dispatchable power.

8. **The EU should consider reimbursement for exported goods under the Carbon Border Adjustment Mechanism (CBAM) to prevent carbon leakage due to the continued decarbonisation efforts.** Decarbonisation, and the protection of European industries, will be key in meeting the climate goals set out by the EU.

Executive summary

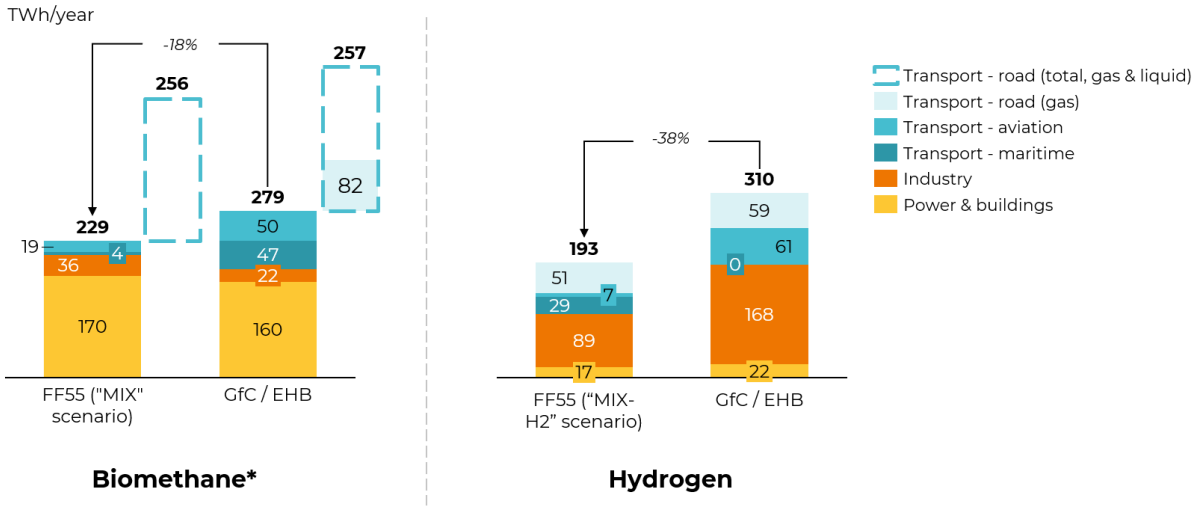
The **Fit for 55 package** is a comprehensive set of updates to existing laws and new legislative proposals from the European Commission (Commission) to help achieve the European Union (EU) target of 55% greenhouse gas (GHG) emissions reduction by 2030 compared to 1990 (the previous target was 40%). This package will have an immense impact on the decarbonisation of the EU economy. **Renewable and low-carbon gases and gas infrastructure will have a pivotal role in cost-effectively achieving these 2030 goals** and the ultimate pursuit of climate neutrality. The Gas for Climate (GfC) consortium welcomes this ambitious package of changes designed to spur faster decarbonisation in Europe. In this paper, we look at the possible impacts of Fit for 55 on renewable and low-carbon gas development in Europe and provide several recommendations that could make Fit for 55 even more impactful.

The GfC consortium has previously called on the Commission to add a binding 11% renewable gas target to the recast Renewable Energy Directive (RED II)—8% for biomethane and 3% for green hydrogen.[7] We estimate that the current Fit for 55 package could achieve a 9.4% renewable gas share by 2030—5.1% biomethane and 4.3% green hydrogen (renewable fuels of non-biological origin, or RFNBOs).[8]

These shares correspond to around 279 TWh of biomethane across power and buildings, industry, aviation, and maritime in the GfC scenario, compared to 229 TWh in the Commission's scenario.[9] Thus, GfC forecasts around 18% higher demand for biomethane by 2030 than the Commission (excluding road transport demand).

For hydrogen, the MIX-H_2 scenario adds up to approximately 193 TWh of hydrogen (RFNBO only) demand compared to the GfC estimation of 310 TWh, a difference of around 38%. The GfC scenarios rely on a combination of green and blue hydrogen, making a direct comparison here less precise.

Figure 1: Comparison of gaseous biofuel and hydrogen volumes across all end-use sectors between the Commission's MIX (and MIX-H_2) modelling scenario and the GfC/European Hydrogen Backbone (EHB) scenarios (TWh). Note*: Dashed box [transport – road (total)] includes non-gaseous bioenergy.



[7] Share of total gas consumption (natural gas, low-carbon gases, renewable gases), with 8% coming from biomethane and 3% from green hydrogen (no multipliers). This would result in around 360 TWh of biomethane and 140 TWh of green hydrogen.

[8] Derived from our calculations based on the MIX scenario (approximately 17% decline in natural gas consumption between 2020 and 2030).

[9] These figures exclude the demand for biofuels in road transport because the available results for the MIX scenario[9] do not distinguish between gaseous and liquid biofuels, whereas GfC estimates only gaseous biofuels (82 TWh, including bio-liquified natural gas (LNG)).

Industry

The relevant targets are:

- 50% of national industrial hydrogen consumption covered by RFNBOs,
- 1.1% per annum (p.a.) increase of renewable energy sources (RES) share in the heating & cooling (H&C) sector (this includes building H&C).

These targets present a significant and concrete push for hydrogen and other renewable energy carriers' development in Europe. Yet, GfC is more ambitious in its plans to:

- Begin decarbonising the iron and steel sector using hydrogen by 2030 (54 TWh/year hydrogen demand in GfC, 0 TWh/year in RED II revision),
- and for the use of hydrogen in industrial heating (GfC installation-level analysis forecasts 52 TWh vs. 17 TWh by the Commission).

Many of the Member States with the highest industrial hydrogen demand (e.g. Germany, Belgium Poland) will not have sufficient RES capacities to supply all their RFBNO demand domestically. Transport of hydrogen from regions with a high RES potential (e.g. the North and Baltic Seas, Nordics, and Southern Europe) will be needed. The envisioned plan for a pan-European hydrogen backbone would need to be sped up to facilitate this integration critical for meeting the national 50% RFNBO target.[10]

No concrete target has been announced for biomethane's uptake in industry. From the Commission's scenarios, we estimate:

- 36 TWh of industrial biomethane demand by 2030, which is significantly more than the 21 TWh foreseen by GfC.

This is most likely caused by the different end-use allocations of available biomethane between the Commission and GfC across all sectors.

Within Fit for 55, the revision of the existing EU emissions trading system (ETS) and the introduction of the Carbon Border Adjustment Mechanism (CBAM) will have the biggest direct impact on the developments in industry in the EU. Increased prices of EU (emission) Allowances (EUA) and less free allocation under the CBAM will incentivise sectors under the ETS (and CBAM) to rapidly switch to renewable and low-carbon energy sources. However, because the CBAM will not cover EU exports (EUA price reimbursement), carbon leakage will still be possible. To prevent the relocation of important industrial sectors from the EU, a gas network able to supply renewable and low-carbon fuels at least cost will be critical in this transition.

Transport

The relevant targets are:

- 13% GHG emissions intensity reduction in final energy demand,
- For RFNBOs, a specific sub-target of 2.6% share of final energy demand in transport and a minimum of 0.7% of synthetic kerosene in final energy demand in aviation (the total sustainable aviation fuels (SAF) target is 5%),
- For biofuels (both gaseous and liquid), the caps and floors depending on the type of feedstocks are updated and (most) previous multipliers, which provided extra incentives for specific types of feedstocks, are discontinued. The absolute scope of the biofuels caps and floors is substantially enlarged by the inclusion of aviation and maritime.

[10] The EHB initiative foresees pan-European interconnection by 2035; see "Extending the European Hydrogen Backbone" at: https://gasforclimate2050.eu/wp-content/uploads/2021/06/European-Hydrogen-Backbone_April-2021_V3.pdf.

- Maritime has a non-fuel-specific fleet target of 6% GHG emissions intensity reduction for onboard fuels by 2030.

In our assessment, the key differences between the Fit for 55 and GfC are in aviation and maritime:

- in aviation, GfC envisions a much faster decarbonisation push, with 14% of the aviation energy coming from SAF by 2030 compared to the Commission's target of 5%,

- in maritime, the Commission seems to rely on RFNBOs (likely methanol) as a near-term decarbonisation opportunity, whereas GfC envisions a bigger role for bio-LNG. We expect that both fuel types will be key contributors to the decarbonisation of maritime.

For road transport, the comparison is more difficult. From the Commission modelling, we can only determine the cumulative demand for bioenergy (gaseous, liquid), whereas GfC/EHB predicts only the gaseous part of the bioenergy demand.

We estimate that even if the RFNBO sub-target is accomplished and all the biofuel feedstocks caps are hit and floors are met, the overarching 13% GHG emissions reduction target for transport would not be achieved (2.6% gap). This gap would need to be covered by either the additional use of RFNBOs, bioenergy, or renewable electricity beyond the targets previously illustrated.

The transport sector will be affected by several other proposals in Fit for 55. Under the Energy Taxation Directive (ETD), all motor fuels will be subjected to a minimum tax rate based on the energy content and generally differentiated according to fuels' environmental performance. In addition, the maritime sector (together with aviation) will be covered by the existing EU ETS. The remainder of the transport sector is then proposed to be allocated under a separate EU ETS (together with fuels used in buildings). We estimate the combined effect of these proposals to be relatively significant. At approximately €0.5/l of gasoline of additional taxation,[11] fuel switching could be incentivised.

