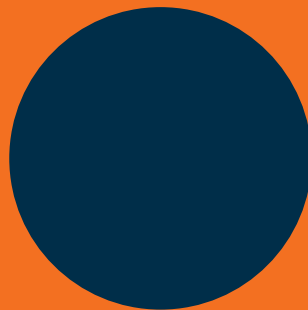
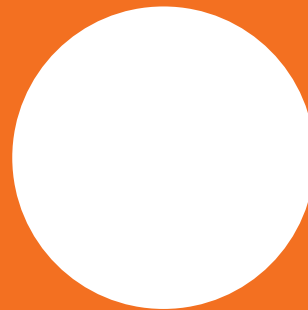


More biomethane for the industry!

Policy package for industrial material
transition and competitiveness



Industry
Biomethane Commission

”

The amount of available biomethane for industrial material transition and competitiveness must increase significantly. Biomethane production needs to increase fivefold by 2030, but existing policy instruments are not enough.

We need to speed up the pace. The conclusion of the Industry Biomethane Commission is that this requires a completely new approach to Swedish biomethane policy. Here are suggestions on how this can be achieved. ”



Adam Kanne, Perstorp,
Chair of the Industry Biomethane Commission



Foreword

Industry is the backbone of the Swedish economy. Successful export companies have been – and remain – essential for our shared prosperity. We want it to stay that way.

But this is a time of change. The geopolitical situation has fundamentally changed, and the risks of fossil fuel dependency have been exposed. At the same time, the need to halt climate change remains. It is clear that our dependence on fossil fuels and fossil-based feedstocks must end – and time is running short.

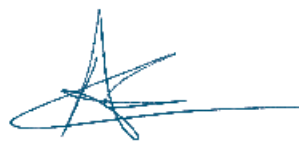
With well-targeted political measures, Sweden has much to gain:

- **Competitiveness and prosperity.** Enabling industry to transition to biomethane will secure Sweden's competitiveness in the global market. This is essential for future jobs and welfare.
- **Security of supply.** Domestic biomethane production increases our resilience and makes us less dependent on uncertain supplies from other countries, not least in the event of a crisis or war.
- **Climate transition.** Industry's need for biomethane is estimated at 10 TWh in 2030. When 10 TWh of biomethane replaces 10 TWh of natural gas, climate emissions are reduced by 2.5 million tonnes of carbon dioxide equivalents. This corresponds to approximately the carbon dioxide emissions from the entire aviation sector in Sweden, both domestically and internationally.
- **Circularity and resource efficiency.** With an investment in large-scale biomethane production, society's waste and residual products are converted into energy, feedstocks and plant nutrients. Sweden is transitioning to a resource-efficient, circular bioeconomy.

In this report, the Industry Biomethane Commission proposes a set of political and practical measures to significantly increase Sweden's biomethane production. The most important message is that the production needs to increase fivefold by 2030 to meet rapidly growing demand. At the same time, the economic conditions for industry to transition to biomethane must be improved. This is an ambitious but achievable goal, provided that decisive action is taken now.

Securing access to biomethane for Swedish industry is a strategic necessity – for the climate, for the economy and for our security of supply.

Stockholm, 19 March 2025



Adam Kanne
Chair
Industry Biomethane Commission



Gorm Jensen
Managing Director,
Perstorp Holding AB



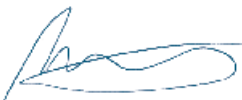
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Johan Svenningsson
CEO, Uniper Sverige



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CEO, Energigas Sverige



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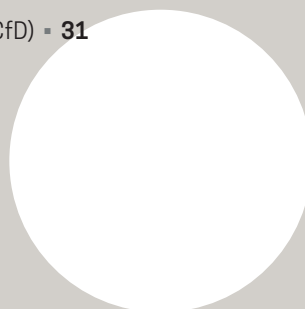
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Summary



A wide range of essential products – from medicines and clothing to appliances and mobile phones – cannot be manufactured without carbon atoms as building blocks in the material. In today’s industrial production, almost all of these carbon atoms come from fossil sources.

