SMART CO_2 STANDARDS FOR NEGATIVE EMISSIONS MOBILITY

EBA
European Biogas Association

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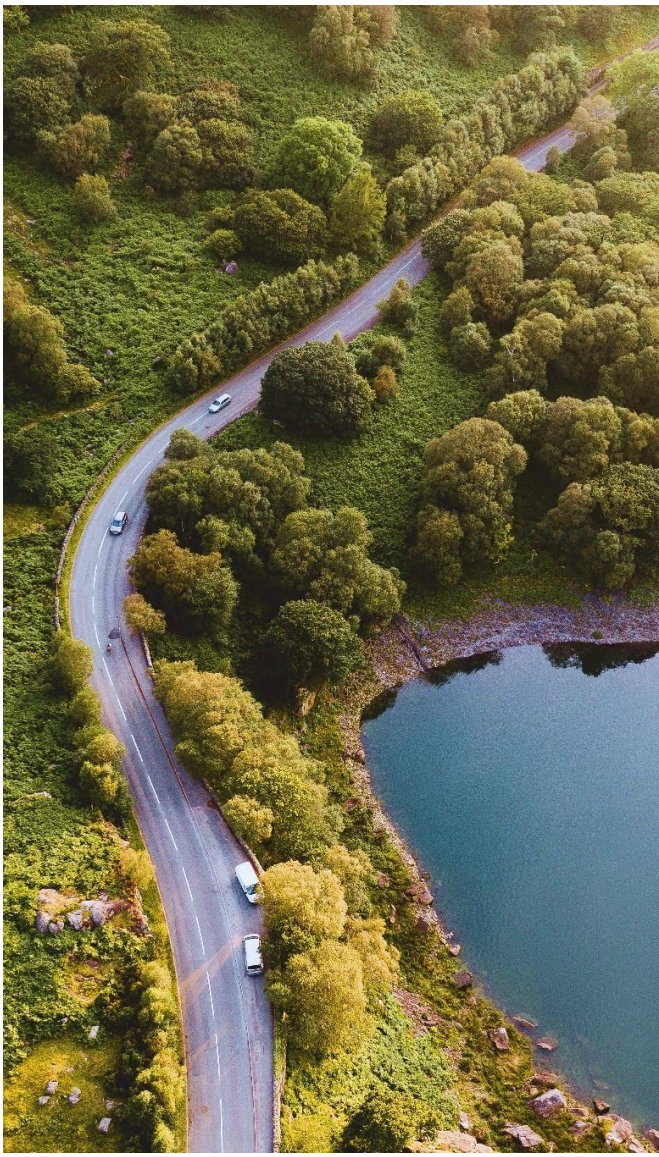
To achieve a climate-neutral EU by 2050 and the intermediate target of at least 55% net reduction in greenhouse gas emissions by 2030, the Commission is preparing a revision of the CO_2 emission performance standards for new passenger cars and vans as part of the 'Fit for 55%' package. National projections indicate that by 2030, greenhouse gas (GHG) emissions from transport will decrease slightly but will nevertheless remain higher than 1990 levels. If these trends continue, the transport sector will fail to contribute to the reduction in emissions which is required in order to meet EU targets. To ensure the full decarbonisation of the transport sector, Europe needs to couple electrification with the deployment of all alternative fuels and technologies; the current standards, however, are placing obstacles in the way of a fast, cost effective shift to carbon neutral mobility in Europe.

Biomethane, which is the upgraded form of biogas, can be used as a renewable fuel, helping us achieve zero or even negative levels of CO_2 emissions. It also enables the development of local circular economies because it can be generated using locally-produced organic residues. Additionally, digestate, a nutrient-rich by-product obtained during the production of this renewable fuel, can be used as biofertiliser to nurture our soils. Biomethane is available right here and now, across Europe, and its production levels can be easily increased to ensure ample future supply.

The need for further action to reduce emissions in the transport sector must be addressed without delay. The development of green electric mobility is advancing but this alone will not deliver the aimed for and much needed decarbonisation in time and cannot cover all areas of transport. In addition, as confirmed by the International Energy Agency (IEA), *'the sustainability of electrification depends on broad decarbonisation of the power sector to actually reduce emissions at the system level'*[1]. The use of other alternative green fuels alongside green electric mobility can speed up transport decarbonisation in the coming years and make sure the socio-economic benefits of this transition remain in the EU, including by supporting the development of a resilient car industry. Biomethane is a readily available and scalable resource that has an important role to play in ensuring that emissions reduction goals are met.