Together with the expected fuel price impacts, the updated CO_2 performance standard for cars and vans will effectively not allow for sales of new vehicles with internal combustion engines in these classes after 2035. New vehicle sales of only battery electric vehicles (BEVs) and fuel cell vehicles (FCVs) would not be penalised. This aligns with the GfC vision, which projects mostly direct electrification of cars and vans. For heavy duty vehicles, GfC does not expect full electrification due to range and cost considerations; instead, it forecasts significant demand for hydrogen and bio-LNG. This vehicle class is not covered by the updated CO_2 performance standard.

The Alternative Fuel Infrastructure Directive (AFID) is proposed to become a regulation (AFIR); as such, it will have direct applicability in the Member States . The AFIR specifies concrete quantitative targets for the development of charging and hydrogen refuelling infrastructure in the EU. For bio-LNG infrastructure (both road and maritime), AFIR has no concrete targets (reference is made only to an unspecified "appropriate number"). This could hamper further development of bio-LNG refuelling stations because priority will be given to electric and hydrogen infrastructure with their concrete targets. This is especially true considering the development of bio-LNG infrastructure differs strongly across Member States.

Buildings

The relevant targets are:

- 1.1% p.a. increase of renewable energy sources (RES) share in the heating & cooling (H&C) sector (this includes industry H&C),[12]

- for district H&C, this annual increase is set to 2.1%,

[11] Additional taxation means the minimum total charge levied in respect to all indirect taxes (excluding value-added tax).

[12] Specifically, 1.5% for Member States where waste H&C is used and a lower or not binding target for Member States with already high shares of RES. In addition, Member States shall endeavour to increase RES H&C share by Member State-specific top-ups to redistribute additional efforts needed to arrive at desired RES shares by 2030.

- indirectly, the buildings sector will be impacted by the ambitious 36%-39% energy efficiency target (whole economy in the Energy Efficiency Directive, or EED).

At the aggregated level:

- the volumes of biomethane and hydrogen the Commission expects in the buildings (and power)[13] sector are close to those estimated in GfC (188 TWh vs. 182 TWh).

These top-level figures do not specify how a unit of renewable gas (biomethane and hydrogen) is used or to what extent it is integrated with the power system (e.g. power production, combined heat and power, gas boiler in a building, etc.). The different options would have a different contribution towards final energy demand depending on the technology's conversion efficiency.

In our previous studies, we investigated the allocation of biomethane to end-use sectors depending on its societal value (over hydrogen and direct electrification). We have concluded that biomethane is best suited for use directly in building H&C utilising the existing distribution networks because it eliminates the need to retrofit the distribution network and appliances for hydrogen. Accompanied by a massive building retrofitting programme to substantially increase energy efficiency, biomethane would be used in a hybrid heat pump setup that increases efficiency, lowers the cost to end users, and provides flexibility to the power system (e.g. at times of longer cold spells with little generation from variable RES). Hybrid heat pumps could also be used indirectly in district heating systems. Here the relative advantage of biomethane in terms of societal value compared to hydrogen is lower.[14]

Overall, Fit for 55 does not specify how to achieve this rapid decarbonisation of the building stock. Other relevant pieces of sectoral legislation—in particular the energy performance of buildings directive (EPBD) scheduled for December 2021—will be critical to determine the path forward for energy efficiency and fuels used for H&C.

However, the changes in the EU ETS (creating a separate EU ETS for fuels used in transport and buildings) and the enactment of minimum taxation levels for fuels used in buildings (ETD) will affect consumer prices. According to our assessment, this price signal (estimated at €15/MWh of natural gas for the combined ETS and ETD effect) will not be strong enough to contribute to a significant switch to lower emitting options. The proposed changes should be complemented by support mechanisms that will further incentivise the decarbonisation of the buildings stock. Unless such incentivisation programmes are enacted nationally, the separate EU ETS system for buildings will likely pass on the costs to consumers, which will likely negatively affect their disposable income and have only a minimal effect on the emissions.

[13] Due to data availability in the RED II impact assessment, we are looking at aggregated demand for the buildings and power sectors.

[14] Using hydrogen centrally (district heating system) does not require retrofitting of the gas distribution system as well as end-user heating appliances. Thus, using hydrogen or biomethane in district heating does not significantly alter societal cost (omitting the cost of the gas itself).

Introduction

The European Commission (Commission) published the first part of the Fit for 55 package on 14 July 2021. This comprehensive proposal aims to reduce greenhouse gas (GHG) emissions in the European Union (EU) by 55% by 2030, and realise the European Green Deal (compared to 1990, the previous target was 40%). Fit for 55 reviews and adds to the climate, energy, and transport-related policy framework on a European level, aiming to transform the European economy and achieve the EU's 2030 climate goals as a milestone on the path to climate neutrality by 2050. Even though the negotiation with Member States and European Parliament might take longer than a year and the final legislative changes are not completely known, the European economy and life of EU citizens are likely to change significantly. Because of this inherent complexity and the long implementation timeline of the package, the Gas for Climate (GfC) consortium has **identified and prioritised key topics** (see Key policy recommendations) to ensure swift implementation of the Fit for 55 proposals.

With Fit for 55, the Commission generally proposes a package that provides a boost for the hydrogen and biomethane sectors, and we applaud its level of ambition. Many of these revisions and proposals are crucially important to the GfC consortium members as they will shape future demand and supply of low-carbon and renewable gases in the EU and the development of the respective infrastructure. This paper provides our **view on Fit for 55, which can be used as input for the ongoing negotiations and for the final trialogue discussions**. In the following chapters, we distil the key aspects of the Fit for 55 proposals relevant to the development of renewable and low-carbon gases in Europe and discuss the possible impacts on the GfC ambition. Subsequently, we compare the figures from the Commission's central MIX scenario (and its H_2 variant), as derived from the recast EU Renewable Energy Directive (RED II) revision impact assessment (IA), with the GfC Accelerated Decarbonisation (AD) pathway and European Hydrogen Backbone (EHB) scenario.[15] We also provide **key policy recommendations targeting possible improvements to the current proposals that are required to meet the 2030 goals in a timely, effective, and cost-efficient manner.**

The GfC scenarios reflect the consortium's vision and ambition and draw on multiple years of energy system analysis and dialogue with EU decision makers. The AD scenario describes a transition pathway from today's energy system to the 2050 net-zero emissions system, showing how a stepwise approach based on system integration can put Europe on course towards a faster and more cost-effective decarbonisation of its energy system compared to current EU trends. The EHB scenario builds on this pathway and assesses how a dedicated hydrogen infrastructure based on repurposed existing natural gas pipelines can help to decarbonise key demand sectors.

The scenarios are complemented by numerous GfC policy papers relevant to EU energy policy.[16] These papers include a call for an 11% renewable gas target by 2030,[17] and a paper exploring whether sequential cropping can meet the criteria for inclusion in Annex IX of RED II.[18]

Overview and timeline of Fit for 55

The Fit for 55 package most notably proposes the following:

- Revising the EU emissions trading system (ETS), including introducing a Carbon Border Adjustment Mechanism (CBAM)
- Revising RED II
- Changing the Alternative Fuels Infrastructure Directive (AFID) into a regulation (AFIR)

[15] This paper refers to these two scenarios as GfC scenarios.

[16] See the GfC website for all of our publications: https://gasforclimate2050.eu/publications/.

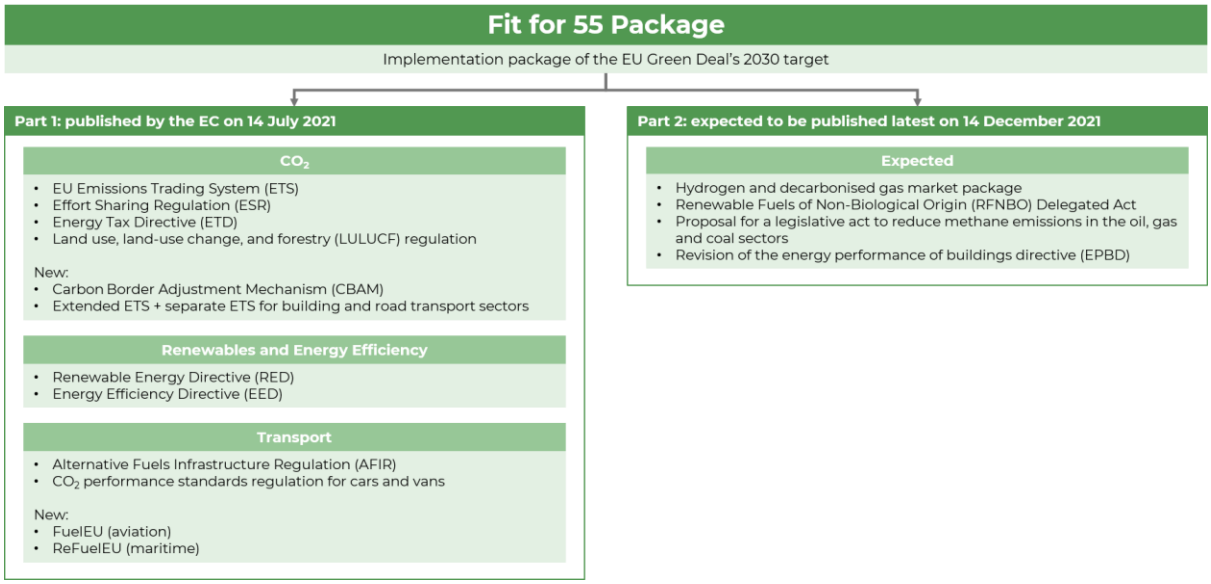
[17] Guidehouse, *Setting a binding target for 11% renewable gas,* prepared for Gas for Climate, January 2021, available at: https://gasforclimate2050.eu/wp-content/uploads/2021/01/Gas-for-Climate-Setting-a-binding-target-for-11-renewable-gas.pdf.

