Biomethane in Sweden – market overview and policies

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ENERGIGAS SVERIGE

Preface

The aim of this document is to give an overview of the Swedish biomethane/biogas market. It describes some statistics of the use and production of biogas and biomethane as well as the main policies and drivers for biogas and biomethane in Sweden. We also briefly describe how the green gas concept and the sustainability criteria scheme is working and possibilities for cross border trade.

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Energy gases in Sweden

In Sweden only about 3 % of the total energy supply of 525 TWh is energy gases (Figure 1), which is rather low compared to many other countries in EU. Of the total energy use (364 TWh) about 3 % is energy gases, mainly used in industry.

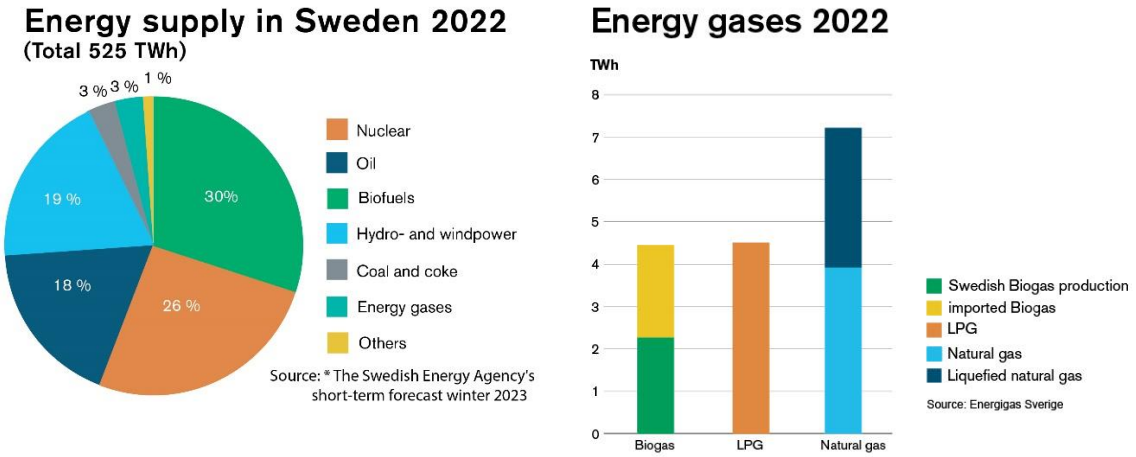


Figure 1 Total energy supply and deliveries of energy gases in Sweden 2022. Source: Swedish Energy Agency and Swedish Gas Association.

The use of energy gases dropped from 20.4 TWh 2021 to 16.2 TWh 2022 – mainly explained by the high energy prices following the Russian war on Ukraine. The share of renewable gases 2022 (biogas/biomethane) was 18 % (4.5 TWh) and the share of fossil gases was 72 % (11.2 TWh Natural gas, LPG and LNG). The trend over the last 10 years (Figure 2) is that biogas and LNG have increased, and natural gas use has decreased, whereas LPG use is rather stable. Around 2/3 of the domestically produced biogas is upgraded and mostly used in the transport sector.

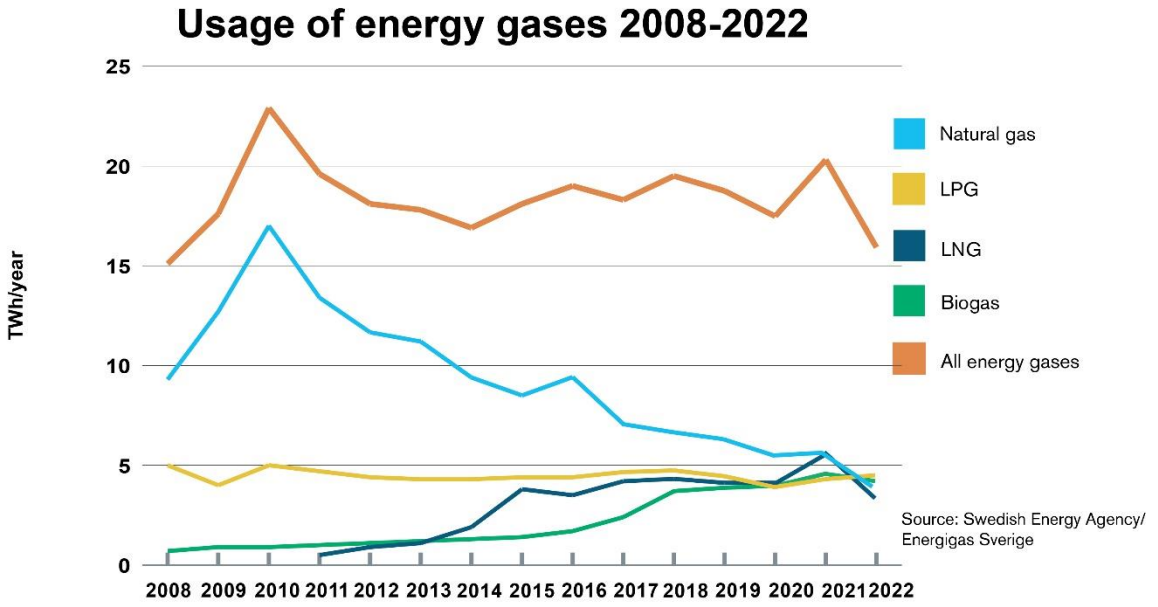


Figure 2 Total use of different energy gases (except hydrogen) in Sweden 2008-2022, TWh per year. Source: Swedish Energy Agency and Swedish Gas Association.

The share of renewable energy in total energy use in Sweden is 63% (2021) and for transport the renewable share is 30 % (2021) according to the renewable energy directive methodology. The recent years´ large increase of biofuel use is mainly due to a rapid increase of HVO at the Swedish market since 2011. This is expected to drop significantly 2024 due to a drastic decrease in the reduction quota obligation for diesel and gasoline from 1 Jan 2024. The total use of methane for transport (CNG/CBG and LNG/LBG) was 1.9 TWh 2022, which is about 2 % of the total energy use for transport. The average biomethane share 2022 in the CNG/CBG used for transport was 97 % and 92 % for LNG/LBG.[1]

Natural gas is mainly used in heavy and small industry (75 %), as shown in Figure 3. In 2021 the share used in industry was 85 %, but due to the high energy prices the natural gas use decreased in 2022 - particularly in industry.