To ensure the full decarbonisation of the transport sector, Europe needs to embrace all alternative fuels and technologies; the current standards to reduce emissions in the transport sector, however, are placing obstacles in the way of a fast, cost effective shift to carbon neutral mobility in Europe.

[1] https://www.iea.org/commentaries/clean-and-efficient-heat-for-industry

3 RECOMMENDATIONS FOR A SWITCH TO NEGATIVE EMISSIONS MOBILITY

RECOMMENDATION 1:
Harmonise the approach to CO_2 emissions in all EU transport policies

The updating of the CO_2 emission performance standards together with other legal frameworks (e.g. RED III) must set out a harmonised approach that enables genuinely carbon neutral and cost-effective solutions to reduce CO_2 emissions in transport. This can only be done by:

- ➔ **STEP 1:** Quick switch from Tank-to-Wheel (TtW) to the more comprehensive and science-based Well-to-Wheel (WtW) approach.

- ➔ **STEP 2:** Adopt a Life Cycle Assessment (LCA) approach in EU vehicle legislation. Manufacturing and recycling can represent anything from one fourth to one half of the total vehicle emissions, but are entirely omitted from the current standards.

Life Cycle Assessment is the only means to ensure that CO_2 emissions in the transport sector are accurately and comprehensively quantified. Considering only tailpipe emissions leaves 93% (54 tonnes/58 tonnes) of transport sector carbon emissions out of the calculation[2].

[2] Volvo_carbonfootprintreport.pdf (volvocars.com)

3 RECOMMENDATIONS FOR A SWITCH TO NEGATIVE EMISSIONS MOBILITY

RECOMMENDATION 2:
Recognise the emissions reduction of biomethane mobility within the CO_2 standards

Introduce a new mechanism in the CO_2 emission standards so that compliance assessments for each manufacturer consider the contribution of biomethane to emissions reduction. This could be done by:

- ➔ **OPTION 1**: Introducing a crediting system for biomethane and other sustainable advanced biofuels.
- ➔ **OPTION 2**: Introducing a carbon correction factor (CCF)[3] as a function of the renewable fuel used.

If a new mechanism cannot be implemented by 2025 at the latest, then the most efficient gas vehicles should be acknowledged as low emission vehicles within the current system.

A crediting system for renewable fuels in the CO_2 emission standards must :

- Support the use of GHG credits financed by OEMs in transport, not in other end-use applications.
- Offer incentives for the production of sustainable biofuels and biomethane.
- Correspond to initiatives in the RED III (e.g. biofuel delivery obligation, GoO).
- Allow the use of national support mechanisms (e.g. tax relief, investment aids).

[3] https://www.ngva.eu/wp-content/uploads/2018/09/CCF-explained_NGVA-Europe.pdf

3 RECOMMENDATIONS FOR A SWITCH TO NEGATIVE EMISSIONS MOBILITY

RECOMMENDATION 3:
Replace fossil fuels with advanced biofuels. Require a growing share of sustainably produced biofuels and renewable gases in mobility fuel use

Introduce a binding obligation for the EU to steadily increase the share of sustainably produced biofuels and renewable gases in transport, reaching 50% in ICE and hybrid vehicles by 2030 and 100% by 2050.

BIOMETHANE: A HIGH PERFORMING RENEWABLE FUEL

An integrated renewable energy mix for transport

In order to contribute to the overall climate neutrality objective for 2050, the greenhouse gas emissions (GHG) of the transport sector in 2050 need to be reduced by 90% relative to 1990, as announced by the European Commission. Transport produces 27% of Europe's total GHG emissions, according to the European Environment Agency. In spite of current efforts, transport has not seen the same gradual decrease of GHG emissions as other sectors[4]. Road transport is also a major contributor to air pollution, especially in cities.