In the transition to a fossil-free society, it is not enough to transform the energy system. Fossil carbon atoms, which are used as feedstocks, must also be phased out. Electrification alone cannot solve this transition, as the carbon atoms themselves need to be replaced by sustainable feedstocks. Biomethane is one of these important sustainable feedstocks, and Swedish industry therefore needs large quantities of biomethane at a competitive price to produce steel, plastic, adhesives and other essential products.

The transition to fossil-free materials must begin here and now

Several large-scale projects are underway in Sweden with a focus on switching to fossil-free materials and products. These are projects that can seriously change the global climate footprint. By taking early market shares in new markets – with a focus on sustainable materials and business models – Swedish industry can simultaneously strengthen its competitiveness in the global market. The climate transition will be a growth engine for Sweden. Jobs and welfare will be secured, as will Sweden’s role as a leading industrial nation. When Swedish-produced biomethane replaces imported fossil-based feedstocks, our preparedness will also be strengthened and our national vulnerability to external crises and geopolitical risks will be reduced.



Limited biomethane production and weak economic incentives slow down the transition

Despite ambitious climate goals and a strong willingness on the part of companies to make the transition, there are currently obstacles slowing down the necessary transition to biomethane. Two overarching problems need to be addressed:

- **The practical problem: Far too little biomethane is produced in Sweden.** With current policy instruments, Swedish biomethane production will increase from today's 2 TWh to around 4 TWh in 2028. That is not enough. The industrial sector's needs alone are expected to reach 10 TWh by 2030, which is estimated to constitute about half of Sweden's total biomethane needs at that timeⁱ. To meet the rapidly growing demand for biomethane, production must reach 10 TWh by 2030 and then continue to increase at a rapid pace. With Sweden's great biomethane potential, the starting point is excellent. However, achieving a fivefold increase in biomethane production within just five years is a major challenge that requires a completely new approach to Sweden's biomethane efforts.

In order to significantly increase biomethane production, current regulations need to be simplified, and policy instruments need to be more long-term. The Industry Biomethane Commission proposes a combination of measures that interact and have the potential to reinforce each other.

- **The economic problem: Weak incentives in basic industry slow down the transition.** As a result of policy instruments, there are currently economic incentives to switch to biomethane, particularly in the transport sector and smaller industries. For Swedish basic industries, the incentives are significantly weaker. The worst economic conditions for transition are found in chemical industries that need to replace fossil-based feedstocks with biomethane in the manufacture of chemical products. In the steel industry, too, the cost gap between biomethane and natural gas risks reducing companies' ability to transition.

Sweden needs to find a solution that accelerates the pace of transition without undermining the industries' global competitiveness. The Industry Biomethane Commission proposes targeted transition support in the form of an industrial CfD.



The Industry Biomethane Commission proposes measures for a significant increase in biomethane production

With the goal of Sweden producing at least 10 TWh of biomethane by 2030, the Industry Biomethane Commission proposes a combination of policy and practical measures here and now. Using a long-term perspective and removing regulatory barriers are important parts of this, as well as promoting large-scale production, realising the great potential of biomethane in agriculture and forestry, and commercialising new technologies.

Set the level of ambition with a target for biomethane production

- Decide on a national target of at least 10 TWh of biomethane to be produced in Sweden by 2030.

Create long-term stability by extending and strengthening current support

- Increase investment security – make it clear, with broad political support, that biomethane production premiums are long-term.
- Stimulate more large-scale biomethane projects – extend and strengthen *Klimatklivet*, and develop it so that investments in gas grid infrastructure can also receive investment support.



Streamline and increase the pace by removing regulatory barriers

- Make it easier and faster to build new biomethane production facilities in Sweden – ensure more efficient and faster permit processes.
- Remove uncertainty surrounding biomethane production from certain agricultural and forestry feedstocks – clarify which biomass is considered sustainable.
- Ensure efficient trade and distribution of biomethane – the mass balance principle should be applied in all relevant regulations to verify biomethane purchases when co-distributed with natural gas.
- Include biomethane production and gas infrastructure in regional energy and climate plans.