[18] Gas for Climate, *Silage crops grown in a sequential cropping system as advanced biomethane crops under the EU RED II*, October 2021, available at: https://gasforclimate2050.eu/?smd_process_download=1&download_id=768.

- Introducing initiatives for sustainable fuels in aviation and maritime transport (ReFuelEU and FuelEU)

The Effort Sharing Regulation, Energy Taxation Directive (ETD), Energy Efficiency Directive (EED), and CO_2 performance standards for road vehicles have also been introduced or revised (see Figure 2).

Figure 2: Overview of the Fit for 55 package[19]



The next step in adopting the proposals and revisions in Fit for 55 is the discussion of the proposals by the European Parliament and the European Council; each will have to define its respective position on the individual files. Both the Parliament and the Council may propose amendments to the Commission proposals. Once the Parliament has voted its position and the Council has reached a general approach, the trilogue process will start between the Commission, the European Parliament, and the European Council to determine a final agreement. The overall process is likely to take years, with the last proposals being adopted in 2023 or later, although some of the proposals can be adopted earlier.

Meanwhile, the Commission is preparing the second set of regulatory proposals, which is expected to be published in December 2021. It consists of four main initiatives:

1. **Hydrogen and decarbonised gas market package:** A revision of the third energy package for gas (Directive 2009/73/EU and Regulation 715/2009/EU) is needed to regulate competitive decarbonised gas markets. It is expected to ensure the gas market framework is in line with the Fit for 55 ambition. The legislative proposals to update EU gas markets will mainly focus on how to enable a market for biomethane and renewable and low-carbon hydrogen. They will also include how to facilitate the injection, transmission, distribution, and trading of renewable and low-carbon gases in the gas grids considering the wider energy system integration.

2. **Methane emissions:** As announced in the EU methane strategy adopted in October 2020, the Commission is preparing a legislative proposal to reduce methane leaks in the energy sector. It is expected to include binding rules on monitoring, reporting, verification, and detecting and repairing leaks in the energy sector and will consider rules on routine venting and flaring.

3. **Energy performance of buildings directive (EPBD):** In October 2020, the Commission presented its renovation wave strategy as part of the European Green Deal. The strategy contains an action plan with concrete regulatory, financing, and enabling measures to boost building renovation. Its objective is to at least double the annual energy renovation rate of

[19] The RFNBO DA (Article 27 of RED II) is not technically part of the Fit for 55 package. It is mentioned here for completeness as it will be important for hydrogen developments.

buildings by 2030, and to foster deep renovation. The Commission will propose a revision of the EPBD accordingly.

4. **Delegated acts (DAs) of the RED II on Article 27 and Article 35.** The DA for Article 27 will specify the production criteria for renewable fuels of non-biological origin (RFNBO) in the EU and possibly for imported RFNBO. The RED II revision also proposed that RFNBO use across all end-use applications is covered by this DA (originally relevant for the transport sector only). The DA for Article 35 will specify the methodology for assessing GHG emissions savings from RFNBO and recycled carbon fuels (RCFs). These legislative pieces will be analysed once published and have not been taken into account in this paper to prevent the risk of conducting our analysis on unsubstantiated information.

1.1 Definitions used in this paper

Renewable fuels of non-biological origin (RFNBOs): Per Article 2(36) of the RED II revision: "'Renewable fuels of non-biological origin' means liquid and gaseous fuels the energy content of which is derived from renewable sources other than biomass." The specific criteria for RFNBO production is being developed in the preparation of the DA on Article 27 (RED II), set for publishing in December 2021. In practical terms, this definition equivalent to green hydrogen (various production technologies) and derivatives of green hydrogen (e.g. green methanol, ammonia, methane.).

Green hydrogen: Hydrogen produced by electrolysis using renewable electricity or by using renewable energy other than biomass (e.g. steam reforming of biomethane would qualify as green hydrogen).

Low-carbon fuels: A variety of synthetic fuels with a lower GHG emissions footprint than their fossil equivalent. This category is expected to be defined in the hydrogen and decarbonised gas market package (expected to be published in December 2021). Methodology for RCFs, a sub-category of low-carbon fuels, should be published in a DA on Article 35 (RED II) in December 2021.

Blue hydrogen: Hydrogen produced by using fossil energy input and employing a high capture rate (>90%) and storage on production process CO_2 emissions. In Europe, this most commonly means applying carbon capture and storage on steam methane reforming or autothermal reforming.

Annex IX Part A advanced biofuels: Biofuels (liquid and gaseous) for transport that are produced from the feedstocks listed in Part A of Annex IX to RED II (mainly waste materials and residues).

Annex IX Part B advanced biofuels: Biofuels (liquid and gaseous) for transport made from the feedstocks listed in Part B of Annex IX to RED II (used cooking oil and animal fats category I and II).

1.2 List of Abbreviations

AD	Accelerated Decarbonisation
AFID	Alternative Fuels Infrastructure Directive
AFIR	Alternative Fuel Infrastructure Regulation
BEV	Battery Electric Vehicle
CBAM	Carbon Border Adjustment Mechanism
CHP	Combined Heat and Power
CO_2	Carbon Dioxide
Commission	European Commission
DA	Delegated Act

EEA	European Economic Area
EED	Energy Efficiency Directive
EHB	European Hydrogen Backbone
EPBD	Energy Performance of Buildings Directive
ERGaR	European Renewable Gas Registry
ESR	Effort Sharing Regulation
ETD	Energy Taxation Directive
ETS	Emissions Trading System
EU	European Union
EUA	EU Allowances
EV	Electric Vehicle
FaSTGO	Facilitating Standards for Guarantees of Origin
FCV	Fuel Cell Vehicle
gCO2eq/MJ	grams of carbon dioxide equivalent per megajoule
GDP	Gross Domestic Product
GfC	Gas for Climate
GHG	Greenhouse Gas
GJ	Gigajoule
GO	Guarantees of Origin
H&C	Heating and Cooling
IA	impact assessment
ILUC	Indirect Land Use Change
km	Kilometre
l	Litre
LNG	Liquified Natural Gas
MWh	Megawatt-Hour
RCF	Recycled Carbon Fuels
RED	Renewable Energy Directive
RED	Renewable Energy Directive
RES	Renewable energy sources
RFNBO	Renewable Fuels of Non-Biological Origin
SAF	Sustainable Aviation Fuels
tCO2	tonnes of carbon dioxide
TEN-T	Trans-European Transport Network
TWh	Terawatt-Hour

2. Impacts of Fit for 55 on the GfC decarbonisation pathways

The European Green Deal and Fit for 55 are underpinned by scenario modelling by the European Commission (Commission) that explores different combinations of policy and regulatory options to reach the underlying 55% greenhouse gas (GHG) emissions reduction goal. The MIX scenario (and its H_2 variant)[20] is the central scenario the Commission used to develop most of its proposals in Fit for 55.[21] While the detailed results of the modelling exercises are not publicly available, a summary of the outputs is accessible,[22] and further details can be derived from the IA of the Renewable Energy Directive (RED) II revision.[23]

In this chapter, we:

- Compare the trajectory up to 2030 illustrated by the MIX (and MIX-H_2) scenario with the Gas for Climate (GfC) Accelerated Decarbonisation (AD) scenario from our *2020 Gas Decarbonisation Pathways 2020-2050* report (for biomethane) and the *2021 European Hydrogen Backbone (EHB) study* (for hydrogen) (these scenarios are referred to as GfC throughout this paper).[24]

- Provide insight into the possible European Union (EU) trajectory up to 2030, and the role of renewable and low-carbon gases in these developments. In certain cases, this means looking beyond the concrete targets the Commission proposes (e.g. 2.6% renewable fuels of non-biological origin (RFNBOs) share in the transport sector) to the overall picture (share of each energy carrier in transport as modelled by the Commission)

- Describe the key differences between the 2030 vision of the GfC consortium and the MIX (and MIX-H_2) scenario by the Commission, even though a direct comparison is not always possible due to methodological differences or lack of data. Note: GfC envisions that hydrogen demand is met by a combination of green and blue hydrogen. Until now, the Commission has only announced the target for RFNBOs (green hydrogen and its derivatives); the goal for blue (low carbon) hydrogen remains unclear.[25]

This chapter is structured into four sections, three of which follow demand segmentation (industry, transport, and buildings and power) and one (additional impacts) that looks at other important considerations for renewable and low-carbon gas development. Each of the three demand sections contains a quantified comparison as described previously and a more general view on the possible impacts caused by Fit for 55 (by assessing the combined effect of the proposals).

[20] MIX-H_2 is a variant of the central MIX scenario, illustrating high uptake of hydrogen in final energy demand already in 2030, aligned with the goal of the Hydrogen Strategy (40 GW of electrolyser capacity in the EU in 2030). MIX- H_2 is used for assessment of options including on the promotion of RFNBOs in industry and in transport.

[21] European Commission, "Policy scenarios for delivering the European Green Deal," accessed 9 November 2021, available at: https://ec.europa.eu/energy/data-analysis/energy-modelling/policy-scenarios-delivering-european-green-deal_en.

[22] European Commission, "Excel files for MIX scenario," accessed 9 November 2021, available at: https://ec.europa.eu/energy/content/excel-files-mix-scenario_en.