The regulation setting CO_2 emission performance standards for cars and vans is one of the regulatory texts under revision in the framework of the EU Green Deal. The Regulation sets EU fleet-wide CO_2 emission targets applying from 2020, 2025 and 2030 and includes a mechanism to incentivise the uptake of zero- and low emission vehicles; the current CO_2 standards, however, refer only to tailpipe emissions. This Tank-to-Wheel (TTW) approach is beneficial for electric cars, but not for gas vehicles with a combustion engine, even those using 100% renewable fuels, such as biomethane.

The environmental performance of biomethane over its complete lifecycle is excellent, but this is not recognised by the current CO_2 regulation. Electric cars, in contrast, are facing increasing challenges in terms of the sustainability and projected price of the batteries. In addition, most of the electricity produced and used in the EU at the moment does not come from renewable sources and the CO_2 standards do not promote the use of renewable electricity in the mobility sector.

CO_2 standards for vehicles have proven to be an effective policy tool, but it is already acknowledged that, without further policy intervention, emissions from road transport are not projected to decrease. The revised CO_2 regulation should propose technology-neutral solutions to reduce emissions in an accelerated and cost-effective way. It should avoid one-size-fits-all options that could prove insufficient in the long-term and may lead to a slow, unfair and costly emissions reduction process.

The CO_2 regulation should be amended to ensure an integrated transition that picks no single green technology over others and leaves no-one behind. All alternative fuels are necessary if transport decarbonisation is to be delivered at pace.

The CO_2 regulation should propose technology neutral solutions to reduce emissions in an accelerated and cost-effective way and avoid one-size-fits-all options that could prove insufficient in the long-term.

[4] https://ec.europa.eu/clima/policies/transport_en

Acknowledging circularity

The production of biomethane is the result of a biological process which does not increase GHG concentrations in the atmosphere, but makes it circulate in short carbon cycles[5]. For this reason, biomethane production can achieve negative carbon emissions, depending on the feedstock and technology used. The term "negative emissions" is used by climate scientists in the IPCC (Intergovernmental Panel on Climate Change) to refer to activities that remove carbon from the atmosphere by capturing it. Biomethane is the purified form of biogas, which is obtained from the decomposition of fresh organic materials. These materials are derived from biomass. During its growth, biomass captures CO_2 from the atmosphere because it is a necessary component in photosynthesis. Some of this captured CO_2 is returned to the atmosphere during the combustion of biomethane, but it is then captured again by newly growing biomass and returned back into the soil, which acts as a natural carbon sink.

In terms of CO_2 emissions, therefore, vehicles running on biomethane perform at a similar or (in the case of negative emissions) higher level than electric vehicles running on renewable electricity; at the same time, they displace the use of fossil fuels. Biomethane is currently obtained primarily from sustainable feedstocks, including locally produced biowaste and residues. Digestate, a nutrient-rich by-product of biogas production, is used to revitalise the soil. In turn, this reduces the carbon-intensive production of mineral fertilisers (also called chemical fertilisers) and therefore further avoids emissions.

The Methane Strategy proposed last year by the European Commission also recognises the potential of biogas and biomethane to reduce methane emissions from agriculture, which currently account for more than half of total EU methane emissions. These emissions are avoided when methane-emitting feedstocks, such as biowaste, or manure from livestock farming, are contained in the closed and controlled environment of a biogas plant. In a biogas production facility, methane is captured and utilised instead of being released into the atmosphere during manure storage. In a similar way, biogas and biomethane can also help reduce emissions from waste, the second biggest source of methane emissions in the EU, valorising waste water and organic waste as feedstocks to produce renewable energy.

Biomethane production is at the heart of an efficient circular economy: it is the best way to recycle organic waste, to produce valuable renewable gas and biofertilizers, promote sustainable and efficient farming practices and create jobs in rural areas.

5 https://www.europeanbiogas.eu/wp-content/uploads/2020/04/20200419-Background-paper_final.pdf

Biomethane production is at the heart of an efficient circular economy: it is the best way to recycle organic waste, produce valuable renewable gas and biofertilisers, promote sustainable and efficient farming practices and create jobs in rural areas. Biomethane production is possible everywhere in Europe. The potential of biogas and biomethane was also pointed out in the recent Farm-to-Fork strategy of the European Commission that encourages farmers to *"grasp opportunities to reduce methane emissions from livestock by developing the production of renewable energy and investing in anaerobic digesters for biogas production from agricultural waste and residues, such as manure.[6]"* Additionally, a scientific study shows that biogas and biomethane have an important role to play in the achievement of all UN sustainability goals[7].