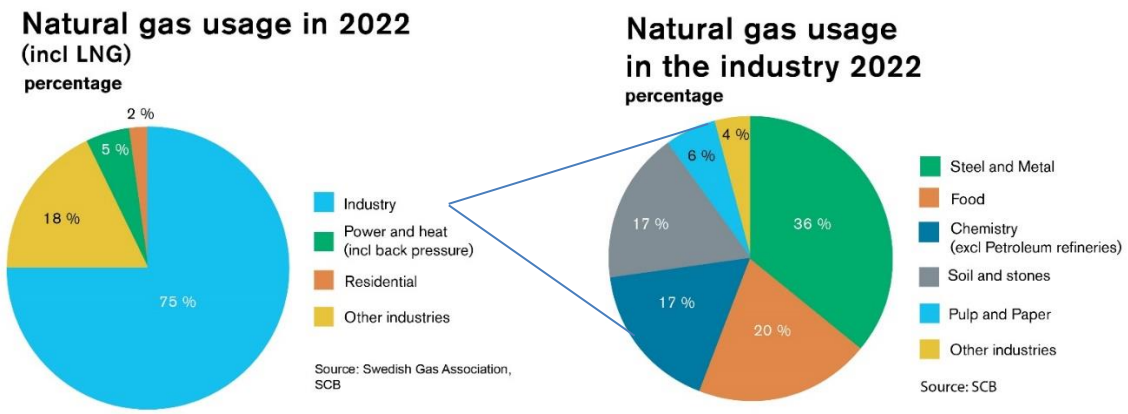
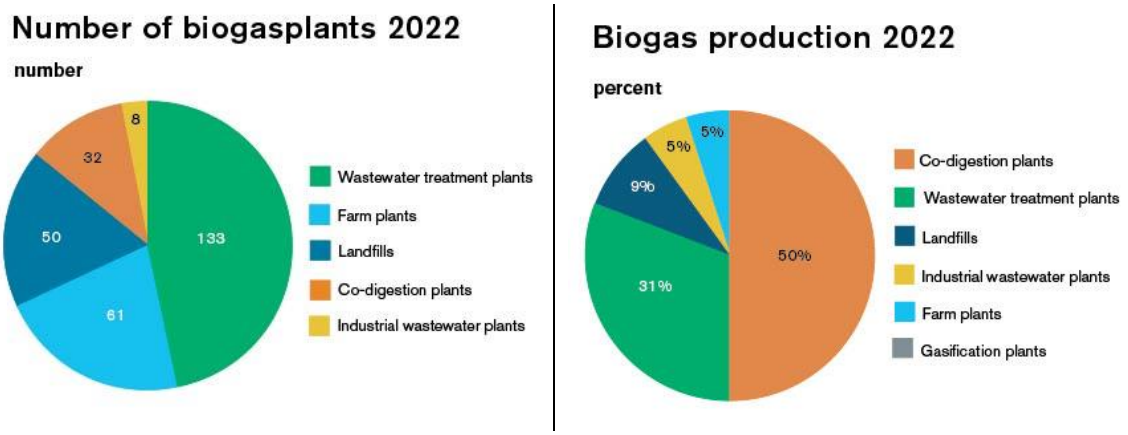


Figure 3 Distribution of total natural gas use and natural gas use in industry in Sweden 2022. Source: SCB.

Production and use of biogas/biomethane

There were 284 biogas plants producing in total 2.3 TWh of biogas 2022, which is the same level as 2021 (+0.6 %). Most of the biogas is produced in co-digestion plants (50 %) in 133 wastewater treatment plants (31 %) as shown in Figure 4.



[1] Source: Swedish Energy Agency

Figure 4 Number of biogas plants and share of biogas production for different plant types in Sweden 2022. Source: Swedish Energy Agency/Swedish Gas Association.

Biogas and biomethane is mainly produced by various organic wastes and residues, such as sewage slugde, organic household waste (food waste), manure, waste from food industries and slaughterhouses (Figure 5).

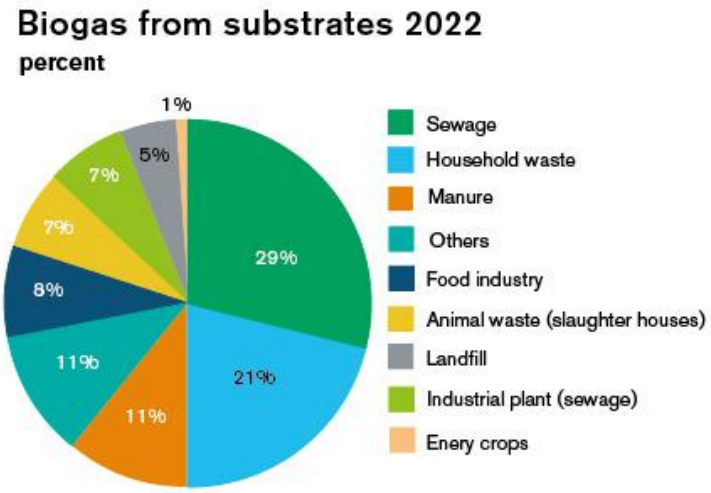


Figure 5 Share of the biogas and biomethane production from different substrates (raw materials) in Sweden 2022, calculated from the amount of used substrates and estimated biogas yields.

The share of biogas that is upgraded to biomethane has increased steadily over the last 10 years, whereas the use for heating has decreased. In 2022 67% of the produced biogas was upgraded to biomethane of which most (75-80%) is used for transport (Figure 6).

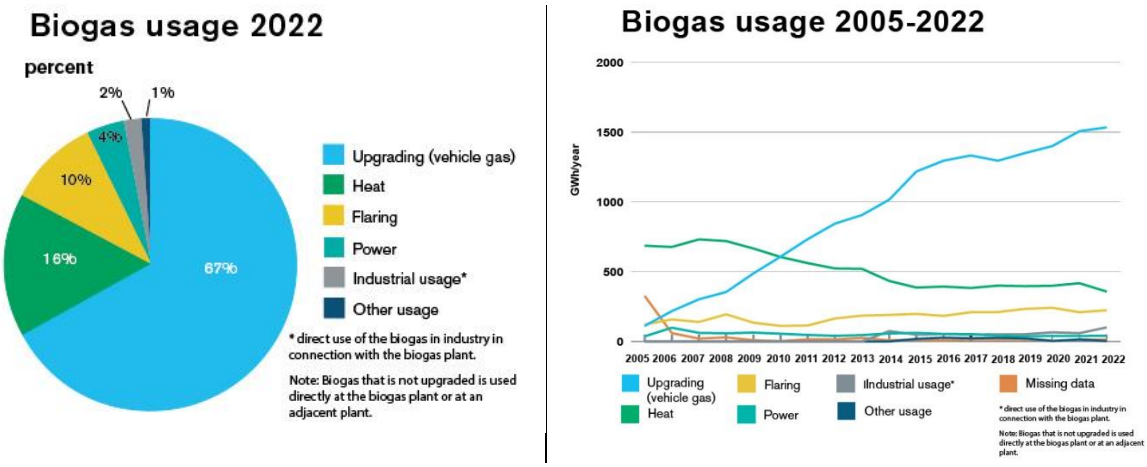


Figure 6 Use of produced biogas in Sweden 2022 and development since 2005. Source: Swedish Energy Agency/Swedish Gas Association.

There were 71 biomethane upgrading units producing about 1.5 TWh biomethane 2022[2]. About 0.55 TWh of this is injected to the south-western gas grid (connected to the European gas grid) and in the Stockholm gas grid. The rest is used locally or trucked to filling stations.

[2] Note that this is part of the total biogas production 2.3 TWh.

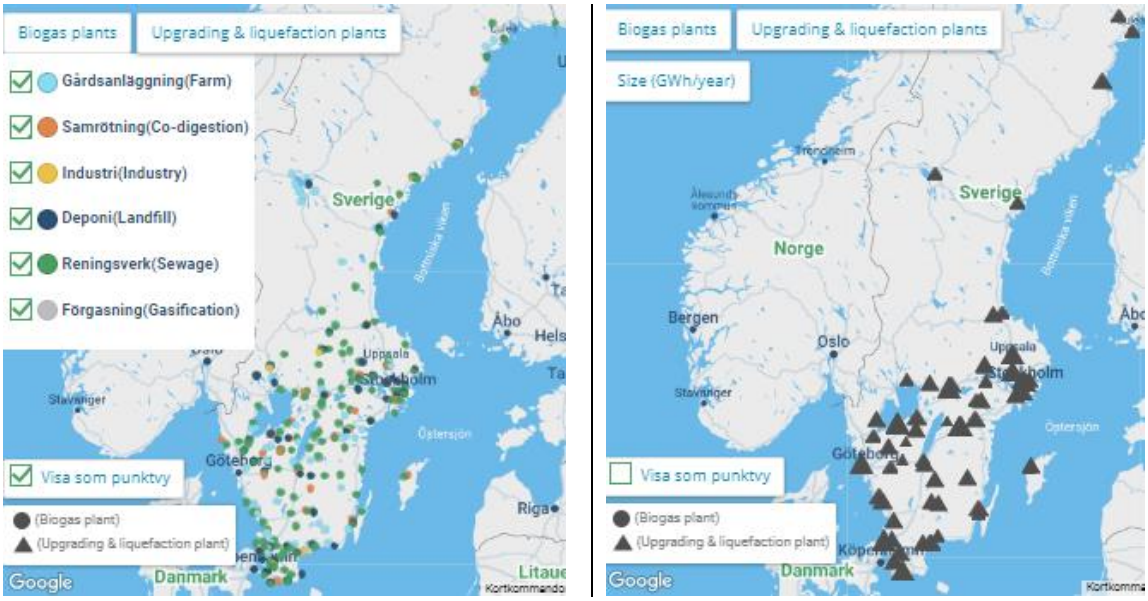


Figure 7 Map of biogas plants and biomethane upgrading units in Sweden 2021. Source: [Karta biogasanläggningar - Energigas Sverige]

A rapidly increasing share of biogas is liquified to LBG. In 2022 there were four LBG plants producing 156 GWh[3] and increase by 63 % since 2021 (Figure 8). Most of the planned new biogas production capacities are LBG plants, and a large part of new production will be manure based.