[23] European Commission, *Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL amending Directive (EU) 2018/2001 of the European Parliament and of the Council, Regulation (EU) 2018/1999 of the European Parliament and of the Council and Directive 98/70/EC of the European Parliament and of the Council as regards the promotion of energy from renewable sources, and repealing Council Directive (EU) 2015/652*, 14 July 2021, available at: https://ec.europa.eu/info/sites/default/files/amendment-renewable-energy-directive-2030-climate-target-with-annexes_en.pdf.

[24] See the GfC website for all of our publications: https://gasforclimate2050.eu/publications/.

[25] The role of blue hydrogen is expected to be clarified in the hydrogen and decarbonised gas market package that should be published before the end of 2021.

2.1 Industry

Quantification of Fit for 55 targets and key differences to GfC scenarios

The relevant, binding, targets for the industry sector are as follows:

- 50% of national industrial hydrogen consumption covered by RFNBOs (both energy and non-energy use), excluding the demand for synthetic kerosene and the production of conventional fuels (RED II revision).

- An annual increase of renewable energy sources (RES) share in the heating & cooling (H&C) sector by 1.1%,[26] encompassing heating and cooling used across sectors, including buildings and industry (RED II revision).

GfC forecasts total industrial hydrogen (green and blue) demand of 168 TWh by 2030, excluding hydrogen demand for synthetic kerosene and hydrogenation of fossil fuels in refineries (accounted for under the transport sector). In comparison, according to the Commission's MIX-H_2 modelling scenario, the RED II revision target of 50% industrial hydrogen consumption covered by RFNBOs could lead to 89 TWh by 2030.[27]

The difference between the two figures can be partly attributed to the GfC analysis expecting significant hydrogen consumption in the iron and steel sector (54 TWh) by 2030. It seems hydrogen-based steel production in the iron and steel sector is not considered in the MIX-H_2 scenario, indicating the Commission does not expect the demand to develop before 2030. In our most updated overview of the self-announced projects in the EU, however, the hydrogen demand in the iron and steel sector adds up to 60 TWh/year by 2030.[28] The Commission only acknowledges hydrogen potential in the sector under "Section 6.1.2. – Energy System impacts not based on modelling" of the RED II revision IA, which cites an estimated 62-68 TWh of RFNBOs to replace fossil fuels in steel production.

It is not directly obvious whether the Commission envisions that the 89 TWh of RFNBOs by 2030 is calculated based on hydrogen demand in ammonia and methanol production and industrial heating[29] or in ammonia, methanol, iron and steel, and industrial heating. If we subtract iron and steel demand to enable a like-for-like comparison, the remaining industrial hydrogen demand forecasted by GfC would be 114 TWh, which is still 30% more than the 89 TWh foreseen by the Commission's modelling.

The second major difference in hydrogen use seems to be in industrial heat demand: 52 TWh in GfC versus 17 TWh in the Commission's modelling. From the IA, we can derive that the Commission likely expects more electrification of industrial heat demand compared to GfC. Our estimates are based on bottoms-up forecasting—for each major industrial installation in the EU, we have looked at sectoral decarbonisation strategies, its natural investment cycle, and the size and range of possible options for (high temperature) heating to assess hydrogen and biomethane demand. The discrepancies can be explained by either different expectations in hydrogen demand by 2030 (e.g. electrification) between the Commission and GfC or the inclusion of blue hydrogen in GfC modelling.

The national target of 50% industrial hydrogen consumption (energy and non-energy purposes) covered by RFNBOs will have an uneven effect among Member States; this is because the industrial use of hydrogen is primarily located in Member States with insufficient RES potential (e.g. Germany, Belgium, Poland)[30] whereas much of the production will likely occur elsewhere (e.g. North and Baltic

[26] 1.5% for Member States that use waste in their H&C. Member States with more than a 50% share of RES in H&C are only obligated to a 0.55% annual increase, and Member States with more than 60% RES share in H&C have no obligation.

[27] The 89 TWh would constitute half of the total hydrogen demand in industry. If the target was met, the other half would need to be covered by grey or blue hydrogen.

[28] Excluding demand expected from the HYBRIT project in Sweden, which has not yet announced its concrete target for 2030. Per the Gas for Climate, *Market state and trends report*, 2021 (to be published in November).

[29] Ammonia and methanol are, besides the demand for additional hydrogen in the petrochemical industry (accounted for under the transport target), the leading current uses of hydrogen.

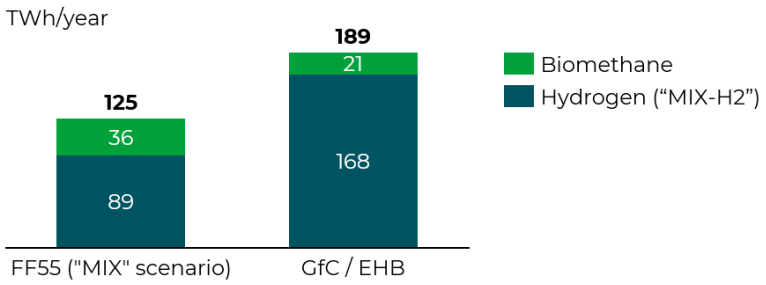
[30] For estimation of the supply and demand potential in European regions, see Guidehouse, *Analysing future demand, supply, and transport of hydrogen*, European Hydrogen Backbone in cooperation with Gas for Climate, June 2021, available at: https://gasforclimate2050.eu/wp-content/uploads/2021/06/EHB_Analysing-the-future-demand-supply-and-transport-of-hydrogen_June-2021.pdf.

Seas, Nordics, and Southern Europe). Without an integrated pan-European hydrogen backbone network, meeting the 50% RFNBO share in 2030 in Member States with high hydrogen demand but restricted RFNBO production potential will be infeasible. The current plans for the European Hydrogen Backbone infrastructure only envision large parts of Europe to be interconnected by 2035.[31] **The development of the backbone would have to be further sped up to facilitate this integration critical for meeting the national 50% RFNBO target.**

A possible alternative or complementary measure could be to expand the definition of statistical transfers under the RED II revision. Statistical transfers present a means to (partially) meet RED obligations by virtually transferring renewable energy from one Member State (that has, for instance, overachieved on its RES target) to another Member State (that would have otherwise have not met its RES target). Currently, however (under RED II revision), statistical transfers can only be applied to overall and sectoral targets and are not allowed to meet sub-sectoral targets such as the 50% RFNBO share in industrial hydrogen consumption. Furthermore, expanding the definition of statistical transfers for this target could delay the buildout of the infrastructure required to transport RFNBOs from one country to another.

No concrete target has been announced for biomethane uptake in industry. Based on total industrial bioenergy demand in the MIX scenario and expected shares of biomass usage in industry, we estimate that the Commission's scenario foresees 36 TWh of industrial biomethane demand in 2030.[32] In contrast, GfC estimates 21 TWh of biomethane demand in industry, around 40% less. This difference likely stems from different allocations of the available biomethane supply by the Commission and by GfC. GfC scenarios allocate biomethane primarily to heavy transport (mostly in the form of bio-liquified natural gas (LNG)), the power sector, and buildings. This allocation is based on the expected higher societal value of biomethane compared to hydrogen for these end uses.[33] Seemingly, the Commission expects a higher uptake of biomethane in industry.

Figure 3: Comparison of estimated biomethane and hydrogen use in industry between the Commission's MIX (MIX-H_2 for hydrogen) scenario and GfC scenarios (TWh).[34]



Impacts of Fit for 55 on industrial demand

The revision of the existing EU emission trading system (ETS) and introduction of the Carbon Border Adjustment Mechanism (CBAM) will have the biggest direct impact on the developments in the EU industry from the proposals under Fit for 55. In the implementation of these regulatory proposals, it is critical to ensure a level playing field across technologies, and that the speed of decarbonisation is accelerated, negative economic impacts on end users are minimised, and internationally competing industries are protected from the risk of carbon leakage. Under the proposed revision, the price of allowances are expected to further increase with the gradual phase out of free allowances. Prices are already around €60/tCO_2, which is higher than the €48/tCO_2 prices assumed in the RED II revision IA

[31] Guidehouse, "Extending the European Hydrogen Backbone," prepared for the European Hydrogen Backbone, April 2021, available at: https://gasforclimate2050.eu/wp-content/uploads/2021/06/European-Hydrogen-Backbone_April-2021_V3.pdf.

[32] 302 TWh of bioenergy use in industry, assuming a biomethane share of 12% as per the Commission's report: Technical assistance in realisation of the 5th report on progress of renewable energy in the EU, 2020.

[33] See our *The optimal role for gas in a net-zero emissions energy system* report (March 2019), available at: 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.

[34] GfC demand is met by combination of green and blue hydrogen, whereas Commission modelled demand is met only by RFNBOs (green hydrogen).

MIX scenario for 2030. As a result, the sectors covered by the EU ETS will be incentivised to switch to renewable and low-carbon energy sources.

The introduction of the CBAM for key industrial sectors aims to create equal conditions for non-EEA imported goods.[35] However, it is unclear if this will be sufficient to prevent carbon leakage in some sectors, especially as CBAM only covers imports into the EU, not exports out of the EU (electricity, iron and steel, cement, aluminium, and fertilisers are covered under the current CBAM proposal).[36] To prevent the relocation of important industrial sectors from the EU, the supply of renewable and low-carbon fuels at the least cost will be critical in this transition. Gas networks able to transport biomethane and hydrogen across Europe will help to optimise the cost of renewable and low-carbon fuels, supporting this transition.