Solid scientific evidence

"From all combinations of fuel/energy carriers and powertrains explored, biomethane represents one of the absolute lowest greenhouse gas intensive routes." This is the conclusion of the recently published Science for Policy report by the Joint Research Centre (JRC)[8], the European Commission's science and knowledge service. The study argues that, as greenhouse gas emissions are associated with both fuel production and vehicle use, it is only by considering the whole pathway (Well-To-Wheel) that the overall impact of fuel and vehicle choices can be accounted for.

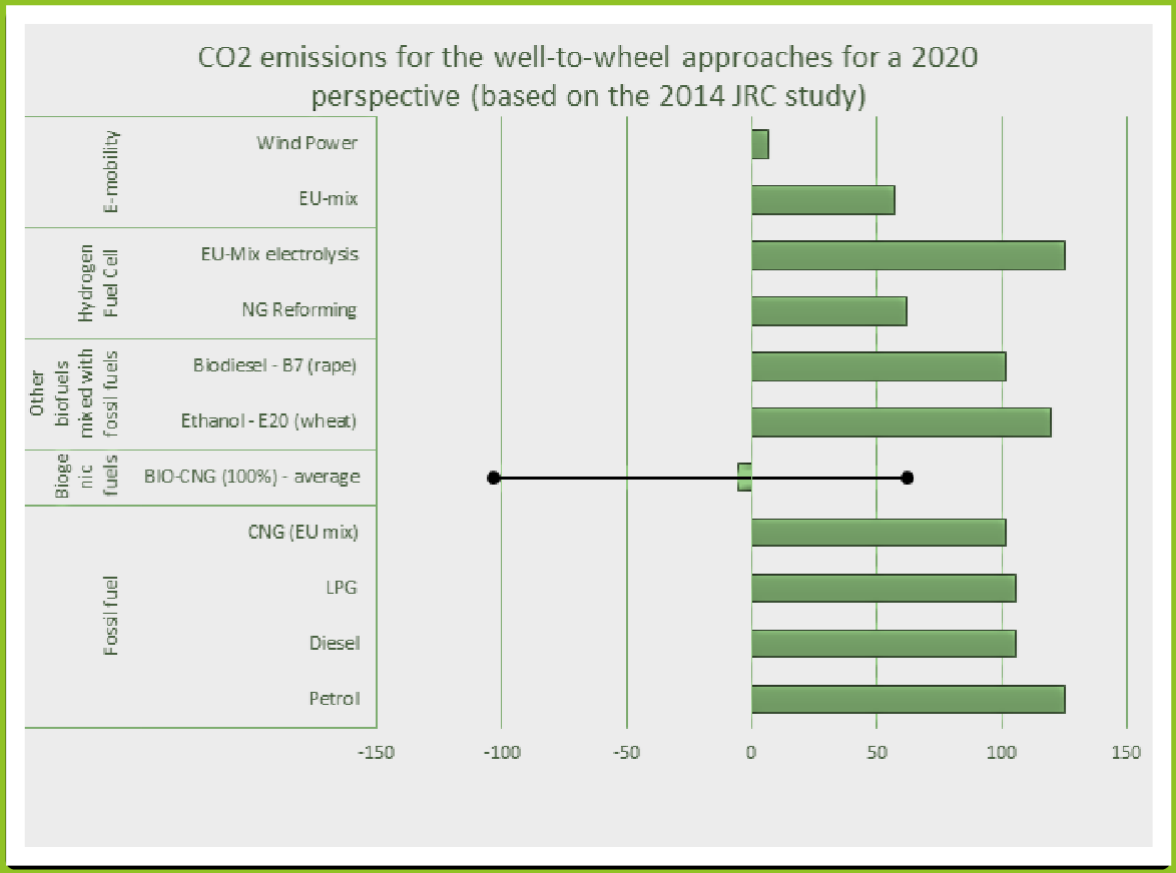
From that starting point, the study aims to provide transparent and objective information to guide future choices of fuel and vehicle technologies towards and beyond 2025, offering evidence-based support for the European policy-making process. One of the key findings to consider in the revision of the EU transport regulation is the outstanding performance of biomethane in reducing greenhouse gas emissions. The climate benefits of using biomethane are, according to the study, similar to those associated with the use of renewable electricity and synthetic diesel (e-fuels). Biogas or biomethane production from manure can even achieve significant negative emissions, as shown by the graph (see next page).