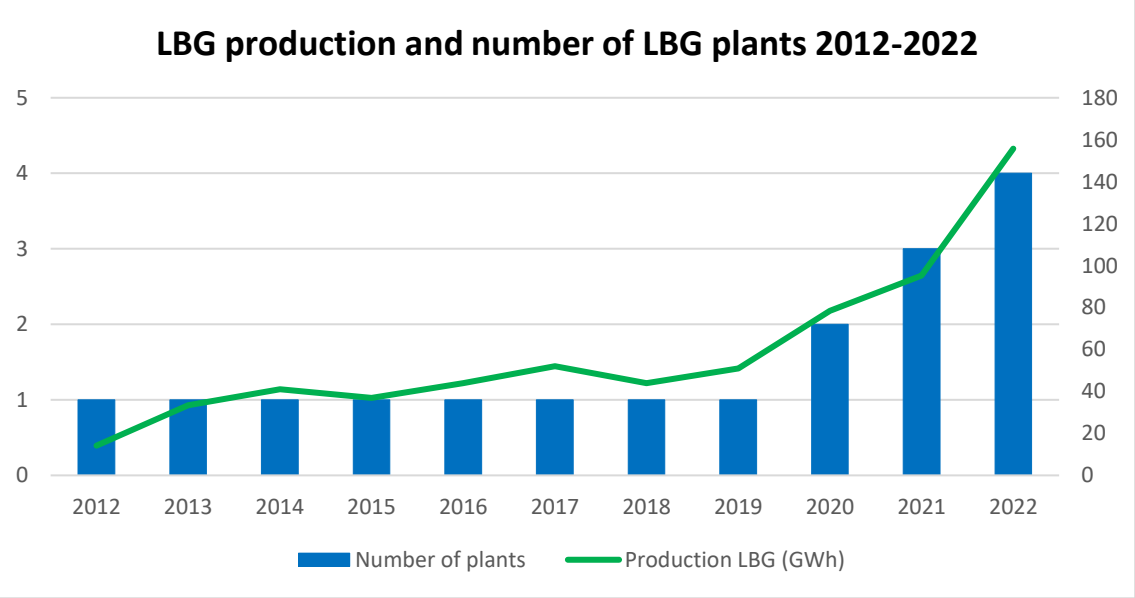


Figure 8 Production of LBG (GWh) and number of LBG plants in Sweden 2012-2022. Source: Swedish Energy Agency/Swedish Gas Association.

Total use of biomethane and biogas including net imports

The import of biomethane through the gas grid has increased rapidly since 2015 from about 0.2 TWh 2016 to 2.5 TWh 2021. In 2022 the biomethane import was 2 TWh of which about 95% is

[3] Part of the 1.5 TWh biomethane produced.

produced in Denmark. Most of the import is used for substituting natural gas in industry and heating. The export is still small but is growing.

The net import of liquified biogas (LBG) increased from 64 GWh to 226 GWh 2022.
The total biogas and biomethane use in Sweden 2022 including net imports of biomethane and LBG was 4.4 TWh, a decrease with 8 % compared to 2021. The total biogas and biomethane use have increased by 129% since 2015 while the production has increased with 18 % during the same period (Figure 9).

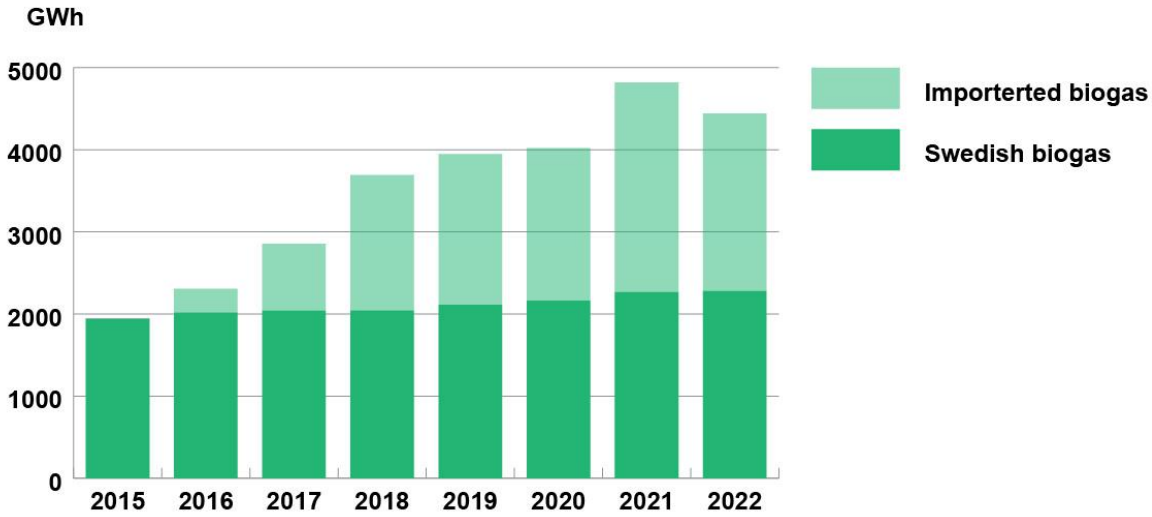


Figure 9 Total biogas use (GWh) in Sweden 2015-2022.

The biomethane market in Sweden

The Swedish biomethane market is to a large extent off-grid with several small local and regional grids or stand-alone biogas plants and filling stations. A large part of the biomethane in Sweden is transported on the road as compressed gas (200/260 bars) and to a small but steeply increasing extent as liquefied gas (LBG). Local and regional gas grids also gain more attention aimed to connect industries, cities and biomethane production plants with an LNG-terminal at the coast.

The gas pipeline infrastructure is limited to the south-western part of Sweden where the transmission network is connected to European gas network via exit Dragör (connection with Denmark). There is also a regional gas network in Stockholm, fuelled with locally injected biogas and shipped LNG/LBG. See Figure 10.