In the Energy Taxation Directive (ETD), a minimum tax rate will be introduced for heating fuels. The expected tax rate is low (€0.15-€0.9/GJ), providing only a minor incentive to switch to less emitting heating fuels in industry.[37] Additionally, tax regulations on the EU level require unanimity among Member States, so they are much less likely to be implemented than the other analysed proposals . While the effect is assumed to be limited, the treatment of biogases under the ETD should be corrected as proposed in the following section on transport, where it is more impactful.

The changes in the ETS sector will be prominent in incentivising the decarbonisation in industry and the utilisation of renewable and low-carbon gases.

2.2 Transport

Quantification of the Fit for 55 targets and key differences to GfC scenarios

The relevant, binding targets for the transport sector are as follows:

- 13% GHG emissions intensity reduction in final energy demand (RED II revision)
- 2.6% RFNBO share in final energy demand in transport by 2030. A multiplier of 1.2 of their energy contents if supplied to aviation and maritime. The target can be achieved by combining all transport sub-sectors, including demand for RFNBOs in refineries (which represents a significant ~140 TWh market) (RED II revision).
- 5% share of sustainable aviation fuels (SAF) in final energy demand in aviation (including 1.2 multiplier if Annex IX Part A feedstocks and RFBNOs are used). A sub-target of a minimum of 0.7% synthetic kerosene share in final energy demand in aviation (ReFuelEU).[38]
- 6% reduction of GHG emissions intensity of the energy used in maritime transport compared to 2020 (FuelEU).
- 2.2% share of advanced biofuels or biogases made from Annex IX Part A feedstocks (mainly waste materials and residue) in transport final energy demand (minimum target, excluding double counting) (RED II revision). A multiplier of 1.2 of their energy contents if supplied to aviation and maritime.

[35] CBAM will apply to EEA and Switzerland; see European Commission, "Carbon Border Adjustment Mechanism: Questions and Answers," 14 July 2021, available at: https://ec.europa.eu/commission/presscorner/detail/en/qanda_21_3661..

[36] At first, an estimated 55% of the EU ETS emissions will be covered by CBAM.

[37] For instance, at the final tax rate for natural gas of €0.9/GJ, the resulting cost would be equivalent to carbon tax of €16/tCO_2 (natural gas footprint: 56.4 g$CO2_{eq}$/MJ). Standalone, the tax rate would not cover the cost premium between fossil and renewable and low-carbon heating fuels.

[38] From the overall SAF mandate, the demand for synthetic kerosene could be between 0.7% and 5% of final energy demand in aviation, including a multiplier of 1.2. The 0.7% is a minimum binding share, whereas the remaining 4.3% (5% minus 0.7%) can be met with other SAF as well. From the IA, it seems that synthetic kerosene only meets the minimum 0.7% mandate. Applying the 1.2 multiplier and 0.8 ratio between RFNBO input and synthetic kerosene output, we arrive at the estimated demand. In addition, hydrogen is needed to refine biojet fuels (~0.15 ratio of hydrogen input to biojet output).

- 1.7% share of biofuels or biogases made from Annex IX Part B feedstocks (used cooking oil and animal fats) in transport final energy demand (maximum target, excluding double counting) (RED II revision).

- 7% share of biofuels or biogases made from food and feed crops in transport final energy demand (maximum target) (RED II revision).

GfC forecasts 120 TWh of hydrogen demand in the transport sector of which 61 TWh are in aviation,[39] 0 TWh in maritime (as bio-LNG was foreseen as a key decarbonisation lever), and 59 TWh in other, including 19 TWh for heavy duty vehicles and 40 TWh of green and blue hydrogen use in refining (dehydrogenation of fossil transport fuels). For the Commission target of 2.6% RFBNO share on transport final energy demand, we estimate the total demand for hydrogen at 87 TWh by 2030. This can be broken down into 7 TWh in aviation (corresponding to the 0.7% synthetic kerosene share target and additional hydrogen use for refining biojet fuel), 29 TWh in maritime (corresponding to the 6% reduction of GHG intensity target), and 51 TWh in other transport sub-sectors (needed to achieve the overall 2.6% RFNBO share in final energy demand in transport target).

GfC energy scenarios foresee 50 TWh of biojet fuel and 47 TWh of bio-LNG in the aviation and maritime transport sub-sectors, respectively. This is substantially more than the 19 TWh and 4 TWh of biofuels expected in the Fit for 55 scenario across the aviation and maritime sectors, respectively. Both GfC and the Commission expect significant demand for biofuels in road transport—256 TWh and 257 TWh, respectively. It is likely, however, that GfC expects 82 TWh of this demand to be covered by renewable gaseous fuels (bio-LNG and compressed natural gas), while the Commission is assuming that liquid biofuels will be dominant.

The key differences between the GfC and the Fit for 55 modelling can be seen in several transport modes. In aviation, GfC anticipates a much faster decarbonisation push than envisioned by the Commission's SAF share on final energy demand, namely 14% compared to the 5% SAF target. In the maritime sector, the Commission projects only modest demand for biofuels (4 TWh) and a much higher demand for RFNBOs at 29 TWh. The GfC pathways allocate bio-LNG to the maritime sector based on observed developments in the sector (focus on reducing sulphur pollutants, affordable reduction of GHG emissions, and fuel availability). Bio-LNG is gradually expected to take over as a fuel of choice. Recent announcements signal that RFNBOs will likely also play a significant role in this sector, in particular methanol.[40] We expect that both these fuel types will be key contributors to the decarbonisation of the maritime sector. For road transport, the comparison is more difficult. From the Commission modelling, we can only determine the cumulative demand for bioenergy (gaseous, liquid), whereas GfC predicts only the gaseous part of the bioenergy demand as mentioned previously.[41]

Ultimately, the binding target relevant for fuel suppliers in Member States is the 13% GHG emissions intensity reduction target in the transport sector by 2030. We estimate that if the overall RFNBO target is met and all biofuel/bioenergy feedstock caps are hit and floors are met, the resulting GHG savings add up to an approximately 10.4% GHG emissions reduction. The gap to 13% (2.6%) would need to be covered by either the additional use of RFNBOs, bioenergy, or renewable electricity beyond the targets illustrated previously.[42] The Commission, therefore, assumes that either renewable electricity will be used (allocated to) in the transport sector (the obligation for Member States to report volumes of renewable electricity used in transports exists as part of the RED II) or that more RFNBOs and biofuels (above the targets or floors) will be demanded.

[39] Both for synthetic kerosene and for production of biojet fuel.

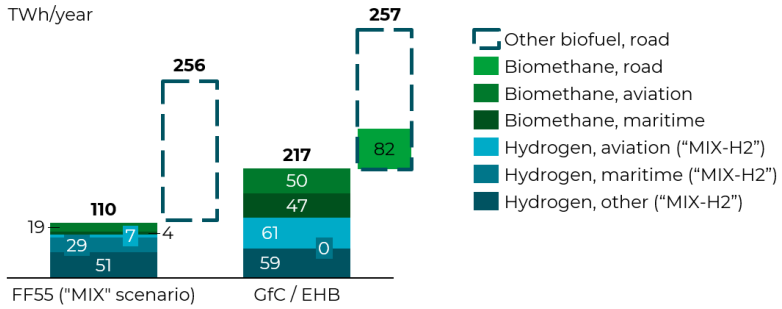
[40] See, for instance, Maersk, "Maersk accelerates fleet decarbonisation with 8 large ocean-going vessels to operate on carbon neutral methanol," 24 August 2021, available at: https://www.maersk.com/news/articles/2021/08/24/maersk-accelerates-fleet-decarbonisation.

[41] Technically, bio-LNG is not gaseous fuel. We treat it is as such because it is a gas that has been liquefied.

[42] All renewable energy sources count for this target (including bioenergy, RFNBOs, and renewable electricity). Multipliers are removed compared to RED II, except for the 1.2 multiplier in aviation and maritime fuels based on Annex IX Part A feedstocks. However, a different fossil fuel comparator is used to calculate the GHG emissions savings in transport (183 gCO_{2eq}/MJ) and biofuels/RFNBOs (94 gCO_{2eq}/MJ) that indicates an implicit multiplier.

The GHG savings goal can be illustrated based on assumptions about the GHG savings of biofuels in comparison to conventional fuels (average of 72%, as reported for biofuels used in 2018) and the GHG savings of RFNBOs in comparison to conventional fuels (assumed 100%). Based on the RFNBO subgoal, we assume that RFNBOs cover for 2.6% of GHG savings, biofuels for 7.8%. These are Guidehouse calculations, not an official part of the RED II revision IA.

Figure 4: Comparison of biofuel and hydrogen use in transport between the Commission's MIX (MIX-H_2 for hydrogen) scenario and GfC scenarios (TWh).



Impacts of Fit for 55 on transport demand

The transport sector will be affected by several proposals under Fit for 55. Overall, there seems to be a clear direction towards the discontinuation of (any) combustion engines in passenger and light-duty transport and beginning the decarbonisation of aviation and maritime (road, aviation, and maritime are the dominant sources of GHG emissions in the transport sector). These developments will be accelerated by the combined effect of the proposed changes.