Similar conclusions are reached in many other studies analysing the transport emissions caused by standard fossils fuels and with alternative fuels, such as electric mobility and biomethane[9]. In total, the EBA has reviewed 12 studies and reports conducted or published between 2014-2020, in order to achieve an overview of the current analyses concerning alternative fuel emissions, with particular reference to biomethane.

[6] https://ec.europa.eu/food/farm2fork_en
[7] http://liu.diva-portal.org/smash/get/diva2:1161103/FULLTEXT01.pdf
[8] https://publications.jrc.ec.europa.eu/repository/handle/JRC121213
[9] The following studies were considered for the preparation of this report:

- JRC 2020, *Well-to-Wheels Report Version 5*
- JRC 2014, *Well-to-Wheels Report Version 4.a*
- IFPEN 2019 *Life Cycle Analyses of Bio CNG*
- CE Delft 2016, *Stream Goederenvervoer*
- Bundesministerium für Umwelt, Naturschutz und nukleare Sicherheit 2019, *Wie Umweltfreundlich sind Elektroautos*
- EMPA 2017, *Abgasemissionen von Gasfahrzeugen*
- Sustainable Gas Institute 2019, *Natural Gas as a Fuel for Heavy Goods Vehicles*
- Aarhus University 2017, *Is it beneficial to use biogas in the Danish transport sector? – an environmental economic analysis*
- VW 2017, *Dena Konferenz – Sehr gute Treibhausbilanz*
- SEAT Presentation: *Por qué biometano?*
- MDPI 2019, *Sensitivity analyses in the Life-Cycle Assessment of Electric vs. Combustion Engine Cars under Approximate Real-World Conditions*
- ScienceDirect 2018, *Well-to-wheel assessment of natural gas vehicles and their fuel supply infrastructures – Perspectives on gas in transport in Denmark*

Figure 1 : CO2 emissions for the WtW approach from a 2020 perspective



The above points do not take into account the extra emissions associated with the production of electric cars. The recent carbon footprint report published by the car manufacturer Volvo[10] shows that electric car production (including battery production) releases 70% more CO_2 than the manufacture and recycling of the equivalent ICE vehicle: this means that the production emissions alone for an electric vehicle represent half of the total emissions caused by an equivalent to half of the total ICE vehicle during its whole lifecycle and 200,000 km of use.

A solution for all transport modes

Biomethane is a versatile sustainable fuel. It can be compressed to Bio-CNG or liquefied to Bio-LNG. It is already being used in light passenger vehicles as Bio-CNG and many studies are showing that hybrids combining electromobility and bio-CNG would be the most performant. More and more biomethane is being used in heavy transport as Bio-LNG[11] and Bio-CNG. The maritime sector has expressed increasing interest in biomethane as a sustainable fuel. In rail transport, diesel locomotives can be retrofitted to run on Bio-CNG[12] or Bio-LNG.

020/~/media/ccs/Volvo_carbonfootprintreport.pdf
[11]https://www.europeanbiogas.eu/wp-content/uploads/2020/11/BioLNG-in-Transport_Making-Climate-Neutrality-a-Reality.pdf
[12]https://www.sia-partners.com/system/files/document_download/file/2021-04/BioNGV%20TER%20Study_Final%20report_0.pdf

Heavy-duty (HD) Long-Haul transport is technically hard to electrify, as it requires high-power engines able to cover long distances while carrying a heavy payload. To operate a 40-tonne HD truck for over 1,000 km, an electric truck using the best currently-available technology would require a battery weighing 6.4 tonnes, whereas the same distance can be covered with some hundreds of litres of Bio-LNG.