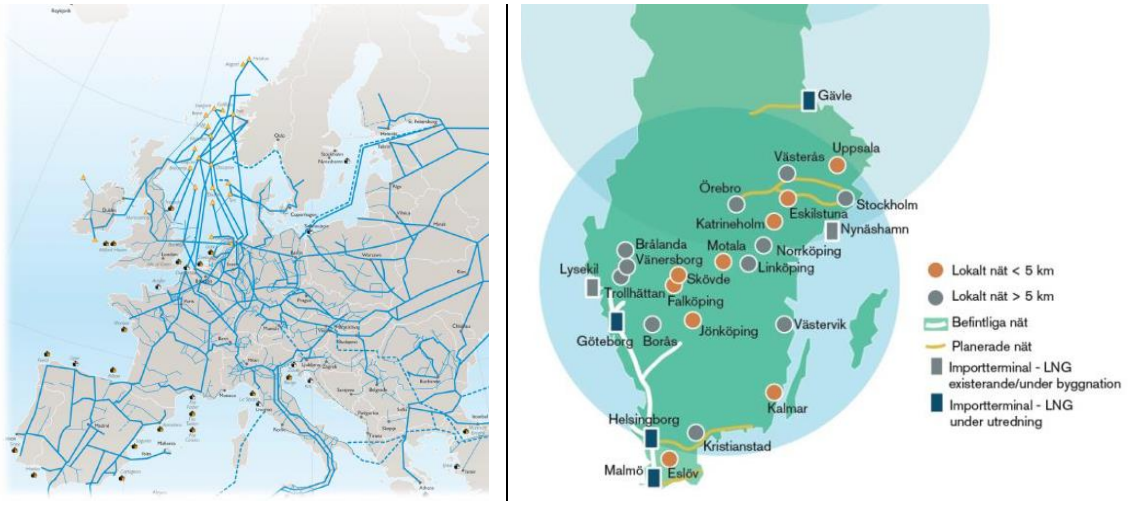


Figure 10 Gas pipeline infrastructure is limited to south-western Sweden and small local gas grids. There are two existing LNG import terminals and a couple of more planned. There are also four LBG plants.

Biomethane in transport

Most of the produced biogas (67 %) is upgraded and mainly used for road transport and CNG busses in public transport due to a favourable support system. The market for biomethane as transportation fuel is now rather developed in Sweden. The use of methane as CNG/CBG in transport increased rapidly up to 2014 but has since then stabilized at around 1.6-1.7 TWh the last years (Figure 11). The biomethane share has however continued to increase and was 96 % 2022.

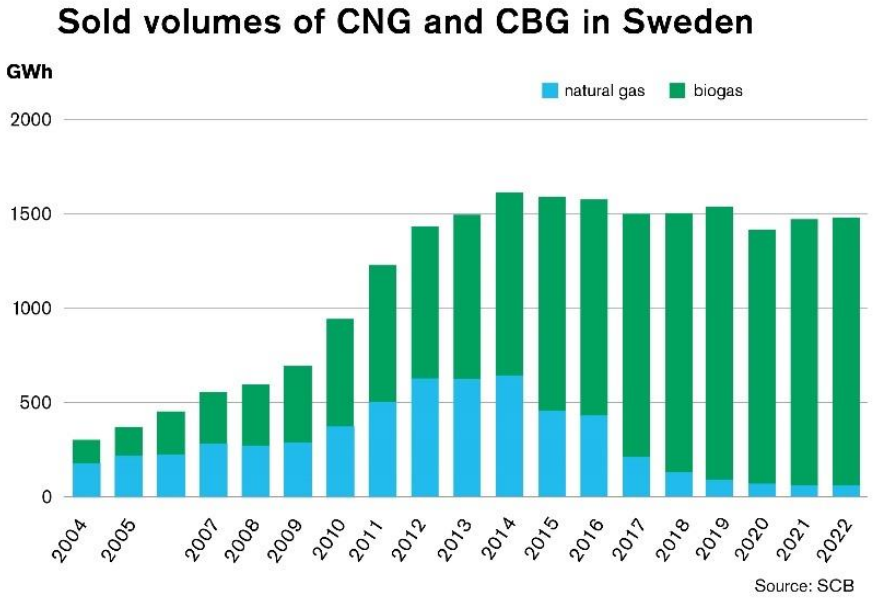


Figure 11 Sold volumes of CNG and CBG in Sweden 2004-2022 (GWh).

Today there are more than 200 public filling stations for CNG/CBG in addition to the 63 non-public stations dedicated to certain vehicle fleets, including busses. For a couple of years, the number of filling stations for LNG/LBG has increased rapidly to around 30 (Figure 13). The total number of gas vehicles was about 50 000 in the end of 2023. The number of buses (2 562) and passenger cars and light duty vehicles (44 503) has declined for a couple of years, while the number of trucks (2 568) has increased (Figure 13).

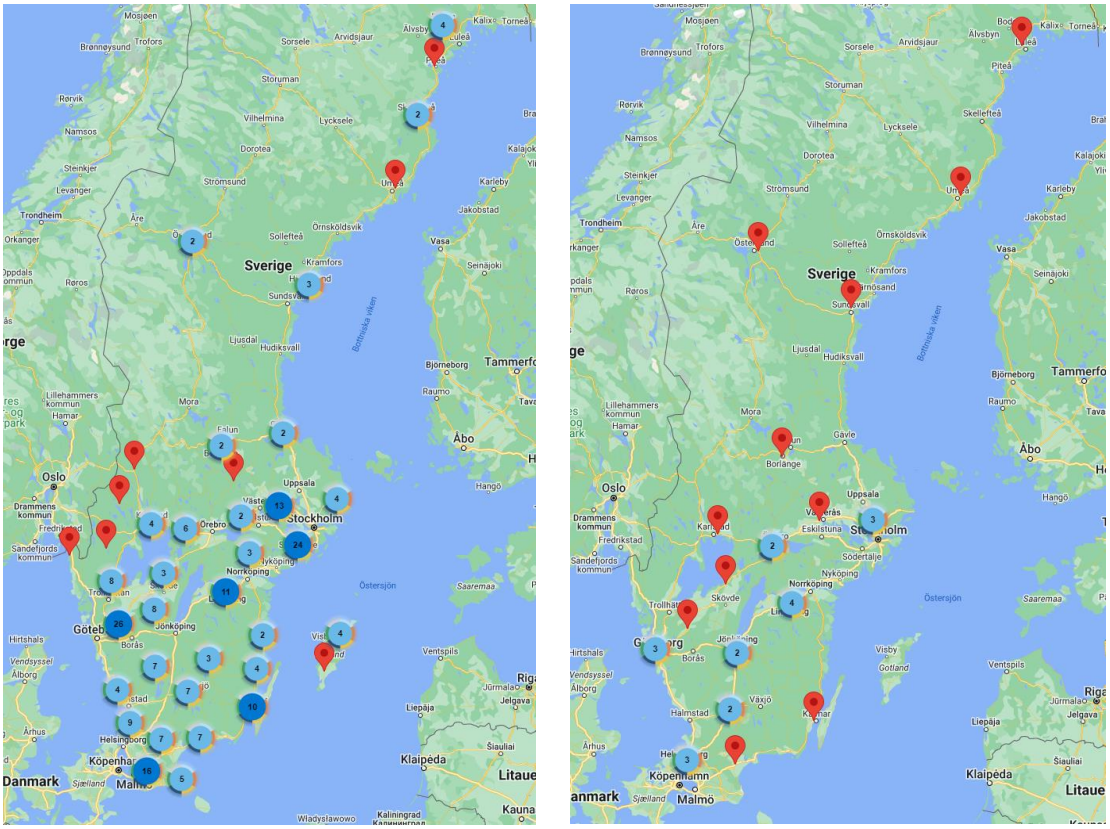


Figure 12 Map of CNG/CBG filling stations (to the left) and LNG/LBG (to the right) end of 2023.