Under the RED II revision, the multipliers for Annex IX feedstocks (concerning liquid and gaseous biofuels) have been removed, except for the 1.2 multiplier in aviation and maritime for Annex IX Part A. However, the scope of the RES-T target has been significantly increased with the inclusion of the aviation and maritime sectors. Electricity use in the transport sector will benefit from an implicit multiplier when calculating its GHG emissions savings under the 13% GHG emissions reduction target. The fossil comparator for electricity is 183 gCO_{2eq}/MJ compared to 94 gCO_{2eq}/MJ for biofuels and RFNBOs.[43] This can be justified by the higher energy efficiency battery electric vehicles (BEVs) compared to fuel cell vehicles (FCVs) and internal combustion engine vehicles. It is possible that in countries with little shares of renewable electricity supplied to the transport sector, the use of advanced or waste-based biofuels and RFNBOs instead of direct electrification could result in higher emissions savings and larger contributions to the RES-T target.[44]

Article 25 of the RED II revision includes the possibility for economic operators that supply renewable electricity to EVs through public recharging stations to receive credits, which they may sell to fuel suppliers. These credits could be used to fulfil the obligations under the 13% GHG emissions reduction target. It is unclear to us why credits can only be generated by renewable electricity and not renewable energy suppliers in general and what the intended effect of this measure is.

Under the ETD, all motor fuels will be subject to a minimum tax rate. The minimum tax rate will be rather significant (especially after full implementation in 2033) and is differentiated by the type of emission profile of the fuels. Electricity, advanced biofuels (liquid and gaseous), and RFNBOs in transport will be promoted the most by the ETD, with only a minimal tax rate applied. As all transport segments will have to be covered by the ETD, its impact on fuel choice could be significant—at the highest tier of the minimum tax rate, each litre of gasoline would be taxed, at a minimum, €0.34/l (€10.75/GJ, 0.032 GJ/l).

Fuel switching will be further incentivised by the inclusion of the maritime sector in the existing EU ETS and coverage of the remaining transport emissions by the proposed separate EU ETS (excluding

[43] To calculate the RES-T target, a baseline is established as *final energy demand in transport [MJ] * fossil comparator 94 gCO_{2eq}/MJ*. Subsequently, the emissions savings are calculated. For fossil fuels, there are no savings regardless of the type of fuel. For biofuels, the reduction depends on the lifecycle emissions. For RFNBOs, the emissions savings will be determined by the delegated act (DA) adopted pursuant to Article 29a(3). Savings from the use of electricity will be calculated as *electricity supplied to the transport sector (MJ) * share of renewable electricity supplied to the transport sector (%) * 183 gCO_{2eq}/MJ*. If the transport sector was fully electrified and supplied only with renewable electricity, the emissions savings would be higher than the baseline.

[44] It will also be harder for countries with high shares of nuclear electricity to reach the RES-T target regardless that it talks about GHG emissions savings. Despite having low GHG emissions, using nuclear power in transport would not benefit the Member States in reaching the RES-T target.

aviation, which is already part of the existing EU ETS). At €50/tCO_2,[45] an additional €0.15/l of gasoline (32 MJ/l * 93.3 gCO_2/MJ) would have to be paid. The combined effect of an additional €0.5 per litre of gasoline could have a significant effect on fuel switching if the minimum tax rates for the alternative fuels are respected.[46]

Interestingly, the differences between the EU Allowances (EUA) price in the existing EU ETS and the separate EU ETS, in theory, play a role in incentivising or disincentivising electrification in transport regarding advanced biofuels and RFNBOs (all three being subject to the same lowest tier, the minimum tax rate in the ETD). This is because electricity emissions are covered by the existing EU ETS, while the residual emissions from advanced biofuels and (possibly) RFNBOs would be covered by the separate EU ETS. The adoption of the ETD is less certain than the other proposals because tax issues require unanimous approval by the Member States.

An issue of particular importance is the treatment of biogas under the ETD. The proposal operates with four biogas categories:

- Advanced sustainable biogas (tax floor of €0.15/GJ)
- Sustainable biogas (tax floor of €5.38/GJ)
- Sustainable food and feed crop biogas (tax floor between €5.38/GJ (2023) and €10.75/GJ (2033))
- Non-sustainable biogas (tax floor between €7.17/GJ (2023) and €10.75/GJ (2033)).

It seems that advanced sustainable biogas corresponds to biogas produced from Annex IX Part A and Part B feedstocks. However, it is not clear why a distinction between sustainable biogas and sustainable food and feed crop biogas was made. By definition, any sustainable biogas, regardless of the feedstock origin, has to comply with the minimum lifecycle GHG emissions reduction required (50%-80% emissions reduction compared to the fossil fuel equivalent) according to Article 29(10) of the RED II. Under the current proposal, sustainable food and feed crop biogas would have the same minimum tax as fossil fuels in 2033. Thus, only two categories should be created:

- Sustainable biogas regardless of feedstock (with €0.15/GJ tax floor in 2033, same as RFNBOs and electricity)
- Non-sustainable biogas (with tax floor as proposed previously)

The current proposal would result in the penalisation of biogases that bring real emissions reductions compared to fossil fuels. This is further supported by the ETD making no distinction between renewable, grey, or nuclear electricity, a lowest minimum tax level (€0.15/GJ) if proposed regardless of origin. To create a level playing field for sustainable energy, we recommend the tax floor for sustainable biogas, RFNBOs, and electricity is at the same minimum tax level.

Together with the expected fuel price impacts, the updated CO_2 performance standard for cars and vans will effectively not allow for sales of new vehicles with internal combustion engines in these classes after 2035. New vehicle sales of only BEVs and FCVs would not be penalised. This aligns with the GfC ambition, which projects mostly direct electrification of cars and vans. For heavy duty vehicles, GfC expects little electrification due to range and cost considerations; instead, it forecasts significant demand for hydrogen and bio-LNG. This vehicle class is not covered by the updated CO_2 performance standard and is left out of the further analysis.

The Commission proposes new regulations for charging and refuelling infrastructure that should contribute to the rapid decarbonisation of the transport sector. The Alternative Fuel Infrastructure Directive (AFID) is proposed to become a regulation (AFIR); as such, it would have direct applicability in the Member States. The AFIR foresees the development of both electricity (charging) and hydrogen

[45] The upper end of the expected EUA price in the separate EU ETS by 2030 from RED II revision IA.

[46] The standalone ETD tax will be at or below the current levels of excise taxation in most Member States (see the Tariffs category at FuelsEurope, "Fuel price breakdown," at: https://www.fuelseurope.eu/knowledge/refining-in-europe/economics-of-refining/fuel-price-breakdown/). The key difference would be the lower level of taxation for alternative fuels. Member States can opt in for higher taxes, but this would have to follow the established environmental performance structure. The taxes would have to increase proportionally across all fuel categories to maintain the differentiation.

(refuelling) infrastructure alongside the Trans-European Transport Network (TEN-T) for road transport. This seems in line with the GfC expected use of electricity (light road transport) and hydrogen (heavy road transport). However, further development of bio-LNG infrastructure as a key decarbonisation lever in heavy road transport seems uncertain in the Commission's proposal. The required bio-LNG infrastructure for road transport (every 400 km) is mentioned only in Recital 29 (of AFID, 2014) but seems to have not been included in AFIR. For bio-LNG infrastructure in road transport and maritime, AFIR requires only an "appropriate number" of refuelling stations to be developed without any specific targets. This could cease further development of bio-LNG refuelling stations because priority will be given to electric and hydrogen infrastructure with their concrete targets. Given the important role of bio-LNG in the decarbonisation of heavy read transport and maritime, bio-LNG infrastructure should be put on par with electricity and hydrogen infrastructure and concrete targets pursued.

2.3 Buildings and power

Quantification of the Fit for 55 targets and key differences to the GfC scenarios

The relevant targets for the buildings and power sector are as follows:

- 49% RES share in buildings' final energy consumption (indicative target only) (RED II revision).
- A binding target for the H&C sector: Annual increase of RES H&C share by 1.1% and 1.5% for Member States where waste H&C is used.[47] For district H&C, this annual increase is 2.1%.[48] These increases encompass heat and cold used across sectors, including buildings and industry (RED II revision).

We look at the buildings and power sector jointly because it is not possible to precisely determine the allocation of power and heat from the combined heat and power (CHP) units from the Commission's modelling. At the aggregated level, volumes of biomethane and hydrogen are similar between the Commission's MIX scenario and GfC's AD pathway—170 TWh of biomethane and 18 TWh of hydrogen are projected in the Commission's modelling scenario compared to 160 TWh of biomethane and 18 TWh of hydrogen expected by GfC.

Although overall volumes are comparable, the actual use cases may differ between the Commission's modelling scenario and GfC figures. These top-level figures do not specify how a unit of renewable gas (biomethane and hydrogen) is used or to what extent it is integrated with the power system. For example, 1 TWh of renewable gas could be:

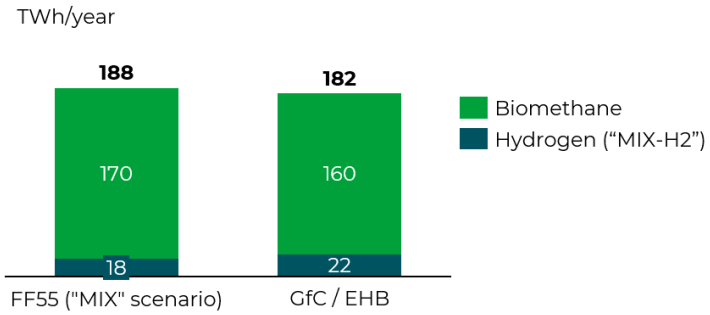
- Used to produce power to meet peak electricity demand
- Consumed by a gas boiler for building heating
- Used in a CHP plant connected to a district heating system

All three options would have a different contribution towards final energy demand depending on the technology's conversion efficiency.