Implement Bioekonomiutredningen’s proposal on revenue guarantees

- Implement Bioekonomiutredningen’s (the Bioeconomy Commission’s) referred proposal on revenue guaranteesⁱⁱ, and ensure that biomethane and intermediate products that are further processed into biomethane are covered if other criteria are met.

Investigate new targets and measures for increased integration with Swedish agriculture

- Strengthen incentives for circular resource flows – develop targets for the use of recycled nutrients in Swedish agriculture and appropriate policy instruments to achieve the target.
- Investigate barriers and propose measures to remove them in order to better utilise agricultural biomass for sustainable biomethane production.

The Industry Biomethane Commission proposes a targeted transition support scheme (an industrial CfD)

Targeted transition support should be introduced to strengthen the industry’s economic conditions for switching to biomethane. The transition support should serve as a bridging solution that helps Swedish industry gain access to fossil-free feedstocks (biomethane) at a competitive price. The long-term solution is a combination of increased demand for fossil-free products and a reduction in the price difference between biomethane and fossil-based feedstocks. When we get there, Swedish industry will be a world leader in fossil-free materials and products.

Ensuring access to biomethane in Swedish industry is a strategic necessity – for the climate, the economy and security of supply.



1. Industrial transition requires biomethane

In the transition to a fossil-free society, it is not enough to transform the energy system. We must also phase out the fossil carbon atoms used as feedstocks in everything from medicines and clothing to appliances and mobile phones.

Swedish industry needs large amounts of biomethane in the material transition. Securing industrial access to biomethane is a strategic necessity – for the climate, for our security of supply and for the industry’s competitiveness in the global market.



Medicines, clothing, appliances, mobile phones and computers are examples of products that cannot be manufactured without carbon atoms as constituent building blocks of the material.

Without carbon – no materials

The element carbon is essential for life. All living organisms contain carbon. But it is not only life itself that is based on carbon. Almost all the products we use in our everyday lives are made up of carbon atoms: the glue in bookshelves, the steel beams in buildings, the paint on cars and the plastic in food packaging. Medicines, clothing, appliances, mobile phones and computers are further examples of products that cannot be manufactured without carbon atoms as building blocks for the material. Today, almost all of these carbon atoms come from fossil sources, such as oil, natural gas or metallurgical coal. In other words, the whole of society is dependent on the availability of carbon atoms.

Without fossil-free products – no fossil-free society

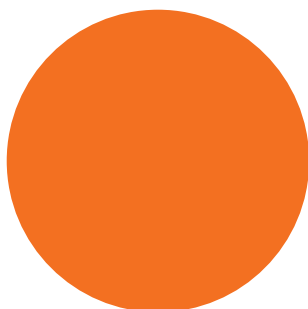
The EU Climate Lawⁱⁱⁱ sets a binding target for the Union to reduce carbon dioxide emissions by 55 per cent by 2030 and achieve climate neutrality by 2050. Sweden’s long-term climate goal is net zero emissions five years earlier, by 2045. This requires a transition from a fossil-based to a fossil-free society. The entire energy system needs to be transformed. But that is not enough. We also need to phase out the fossil carbon atoms used as feedstocks for materials and products.

From the Commission’s communication *Sustainable Carbon Cycles, COM(2021) 800*:

“Beyond decarbonising its energy system to be climate neutral by 2050, the EU will also need to rethink its sourcing of carbon as feedstock for industrial production. Fossil carbon should be replaced by more sustainable streams of recycled carbon from waste, sustainable biomass and directly from the atmosphere.”

Swedish industry wants transition – for the climate and competitiveness

Several large-scale projects are underway in Sweden with a focus on switching to fossil-free materials and products. Three examples are Perstorp’s Project Air for the production of fossil-free chemicals, SSAB’s development of fossil-free steel production and Högånäs’ ambition to be the first company in the world to offer completely fossil-free ceramic powders and metal powders. These are projects that can seriously change the global climate footprint. By capturing early market shares in new markets – with a focus on sustainable materials and business models – Swedish industry is also strengthening its competitiveness in the global market. In many other parts of the world, the focus is on price pressure on fossil-based products. Swedish industry, on the other hand, sees an opportunity to build a market for fossil-free products, where Swedish industry can be a strong competitor.