The maritime transport sector carries 80% of the world's goods[13]. In the EU, maritime transport was responsible for over 138 million tonnes of CO_2 equivalent in 2018 (3.7% of total EU emissions). With the shipping sector projected to grow further, the level of GHG emissions could as much as double by 2050[14]. Less than 1% of the world fleet currently runs on alternative fuels: the decarbonisation of the shipping industry will require the use of all available and compatible zero or low carbon fuels, including Bio-LNG.

Other types of heavy mobility are similarly hard to electrify; for example many agricultural machines, for example, need powerful engines and are used for only a few weeks per year. Biomethane could be a natural replacement for diesel in this type of equipment. Garbage trucks often already run on biomethane produced from the local biowaste, as are many local buses. Local ferries and costal fishing boats are also looking at using locally-produced biomethane in order to move away from diesel. It makes sense that the biomethane produced from waste and residues should benefit the decarbonisation of the local communities, helping them embrace not only decarbonisation but also the circular economy.

The technologies to enable the further deployment of renewable gas in all areas of the transport sector are already available. Standard Internal gas Combustion Engines (ICEs) are compatible with biomethane. There are currently 1.4 million cars with gas engines within the EU. It is estimated that 17% of the total gas used in these cars is biomethane. The share of biomethane is growing as biomethane production increases. To allow a faster transition, legislation should support the scale-up of both the production of this alternative fuel and its use within the transport sector, taking advantage of the existing transport infrastructure. It is possible to retrofit gasoline or diesel engines, creating a dual fuel or fully gas-based engine suitable for the use of biomethane. This would help accelerate the energy transition in transport at a competitive cost.

To allow for a faster transition, legislation should support the scale-up of both the production of this alternative fuel and its use within the transport sector.

[13] https://www.europeanbiogas.eu/wp-content/uploads/2020/11/BioLNG-in-Transport_Making-Climate-Neutrality-a-Reality.pdf
[14] https://www.europarl.europa.eu/RegData/etudes/BRIE/2019/642224/EPRS_BRI(2019)642224_EN.pdf

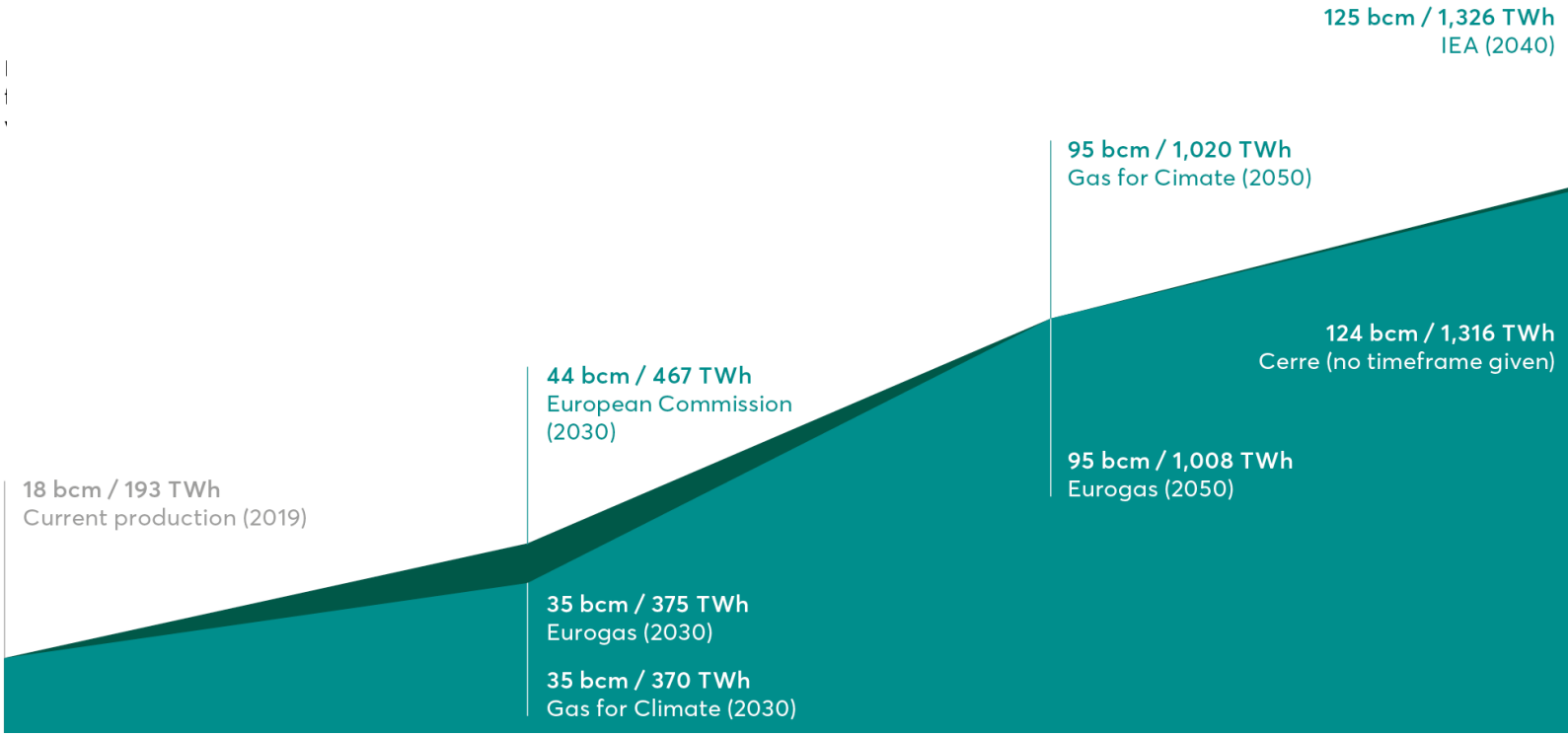
According to NGVA Europe (Natural bio-Gas Vehicles Association), at the end of 2019, there were 1,160 active Bio-CNG and over 100 Bio-LNG filling stations in Europe and this number is expected to rise significantly in the coming years. Bio-LNG production capacity in Europe is expected to reach 889 tpd by the end of 2022. This forecast is conservative, as it includes only projects that have already been made public and received permission to go ahead. The number of plants and total production capacity may well rise still further, if more projects are approved[15].