[47] Member States with more than a 50% share of RES in H&C are only obligated to a 0.55% annual increase, and Member States with more than 60% RES share in H&C have no obligation.

[48] With no obligation for Member States that have more than 60% share of RES in their district H&C.

Figure 5: Comparison of biomethane and hydrogen use in buildings and power between the Commission's MIX (MIX-H_2 for hydrogen) scenario and GfC scenarios (TWh).



Impacts of Fit for 55 on buildings and power demand

In the GfC scenarios biomethane supply is restricted to only sustainable production practices and is allocated to end uses where it has the highest societal value (savings) over hydrogen. Hydrogen is then used in other end uses where it has an advantage over direct electrification or where it acts as a feedstock. Using this logic, we concluded in our previous studies that biomethane has the highest societal value if used directly for building H&C utilising the existing gas distribution networks because it eliminates the need to retrofit the distribution network and appliances for hydrogen.

In the GfC vision to decarbonise the building stock, first, a substantial improvement in building energy efficiency is required. This seems in line with the Commission target of energy efficiency improvements of 36%-39% by 2030 in final and primary energy consumption under the revised Energy Efficiency Directive (EED), although it is unclear how much the buildings sector is supposed to contribute to this target. Second, new buildings are mostly relying on direct electrification with heat pumps. Finally, for a substantial part of the building stock in Europe (especially difficult-to-insulate buildings), standalone heat pumps would not cover all the heating requirements; this is where hybrid heat pumps using biomethane (combination of a heat pump and a gas boiler) come into play.

This hybrid heating setup helps to meet a building's heating demand and acts as a buffer against harsh weather conditions (e.g. longer cold spells with little generation from variable RES). Further, it can provide flexibility to the power system by reducing electricity (heat pump) demand if needed by responding to price (including carbon tax) signals.[49] Hybrid heat pumps can also be used indirectly in district heating systems. Here the relative advantage of biomethane in terms of societal value compared to hydrogen is lower.[50] The construction of new district heating systems can be more expensive (especially in low population density areas) compared to the installation of hybrid heat pumps in buildings.[51]

Overall, the uptake of biomethane for heating in buildings is difficult to predict as it depends on whether other relevant pieces of sectoral legislation ensure the level playing field across technologies, especially the Ecodesign Directive, the Ecolabel Regulation, and subsequent implementing regulations, and the energy performance of buildings directive (EPBD), which is scheduled for December 2021.

Similarly, the RED II revision does not directly specify how to reach the H&C target. H&C is relevant for the buildings sector and encompasses heat and cold used across the sectors (e.g. industrial heat). The IA states a 41% RES H&C share by 2030, which would be around a 1.8% per annum (p.a.). increase (2019-2030), so the binding target of 1.1% (or 1.5% if waste H&C is used) seems to be too low. In addition, Member States shall endeavour to increase RES H&C share by Member State-specific top-ups to redistribute additional efforts needed to arrive at desired RES shares by 2030 (depending on the current situation, relative GDP, etc.). According to the IA, these resulting p.a. increases vary from 0.6%

[49] Provided that buildings are part of a smart grid that allows consumers to behave as rational economic actors.

[50] Using hydrogen centrally (district heating system) does not require retrofitting of the gas distribution system and end-user heating appliances. Using hydrogen or biomethane in district heating does not significantly alter societal cost (omitting the cost of the gas itself).

[51] Estimates for new district heating are around €5,000/household in high density areas and €20,000/household in low density areas.

(Sweden) to 2.7% (Luxembourg).[52] If this revision is only implemented in 2023, even higher p.a. increases would have to be achieved.

For district H&C, the obligated p.a. increases are even higher at 2.1%. This could mean that all kinds of renewable energy for H&C will be in high demand, including direct electrification, bioenergy (including biomethane), and potentially RFNBOs. A thing to consider is that the higher required p.a. increase of RES in district H&C (compared to general H&C) could lead to preferential allocation of biomethane. As explained previously, our research shows that biomethane has higher societal value when being used directly in building H&C than in district H&C.

Decarbonisation of the buildings sector will be supported by several changes proposed under Fit for 55. As mentioned previously, the EED requires significant energy efficiency improvements to happen (across the economy) in a relatively short period. Likely, the buildings sector will be the largest contributor to these improvements. As a novelty, the buildings sector is proposed to be covered under the separate EU ETS, which will affect fuel use in buildings. Similarly, changes to the existing EU ETS will affect power prices for buildings, which is relevant for direct power use and indirectly for heating (e.g. with heat pumps). Fuel use in buildings is scheduled to be subject to minimum taxation levels based on the GHG emissions profile of the fuel under the revised ETD. We expect that the effect on end users' prices will be greater under the separate EU ETS[53] and lesser under the ETD.[54]

In our understanding, even the combined effect of the EU ETS and the ETD will likely not be enough on its own to incentivise a significant switch to less emitting options in the buildings sector. The price signal should be complemented by support mechanisms that will further incentivise decarbonisation. As discussed, the GfC vision illustrates how substantial renovation programmes combined with a switch to hybrid heat pump systems can promote rapid and cost-effective emissions reductions in the buildings sector. Unless such incentivisation programmes are enacted nationally, the separate EU ETS system for buildings will likely pass on the costs to consumers, which will likely negatively affect their buying power and have only a minimal effect on the emissions.[55]

Hydrogen plays a bigger role in the GfC scenarios in centralised power generation to cover peak demand on various timescales (typically longer than a day). Hydrogen-fired electricity generation is eventually substantial as the power grid becomes progressively decarbonised. However, in 2030, the role is relatively limited as the penetration of variable RES electricity (and availability of natural gas peakers) does not yet merit substantial hydrogen-based electricity storage on longer timescales. Similar to the industrial sector, the power sector is expected to face a further increase in the price of EUA under the EU ETS. Additionally, the initial scope of CBAM includes power imports as a safeguard against highly emitting imports of power from non-EAA countries.

2.4 Additional impacts

In this section, we look at several overarching elements from the Fit for 55 package that might influence the supply and transport of renewable and low-carbon gases.

2.4.1 Green hydrogen

Green hydrogen (RFNBOs) has received a significant push in the revision of the RED II, which is also deemed crucial by the GfC consortium. If the targets set out in the Fit for 55 are to be met, Member States will have to ensure a steep increase in RFNBO consumption, either via support schemes or obligations (quotas). Substantial governmental funding will also be needed for RFNBOs to cover the

[52] European Commission, *Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL amending Directive (EU) 2018/2001 of the European Parliament and of the Council, Regulation (EU) 2018/1999 of the European Parliament and of the Council and Directive 98/70/EC of the European Parliament and of the Council as regards the promotion of energy from renewable sources, and repealing Council Directive (EU) 2015/652*, p. 85, 14 July 2021, available at: https://ec.europa.eu/info/sites/default/files/amendment-renewable-energy-directive-2030-climate-target-with-annexes_en.pdf.

[53] At €50/tCO_2 (higher end of the range of modelled carbon price from the RED II revision IA, 2030) the heating cost of a natural gas-fed condensing boiler could increase by €11/MWh of natural gas (56.4 gCO_2/MJ * 90% efficiency).

[54] For the same condensing boiler, the effect on natural gas price from the ETD could be ~€3.6/MWh of natural gas (€0.9/GJ * 90% efficiency).

[55] The ETD for fuels in buildings is less likely to be approved as tax issues in the EU require unanimity by the Member States.

massive prospective demand. The effect of the carbon pricing under the ETS on its own will likely not be sufficient to cover the cost gap to the fossil incumbents in many applications.[56] This is especially true for the industry sector, which is facing international competition, and less true for the transport sector, which can more easily pass through the green (RFNBO) premiums. Subsidies such as the carbon contracts for difference will be of major importance.

The RFNBO production criteria will be key for green hydrogen; these criteria will become clear when the DA of Article 27 of the RED II is published in the fourth quarter of 2021. Several important things seem to have been decided already, however. Only the calorific value (usable energy) of RFNBOs counts as renewable energy, not the RES electricity input. This might incentivise direct electrification by Member States. Additionally, RFNBOs count for the RES targets in the sector and country where they are consumed, not produced (i.e. incentivising imports and exports). Finally, RFBNO criteria have been expanded beyond the transport sector to all end-use sectors.

2.4.2 Blue hydrogen

Blue hydrogen is not part of the RED II revision targets because it is not considered a renewable fuel. The criteria for blue hydrogen should be specified in the hydrogen and decarbonised gas market package (December 2021). A possible concern exists for Member States where industrial companies considering a fuel or feedstock switch to hydrogen (i.e. applications that previously have not used hydrogen) were planning to start with blue hydrogen. These Member States would now have to cover at least 50% of the national demand with RFNBO.s This target could disincentivise the switch to hydrogen for some companies if the planned blue hydrogen costs were below those of RFNBO costs.

The ETD, if implemented, would influence the impact of the competitiveness of blue hydrogen (vs. green) after 2033, when low-carbon fuels would be in a higher minimum tax bracket. Similarly, the expected changes in the EU ETS (increased prices of EUA) might play a role (depending on the CO_2 capture rate either higher or lower). Ultimately, the blue hydrogen production cost is sensitive to natural gas market prices. Its competitiveness will therefore be mostly determined by the developments in the wholesale natural gas prices in coming years.