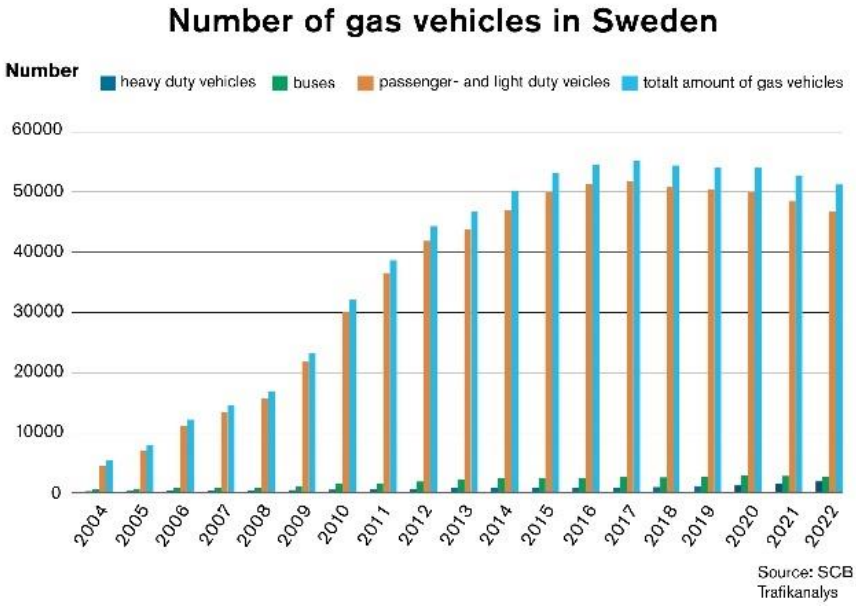


Figure 13 Number of CNG/CBG filling stations and gas vehicles in Sweden 2004-2022. Source: SCB, Transport Analysis and Swedish Gas Association.

Liquid biogas for long haul heavy-duty vehicles is increasing rapidly

The interest for liquified biogas is large and the market is growing. The number of LNG heavy-duty vehicles are increasing rapidly in Sweden, which is also the case for the number of filling stations and sold volumes (Figure 14). The share of bio-LNG (LBG) is increasing and was 95% as an average 2022. In 2023, however, the share of bio-LNG seems to have decreased due to the stopped tax exemption from March 2023 (82 % Q1-Q2 2023) - see below (*Source: SCB*). Beside the HDV sector there is also an increasing demand for LBG in off-grid industries substituting their LNG use. There is also a growing interest for LBG in the maritime sector with a potentially large market ahead as many new ships the last couple of years are LNG/LNG-ready ships.

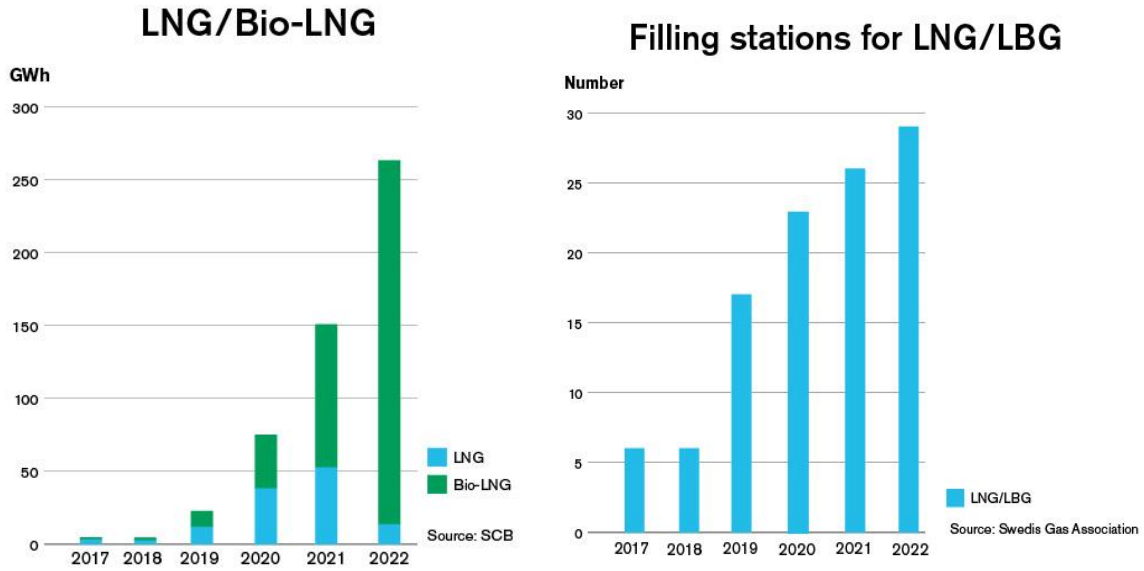


Figure 14 Sold volumes of LNG/Bio-LNG for transport and number of filling stations in Sweden 2017-2022.

Long-term energy and climate policy

The climate act sets long-term ambitious GHG targets for 2030 and 2045

Ambitious energy and climate goals push for increased renewable energy. Since 2017 there is a climate law and ambitious long-term climate and energy goals:

- Climate neutral energy sector 2045 of which at least 85 % GHG emission reduction in Sweden. From 2045 negative emissions.
- 100 % fossil free electricity production 2040[4]
- 63 % GHG emission reduction in non-EU ETS sector in 2030 and 75 % 2040 compared to 1990
- 70 % GHG emission reduction in domestic transport (excl. aviation) 2030 compared to 2010

The government is according to the law committed to present a climate policy plan every 4 years. The first was presented late 2019, and the new government from October 2022 presented their climate policy plan in December 2023. Further, a climate policy council shall continuously analyse the current climate policies and make recommendations. The climate policy council presented their first annual report 2019, which indicated that policies are not enough to reach the goals. The latest report (March 2024) was very critical to the current climate policy and that the government´s climate action plan is inadequate and insufficient for reaching the climate goals.

Roadmaps and visions in the gas industry

National Biogas Strategy

There is so far no official strategy or goals for biomethane or energy gases in Sweden. However, in 2018 the Government appointed a broad biogas market inquiry which presented their report in December 2019, see below.

Roadmap for fossil free energy gases 2045

In 2020 the Swedish gas industry through the Swedish Gas Association published a roadmap on how to achieve fossil free energy gases by 2045, within the governmental initiative Fossilfritt Sverige. Roadmap for fossil free competitiveness of the Gas Sector sets targets for the entire gas market up to 2045 and includes 4 policy recommendations and 11 industry undertakings. The roadmap will be upgraded 2024 with new goals and new policy recommendations.

THE GAS INDUSTRY´S JOINT VISION:

- All energy gases used in Sweden will be completely fossil free by 2045 at the latest.
- The potential for producing renewable gas will be realised.

The GAS INDUSTRY OBJECTIVES THROUGH TO 2023 AND 2030

- 2023: All CNG (Compressed Natural Gas) for transport will be biomethane.
- 2030: Liquefied gas used to power vehicles will reduce greenhouse gas emissions by an average of 70–90 per cent compared to fossil fuels such as petrol and diesel.
- 2030: All energy gases in the power and heating generation sectors will be completely fossil free.

[4] The former agreement was 100% renewable electricity, but was 2023 changed by parliament to fossil free electricity

The Biogas market inquiry

In December 2019 a Government-appointed broad biogas market inquiry Mer biogas! För ett hållbart Sverige SOU 2019:63 presented their report with descriptions of the biogas market, its environmental and social benefits, potential and policy recommendations. It suggested several policy measures, including adopting a national biogas/biomethane production target of 10 TWh by 2030 and that the tax exemption for biogas is complemented by a new long-term production support scheme with additional production premiums for manure-based biogas, upgraded biogas (biomethane) and liquified biogas (LBG). It also suggested another (auction based) production support scheme for biogenic gases produced from lignocellulose.

Policy development after the Biogas market inquiry

Since the Biogas market inquiry report several policy measures have been realized:, the suggested biogas production support scheme has been implemented, investment support for biogas solutions including vehicles and filling stations have been prolonged and continued exemption from CO2 and energy tax for biogas and bio-LPG was approved by the EU Commission until 2030 (the tax exemption was revoked from March 2023 due to a ruling in the EU Tribunal – see below).

From November 2022 the purchase bonus for new electric, hydrogen and gas cars of the rather new bonus-malus scheme for passenger cars and light vehicles was revoked by the new Government. The purchase bonus for gas HDVs was suggested to be revoked from 2024 due to new EU state aid rules, but could in the end be prolonged by the Government in January 2024 with some adjustments.