Legislative support is instrumental in providing certainty for investors and car manufacturers and channelling investments towards the development of renewable gas infrastructure. At a national level, Spain has now set the GHG contribution of biomethane-fuelled cars to "0" in its Tank-to-Wheel (TtW) framework, recognising the positive effects of biomethane. This is in line with the initiatives implemented in other countries, such as Sweden, which has embraced the huge potential of biomethane in the transport sector. In Sweden, biomethane accounts for 94% of overall vehicle gas consumption.

Biomethane volumes are large

Although there are naturally variations between studies in terms of methodology used and assumptions made, all reach similar conclusions regarding potential biogas and biomethane production by 2030 and 2050. There is a consensus that by 2030, the biogas and biomethane sectors combined can almost double their production and by 2050, production can more than quadruple. This is equivalent to 100 million passenger vehicles or 2.5 to 5 million heavy duty vehicles (HDV), depending on the type of HDV considered.

Figure 2 : Potential of biomethane in Europe by 2030 and 2050 'EBA Statistical Report 2020'



[15] https://www.europeanbiogas.eu/eba-statistical-report-2020/

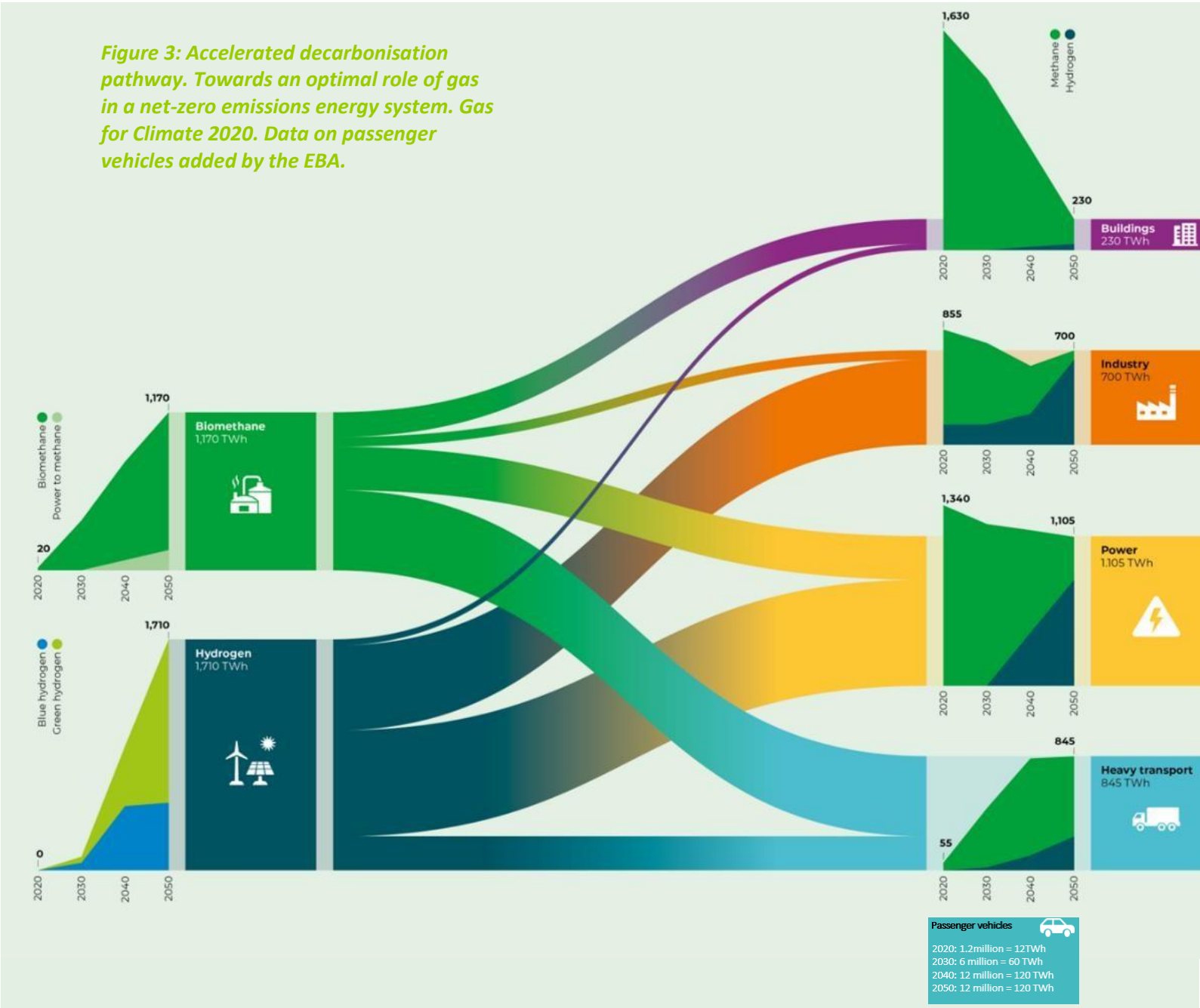