2.4.3 Biomethane

Biomethane is affected by several changes under the Fit for 55. The incentives for RED II Annex IX feedstocks are proposed to change under the RED II revision as the multipliers are removed (apart from a 1.2 multiplier for Part A fuels used in maritime or aviation). The renewable transport target is instead defined on a GHG-saving basis. Fuels made from Annex IX feedstocks would be expected to count more towards the targets (on a per litre basis) than crop-based biofuels because the GHG savings should be higher from the mostly waste and residue feedstocks in Annex IX. This could be seen as a replacement to the existing multiplier system, which more directly reflects the GHG-saving value of the fuel.

The RED II revision proposes maintaining a sub-target for Annex IX fuels, and over time, the Commission will review whether additional feedstocks should be included in the Annex. As under the RED II, feedstocks that can be converted using advanced technologies can be added to Part A, which has a sub-target, and feedstocks that can be converted using mature technologies can be added to Part B, which is capped. The cap for Part B feedstocks was introduced under the RED II to limit the level of support for used cooking oil and animal fat-based biofuels that experienced supply chain issues such as fraud, which indicated they might be over-incentivised. The cap was set at the existing level of use of those feedstocks in EU biofuels.[57] If additional feedstocks are added to Part B, the Commission should be obliged to review the level of the cap and raise it accordingly. Otherwise, an opportunity is missed to incentivise the use of genuinely sustainable feedstocks that can be converted using mature technologies.

[56] This is likely true even if accounting for the cost of emission allowances further increasing due to less free allocation and the CBAM.

[57] In addition to that cap, the Commission is currently strengthening the sustainability certification rules for all biofuels, including waste and residue supply chains, via the forthcoming Implementing Act on voluntary schemes to strengthen the supervision of those supply chains. See European Commission, "Sustainable biofuels, bioliquids and biomass fuels – voluntary schemes (implementing rules)" at: https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12723-Sustainable-biofuels-bioliquids-and-biomass-fuels-voluntary-schemes-implementing-rules-_en.

2.4.4 Sequential cropping

The GfC scenarios show a significant role for sequential cropping to provide sustainable feedstock for biomethane. The status of sequential cropping can be further clarified in the RED and appropriate guidelines given (the recommendation can be pushed forward in the RED II). The GfC consortium published a paper[58] that shows that **silage crops grown in a sequential cropping system**, as cultivated in Europe, meet the evaluation criteria for advanced feedstock as included in Annex IX of the RED II. A key characteristic is that silage crops can be harvested early in a sequential cropping system, meaning they have not fully matured. This enables them to be produced in combination with the main crop on the same plot of land without lowering the yield of the main crop. The paper recommends that silage crops grown in a sequential cropping system be included in Annex IX. However, it would not be desirable for sequential cropping to be in a part of the Annex that is capped at the level of used cooking oil and animal fat consumption. Sustainable sequential cropping that does not trigger demand for additional land should be treated as a sustainable practice under the RED II revision and encouraged in a part of the renewable energy targets that are not capped.

2.4.5 Union database, GOs, and mass balance system

The RED II introduced a requirement for the Commission to establish a **Union database** to ensure transparency and traceability of renewable fuels, which has been further specified in the proposed RED II revision. Originally conceived to only be used to track fuels used in transport, an extension to cover broader renewable fuel use has now been put forward. The system of compliance with the sustainability criteria for renewable and low-carbon fuels (mostly biofuels) is based on voluntary certification schemes that are recognised by the Commission. The Union database is envisioned to improve supply chain security, prevent fraud, and serve as a centralised repository for all renewable, low-carbon, and recycled carbon fuels (Article 31a, RED II revision).

The characteristics of the fuels, including sustainability certification, country of origin, and lifecycle GHG emissions, should be traced from feedstock production[59] up to supply onto the market; Member States should require that the relevant economic operators enter the required information into the database. Any Guarantees of Origin (GOs) shall be cancelled before the fuels can be registered in the database (Recital 38, RED II revision).

Since its inception, the RED has required a **mass balance** chain of custody system[60] to be used to trace sustainability characteristics through bioenergy supply chains. This means that at each step in the supply chain, the material sold must have the same characteristics overall as the material taken in, and this needs to be administered at the site level. In RED II, transmission and distribution infrastructure was added to the definition of a site (RED II Article 30(1)a). The intention of this is to allow a mass balance system to be used to facilitate the mixing of renewable gases in a pipeline infrastructure (grid). The detailed implementation of this is still being worked on by the Commission, and the Union database could play an important role to ensure that any volume of renewable gas put into the grid can only be claimed once regardless of which end-use sector it is used in.

The details of how this mass balance system is implemented are crucial. For gaseous fuels, the RED II revision IA hints at what is meant: “renewable and low carbon gases injected into a grid could be retrieved flexibly at any other point of the grid provided the grid is interconnected.” In our understanding, it is the Commission’s intention that renewable and low-carbon gases can be freely produced and consumed across the EU (if injected into the gas grid) as this constitutes a fully interconnected gas grid. In that sense, both blending (of renewable and low-carbon fuels with natural gas) in the gas grid and separate transmission or distribution (e.g. of hydrogen) is permissible. In the EU, this would effectively mean that renewable and low-carbon gases could be produced and consumed in any two Member States under this understanding of mass balancing (with the appropriate cancellation of certificates or GOs).

[58] Gas for Climate, *Sequential silage crops as advanced feedstock under the RED II,* October 2021, available at: https://gasforclimate2050.eu/wp-content/uploads/2021/10/GfC_Including-Sequential-Silage-Crops-in-RED-Annex-IX_October-2021_-final.pdf.

[59] In the case of RFNBOs, it is still to be further specified, but this is likely to mean from the renewable electricity production.

[60] This is in contrast to a *physical segregation*-type chain of custody system that would not allow any physical mixing of sustainable and non-sustainable materials in the supply chain, or a *book and claim* system, which allows trading of sustainability certificates independent from the trading of a physical material or fuel.

A stricter understanding of this mass balancing system is highly undesirable because it would present an undue burden on renewable and low-carbon gas producers, transporters, and consumers. For instance, if gas transport operators (e.g. transmission system operators) were required to book an adequate cross-border capacity each time a renewable or low-carbon fuel certificate is being transferred from one Member State to another, this would be challenging from both a physical and administrative point of view. At the same time, no benefits would be achieved by using this stricter approach. Similarly, interconnector capacity bookings are not required by the transfer of GOs in the electrical system between Member States, nor for statistical transfers (Article 8, RED II).

A key benefit of renewable and low-carbon gases including biomethane and hydrogen is that they can be used in any end-use sector to provide electricity or heat or be used as a transport fuel. This also means that a robust system is needed to ensure the renewable energy content is only claimed and counted towards Member State targets once. This is already a point of attention for biomethane, especially when injected into the gas grid, and will become even more important when dealing with green hydrogen, which could be made using renewable electricity (which could itself be counted towards renewable targets) and then fed into a gas grid or used as a precursor for another renewable fuel or material. For the system to be credible, the renewable energy content must only be counted once.

Steps are needed to improve market fluidity across the EU and to facilitate robust cross-border trading of renewable and low-carbon gases. The Union database could play a role in facilitating that (although there is no role for renewable electricity foreseen in the database). In the meantime, national biomethane registries play an important role to ensure biomethane accounting is robust within a country, but this needs to evolve into a more harmonised pan-European system to enable a more fluid market. The European Renewable Gas Registry (ERGaR)[61] scheme is being developed by a consortium of biomethane registries from different Member States to facilitate cross-border trade of biomethane certificates. If accepted by the Commission, this scheme could play a vital role.

GOs could also constitute a powerful tool to enable the robust scale-up of renewable and low-carbon gases; however, their role needs to be more clearly defined. RED II requires Member States to extend existing GO schemes to include renewable gases such as biomethane and hydrogen (RED II Art 19). A robust implementation of this with a clear role for GOs would facilitate greater cross-border trade of such gases between Member States. The Facilitating Standards for Guarantees of Origin (FaSTGO) project[62] provided advice to the Commission in 2020 in the run-up to RED II implementation regarding the revision of the CEN 16325 standard for GOs. Now the Renewable Gas Trade Centre in Europe (REGATRACE)[63] H2020 project is ongoing, aiming to advise the Commission on how to create an efficient system for issuing and trading GOs for biomethane and renewable gases. These initiatives are essential to ensure a system can be built to facilitate a strong uptake of the European biomethane market.

An option to make the system more practical would be for mass balancing to be followed only until the renewable gas is produced and injected into the grid or transported by other means. From that point, GOs should become the main instrument to carry information, including sustainability characteristics. The EU has already created functional trading conditions for renewable electricity. The gas sector needs similar mechanisms to trade volumes and GOs of renewable gases across borders.

Furthermore, the Fit for 55 package does not foresee the GOs system being linked into the EU ETS system. Doing this at the EU level could drive further demand for biomethane from ETS sectors and enable the creation of a liquid GOs market that allows emissions reductions to be claimed under the ETS if participants use biomethane from the grid. This is only possible in some Member States with well-developed national biomethane registries. Providing a clear mechanism at the EU level to allow renewable gases from the grid to be used in the EU ETS (while avoiding double counting of GHG savings) would provide a key driver for the development of renewable gases at scale.

[61] For more information, see the ERGaR website: http://www.ergar.org/.

[62] Association of Issuing Bodies, "FaStGO," accessed 9 November 2021, available at: https://www.aib-net.org/news-events/aib-projects-and-consultations/fastgo.

[63] The REGATRACE project runs from June 2019 to November 2022; for more information see: https://www.aib-net.org/news-events/aib-projects-and-consultations/regatrace.

More work is needed on the definition and enhancement of rules that allow for mutual recognition of GOs between Europe and neighbouring regions, including North Africa, to facilitate imports of renewable energy.