There is still no national biogas target adopted. To increase domestic biofuel production from ligno-cellulosic residues the Government-appointed Bioeconomy inquiry in March 2023 proposed a new long-term auction-based production support scheme. It would be in the form of “contracts for difference” for large scale (> 0.5 TWh/year) production of liquid biofuels and other intermediate products of certain quality. It is limited to “advanced” biomass feedstocks listed in REDII Annex IX or biogenic CO2 and renewable electricity and the use of new technology but not limited to a certain end product or end use. If implemented it could include e.g. gaseous fuels from biomass gasification such as biomethane.

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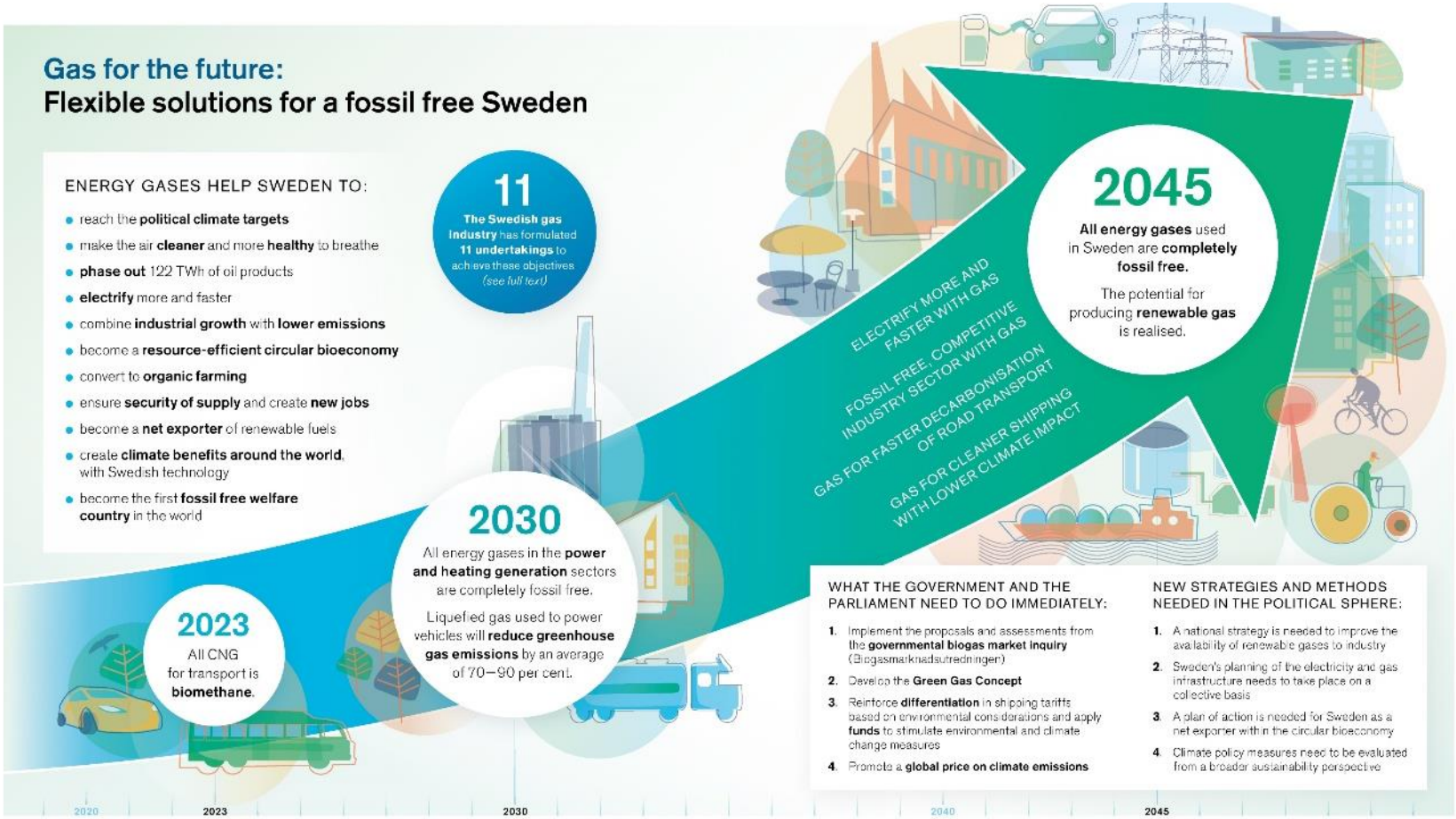

Regulatory framework, support systems and drivers for biomethane market

In Sweden general economic incentives in terms of high CO_2 and energy tax on fossil fuels and tax exemption for renewables have been the main drivers for decarbonising since the 1990's and has been the main driver for biogas and biomethane, but has recent years been complemented by productions support, investment support and increasing prices in the EU emission trading scheme (EU ETS). Since the taxes are highest in the transportation sector, most of the biomethane has been used for road transport, but also to some extent for heating (district heating or process heat). In other sectors, such as industry with high natural gas use, the tax advantage for renewables is generally much lower. It is only during the last 3-4 years that the biomethane demand in industry has risen dramatically. Biomethane has become more competitive in parts of the industry due to increased tax on natural gas for heating and increasing CO2 prices within ETS.

The gas use in general as well as the biomethane use and imports dropped significantly in 2022 due to the high energy prices caused by the Russian war on Ukraine. Since the abrupt change in tax on biogas and biomethane use 7 March 2023 (from full exemption of energy and CO2 tax to be fully taxed as natural gas and LPG) both production and biomethane demand is under high pressure with decreased competitiveness (see * below).

The biomethane production has increased steadily since 2005 mainly driven by investments by municipalities and regions in biomethane driven public transport (buses) and new biogas plants with upgrading for recycling of organic household waste (co-digestion plants). Biogas production has occurred for several decades in many sewage plants but since 2005 the share of biomethane upgrading has increased. There have been several investment support programmes that have facilitated this development. In the recent years, a large part of new production is run by private companies mainly focusing on agricultural and industrial organic waste and residues such as manure and waste from food industry and slaughterhouses. It is also in the private sector where most of the additional production capacity investments are foreseen in the future.

Existing national policies and drivers

Fiscal incentives – CO_2 and energy tax exemption (temporarily revoked*)

- Transportation:
  Exemption from CO_2 and energy tax for biomethane as transportation fuel is approved by the EU Commission until the end of 2030. Natural gas for transportation is exempted from energy tax and only pay CO_2 tax. The CO_2-tax rate 2023 corresponds to 2840 SEK/1000 Nm^3 (~24 €/MWh). The value of the biomethane tax exemption can be estimated with the corresponding tax for petrol. The CO_2-tax for petrol 2023 is 2.87 SEK/litre (~29 €/MWh) and the energy tax is 3.44 SEK/litre (~34 €/MWh).

- Heating fuel (including industrial use):
  Exemption from CO_2 and energy tax for biogas or biomethane for heating (including industrial use) is approved by the Commission until end of 2030[5]. Corresponding tax 2023 on natural gas is 3946 SEK/1000 Nm^3 (~33 €/MWh). The former partial exemption from energy tax for fossil fuels used in the manufacturing process in industrial activity (for other purposes than use in motor vehicles) was phased out in

[5] Also bio-LPG is exempted from CO_2 and energy tax until end of 2030

July 2021. For industrial activities included in the EU ETS, is exempted from 100 percent of the CO_2 tax.

- Heat or CHP plants:
  Exemption from CO_2 and energy tax for biogas or biomethane when used in heat or combined heat and power plants. Natural gas, and other fossil fuels, for such use within the EU ETS, are exempted from 100 percent of the CO_2 tax from 1 January 2023.