The potential biogas and biomethane production calculated for 2030 ranges between 35 and 44 bcm, equivalent to 370 TWh and 467 TWh. This represents between 46 and 58 GW of production capacity. Even as far ahead as 2050, the calculations from Eurogas (95 bcm or 1,008 TWh) and the Gas for Climate consortium (95 bcm or 1,020 TWh) produce very similar predictions, at 126 and 128 GW of production capacity, respectively.

The International Energy Agency (IEA) calculates Europe's biomethane potential as 125 bcm or 1,326 TWh, representing 166 GW of production capacity. According to the IEA, this potential is reachable by 2040.

The figures shown on the previous page indicate potential biogas and biomethane production for 2030, 2040 and 2050, according to the different studies. The numbers are presented as the yearly production potential in bcm and TWh. Where necessary, the calorific value of biomethane (10,61 kWh/Nm³) was used to convert from bcm to TWh and vice versa.

The graph below illustrates that there is enough biomethane to be used in multiple sectors which will need to decarbonise in the coming years.

Figure 3: Accelerated decarbonisation pathway. Towards an optimal role of gas in a net-zero emissions energy system. Gas for Climate 2020. Data on passenger vehicles added by the EBA.



About the EBA

The EBA is the voice of renewable gas in Europe. Founded in February 2009, the association is committed to the active promotion of sustainable biogas and biomethane production and their use across the continent. The EBA today counts on a well established network of over 150 national organisations, scientific institutes and companies from Europe and beyond.

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