* The state aid approval for the Swedish tax exemption 2021-2030 for biogas and bio-LPG for transport or heating has been revoked by an EU General Court ruling (Landwärme vs Commission Case T-626/20) in 21st of December 2022. The Swedish Tax authorities has announced that no tax exemption is granted from 7th March 2023 and onwards. The state aid approval process is now re-opened, and the Commission needs to perform a more comprehensive investigation before new approval can be given. The Commission announced early 2024 that the investigation has opened. It could take up to 18 months.

Production support/premium

Production support scheme for biogas and biomethane from 1 July 2022.

The support scheme consists of three premiums, which are additional:

- Max 0.40 SEK/kWh (~35 €/MWh) support for biogas produced from manure[6].
- Max 0.30 SEK/kWh for biogas upgraded to biomethane.
- Max 0.15 SEK/kWh additional for biomethane that is liquified to LBG[7].

The scheme is administered by the Swedish Energy Agency and support is given to the raw biogas producer based on continuous yearly applications. There is no guaranteed support or period based on contracts etc, but the aim is long-term support of about 10 years. Support can be combined with other support such as investment support or tax exemption but is subject to annual overcompensation assessment.

Biomethane and LBG premium are eligible for biomethane from all substrates except landfill gas and food and feed crops. Eligible also for biomethane produced with other technologies than anaerobic digestion such as biomass gasification. Only eligible for plants producing up to 50 000 tonnes biogas/biomethane/LBG per year. The support was before limited to use in transportation or for very small-scale production of heat and power but is since 2023 eligible for any final use.

Investment support

- Local climate investment programme:
  Investment support (up to approx. 45-65 %) for all types of investments or measures that leads to high GHG emission reductions, 2015-2028. The budget for 2024 is 4.1 Billion SEK/year (~0.36 Billion €). A significant part of the investment support so far has been granted to biomethane investments (many biogas plants, several CBG and

[6] This support has been available since 2015 by the Swedish Board of Agriculture but is since 1 January 2024 part of the biogas support scheme at Swedish Energy Agency

[7] The new production support scheme has replaced a temporary and more limited biomethane production support in place from October 2018 until end of 2021.

LBG filling stations and LBG-trucks) but also other measures such as EPV charging infrastructure.

Previous (ended) investment support programmes:

- Drive LBG - 200 MSEK support 2018-2021 for the establishment of an LBG innovation cluster – for promotion and demonstration of the whole production and utilisation chain in a region for LBG in heavy road and sea transport. Drive LBG was co-ordinated by the Swedish Gas Association in cooperation with regional biogas organisations. Investment support for various LBG investments have been granted within the project, including biomethane liquefaction plants, filling infrastructure and long-haul HDVs.
- Investment grants for marketing of new technologies and new solutions for biogas during 2010-2016. Maximum 45 % or 25 MSEK (~2,5 M€) of the investment cost.
- Climate investment grant for municipalities: Total budget 1925 MSEK (~190 M€) until the end of 2018.

Economic incentives and other regulations for low emission road transport, including biomethane

- The former (2018-2022) bonus[8] for purchasing new low emission cars (electric, hydrogen or gas vehicles) in the Bonus-malus taxation system for light vehicles was cancelled by the new government from 8th of November 2022.
- Climate purchase premium for HDVs and working machines, including gas vehicles, of up to 20 % of purchase cost. The bonus is granted by the Swedish Energy Agency.
- New legislation for environmental zones in cities from 1st of January 2020. Cities can put up restriction zones for polluting (noise and emissions) vehicles in three different restriction levels. Only Euro 6 gas vehicles (NGVs), hydrogen and all-electric vehicles are allowed in all three zones. On the heavy-duty side, Euro VI plug-in hybrid electric vehicles (PHEVs) are also allowed.

Other policies and regulations with positive effect on the biomethane market

- Environmental information about all transportation fuels must be displayed at the filling station, including origin and CO_2 reduction from 1st Oct 2021.
- Rules and environmental criteria for public procurement of fuels and vehicles.
- Municipalities must provide systems for separation and collection of organic waste from households from 2024. The national goal of collection and recycling of nutrients and with energy recovery (digestion) from 40% of all organic waste from households, commercial kitchens, grocery stores and restaurants was reached. The new national goal is 75% nutrient and energy recovery (digestion) by 2023, which was not reached.
- Sea transport: International environmental legislation (sulphur and nitrogen oxide limits) together with some environmental-differentiated port fees push for more LNG ships. However, no energy or CO_2 tax on maritime fuels means no economic incentives for renewables at this point. Incentives are however expected in a few years, following new legislation within the EU Fitfor55-package.

[8] Bonus up to 70 000 SEK (~7000 €) when purchasing new low emission cars (EV or PHEV). Gas vehicles is granted a bonus of 10 000 SEK (~1000 €). Malus in terms of increased CO2-based vehicle tax first three years for high emission cars (gasoline and diesel cars).

Some policy barriers for further development

- The long-term policy conditions have been too uncertain for biomethane production to take the next step. The last years biomethane use has increased more rapidly than the production. Some important barriers for investments in production have been removed the last years. Important is the new long-term production support for biomethane from 2022 and the purchase bonus for gas vehicles. The production support scheme has been confirmed by the new government until 2026, the support is now open to any biomethane end use and the premium for manure-based biogas has finally become a part of the long-term biogas support scheme.
- However, the biogas production support is subject to annual Governmental budgets and its political certainty is not guaranteed long term. Implementing a biogas strategy and setting a target for biomethane would decrease the political uncertainty and further strengthen the investor confidence.
- The so important 10-year EU Commission approval of the tax exemption for biomethane from 2021 gave more long-term confidence and trust in the market. The sudden revoke of the tax exemption leading to full energy and CO_2 tax for biogas and biomethane use from March 2023 due to an EU General Court ruling was therefore detrimental to the market and for investments. Especially for the very promising and quickly increasing LBG-market for heavy duty vehicles. A quick re-implementation of the tax exemption is crucial to not severely cause long term harm to the biomethane market development.
- Acknowledgment of market instruments and mass balance principles for trade and compliance to various policies such as ETS, taxation, RED sustainability criteria and GHG-accounting schemes are crucial for efficient market development. It is still not fully recognised in all important schemes or accounting programmes and the uncertainty and different rules hamper the market and increase costs.
- The lack of a biogas registry/Guarantees of Origin system in Sweden is an increasing problem – particularly for cross border trade. A law is in place to extend the existing GO-system to gas (following Article 19 of REDII), but the Government has still not decided when it shall come into force. It has been waiting for more clarity in EU rules such as the delayed revision of the mandatory GO standard EN 16325, the implementation of the Union Database for sustainable biogas and biofuels and how it will integrate with GOs and the adoption of REDIII.
- There are a couple of taxation rules that are disadvantageous for biomethane, for instance that taxation now is based on volume instead of energy content.
- The phasing out of the internal combustion engine – particularly in the EU CO_2 standard regulation for road vehicles – will negatively affect the development for biomethane in road transport. Potential lack of local biomethane demand in a country with limited gas grid infrastructure will be a challenge for many biomethane producers. Liquefaction to LBG will be key to reach potential large gas users in industry, long haul heavy road transport or maritime transport in the future.
- The conditions for biomethane in light road vehicles have been further worsened by the revoked tax exemption 2023 and the cancelled purchase bonus 2022.
- The economic incentives for biomethane use in the maritime sector and in some industrial sectors are too week for biomethane to be competitive to fossil fuels. Particularly for use in the iron and steel sector and for use as raw material in the chemistry industry since exemption from energy and CO_2 taxes are not effective in these sectors and/or they are not included in the ETS.

Regulation on sustainability criteria, mass balancing in gas grids, cross border trade and tracking systems

Green gas concept allows for mass balancing in gas grids for tax purposes

There is no biogas registry or independent certification system currently in place in Sweden, but mass balancing is possible for biomethane in gas grids since 2011 in the taxation regulation as well as in the sustainability criteria scheme. The Tax Authority, however, has the possibility to request full documentation from all taxable companies using the green gas concept. All companies are using in-house accounting to make sure that they inject (or that it is injected for their account) as much biomethane as they take out and put into market for energy purposes. Some companies use third party auditing for this.

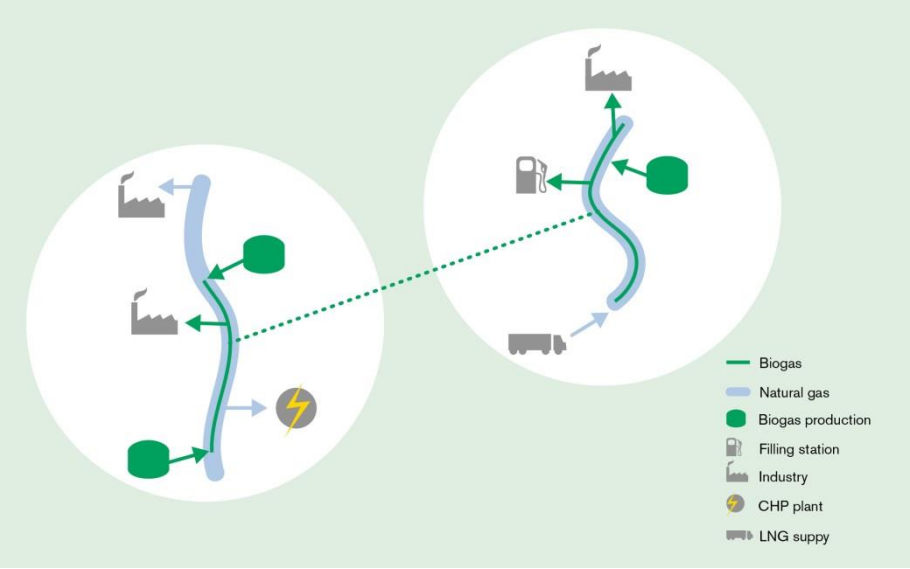

Figure 15 The green gas concept in Sweden. 100 % biomethane can be purchased and claimed as biomethane from the gas network or local gas grids through the mass balance principle and is eligible for exemption of energy and CO_2 tax.* Full in-house documentation and a purchasing contract between the user and the supplier is required.

In the Act (1994:1776) on energy taxes[9] the green gas concept was introduced in 2011, which means that biomethane users connected to the gas grid or in a local grid can buy and claim any share of biomethane even though it is a physical mix of natural gas and biomethane. Biomethane from gas grids is eligible to full energy tax and CO_2 tax exemption.* The biomethane content shall be decided by the purchasing contracts between the user and the supplier, and the supplier must assure that the same amount has been injected to the grid. If the biomethane is bought in another country, and transported to Sweden from Denmark through the grid, transmission capacity from the injection point must thus be booked.

The green gas concept is in principle applicable for both imported and domestic biomethane and is possible also between gas grids in Sweden that is not physically connected.

"Green gas concept" since 2022 also possible within EU ETS

Following a revision of the EU ETS regulation, from 1st of January 2022 emission allowances are no longer required for biogas purchased from gas grids and the biogas share is decided based on purchase records, proof of sustainability and records from a biogas registry/Guarantees of Origin (if

[9] Lagen (1994:1776) om skatt på energi (Chapter 2, 2 a §)

available). Until a biogas registry/Guarantees of Origin for biogas is implemented in Sweden other proofs are accepted.

* The state aid approval for the Swedish tax exemption 2021-2030 for biogas and bio-LPG for transport or heating has been revoked by an EU General Court ruling (Landwärme vs Commission Case T-626/20) in 21st of December 2022. The Swedish Tax authorities has announced that no tax exemption is granted from 7th March 2023 and onwards. The state aid approval process is now re-opened, and the Commission needs to perform a more comprehensive investigation before new approval can be given. The Commission announced early 2024 that the investigation has opened. It could take up to 18 months.

RED sustainability criteria

The national sustainability criteria scheme is regulated by the Sustainability Act (2010:598)[10] and is supervised by the Swedish Energy Agency. All suppliers of biofuels (including biomethane aimed for transport) eligible for taxation must apply for a Sustainability Decision (Hållbarhetsbesked) by the Swedish Energy Agency. From 1st July 2021 the sustainability criteria apply also to other energy purposes than transport (electricity, heating and cooling), including all biogas and biomethane used in installations > 2 MW. The already existing national RED sustainability criteria scheme continues with the same set up, but now extended to all biomass fuels.

To be eligible for tax exemption or to be counted for in other support systems, such as the GHG reduction obligation for gasoline and diesel, green electricity certificates or EU ETS, all liquid and gaseous biofuels and liquid biomass fuels must meet the sustainability criteria, which is proven by a valid Sustainability Decision.

To get a Sustainability Decision, the supplier must set up a control system covering the whole production and supply chain with routines – including agreements with sub-suppliers, regularly sampling and auditing, and a mass balance system – that assures that biofuels supplied meet the sustainability criteria. A statement from an independent auditor assuring that the control system fulfils the requirements must be sent to the Swedish Energy Agency, together with the application. The supplier must in April every year report to the Swedish Energy Agency the amounts of sustainable biofuels delivered and their sustainability characteristics. The Sustainability Decision is reviewed every second year or so by the Swedish Energy Agency, based on independent auditing of the control system including samples of actual biofuels consignments delivered. All suppliers of biofuels must have a sustainability decision, but an alternative to show that all requirements in the national regulations are met is to refer to certification by a Voluntary scheme (VS) approved by EC. Biofuels covered by certification from a VS is always compliant with the sustainability criteria in Sweden.

For biomethane export (which so far is very limited) Swedish producers normally use voluntary scheme certifications. For imports voluntary scheme certificates are usually used to prove compliance in Sweden, but it is not necessary if the supplier´s control system have sufficient routines that can assure RED compliance through the whole production chain and if this was described to the Swedish Energy Agency in the Sustainability Decision application.

Mass balancing in the gas grids and cross border

Just like the green gas concept in the tax regulation mass balancing is recognised within the Swedish national gas networks and local grids, based on purchasing contracts and proofs of injection of the same amount of biomethane into the grids.

[10] Lag (2010:598) om hållbarhetskriterier för biodrivmedel och flytande biobränslen (hållbarhetslagen)

Biogas registry / Guarantees of Origin for gas

So far there is no national biogas registry or centralized system for register and tracking biomethane in Sweden. As mentioned above the most important driver for biomethane – exemption from energy and CO_2 tax – is already possible through the green gas concept which is supervised by the Tax Authority. The Swedish biomethane market is mainly off grid and only a small part of southwestern Sweden is connected to the European gas network, and there is a regional gas network in Stockholm. There are some local grids or just stand-alone plants and gas filling stations. This is another reason why biogas registry has not been prioritized in Sweden until now.

However, establishment of a national biogas registry and/or system for guarantees of origin (GO) has gained more interest recent years and the Swedish Gas Association is actively working to make this happen. The increased cross border trade through the gas grid, the increasing use of biomethane in industry and the ongoing integration of energy systems highlight the need for a harmonised European tracking system for energy and renewable gases. According to the REDII Article 19 the Member states are requested to grant GO also for renewable gases from 30 June 2021. As mentioned above a registry or GO system is requested also for zero-emission compliance for biogas from the gas grid within EU ETS.

GO system for gas is being implemented but is delayed

A national Guarantees of Origin (GO) system extended to renewable gases is currently being prepared and will be implemented by the Swedish Energy Agency. The legal act for the extension to gas, heating and cooling was adopted by the parliament in 2022 but will not come into force until the Government decides. The final implementation (and the detailed regulations) is awaiting the ongoing revision of the CEN standard EN 16325 for GOs, which is delayed.