High demand for recycled and biogenic carbon

Electrification alone cannot solve the transition to fossil-free materials, as the carbon atoms themselves are needed. The alternatives to fossil carbon atoms are recycled carbon or biogenic carbon from sustainable biomass. Carbon is a valuable resource and competition for sustainable carbon will increase. While fossil fuels are being phased out, the global demand for carbon atoms for materials will more than double by 2050.^{iv}

Fossil-free products require biomethane

One of the important fossil-free feedstocks that industry is in great need of is biomethane. Biomethane contains valuable biogenic carbon. In some manufacturing processes, biomethane is the only realistic alternative to the fossil carbon used today. Biomethane can, for example, replace natural gas in industry without the need to change industrial processes. Biomethane can also be mixed with natural gas and co-distributed in the same infrastructure.

What is biogas and biomethane?

Biogas is a fully renewable raw material and fuel produced from biomass. Biogas consists mainly of methane (40–80 per cent) and carbon dioxide, as well as small amounts of water and other compounds.

The primary way to produce biogas is through digestion, where microorganisms break down organic material in an oxygen-free environment. Today, biomethane is mainly produced from sewage sludge, food waste, manure and various types of waste from the food industry.

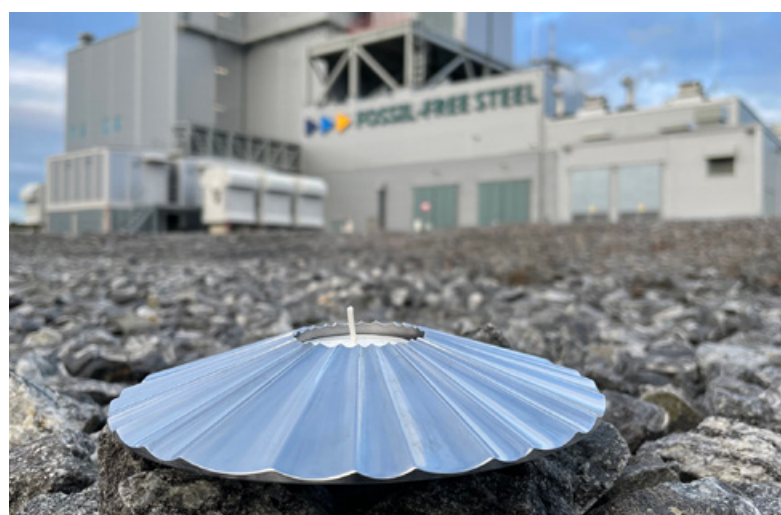
The biomethane plant also produces nutrient-rich digestate that can be used as fertiliser in agriculture, thereby replacing fossil-based artificial fertilisers. The digestate has a high organic matter content with stable carbon compounds, which contributes to better soil structure, water retention capacity and durable carbon sequestration in the soil.

Biogas/biomethane can also be produced from ligno-cellulose such as wood waste and forest residues, but this requires new technology such as gasification. Another way to produce renewable methane is to produce so-called e-methane. Hydrogen produced from electricity through electrolysis reacts with separated carbon dioxide to form methane.

To increase the energy content and achieve natural gas quality, the biogas is purified of carbon dioxide and other substances – a process known as upgrading. Upgraded biogas (biomethane) can directly replace natural gas and can be distributed together with natural gas.

Biomethane can also be cooled down to liquid form. Liquefied biogas (LBG) is significantly more energy-dense than gaseous biomethane and can therefore be transported more cost-effectively in the absence of a gas grid. Liquefied biogas can directly replace the use of liquefied natural gas (LNG), and can be distributed together with LNG by truck or ship.

The Industry Biomethane Commission focuses entirely on the need for biomethane of natural gas quality. This type of biogas is absolutely essential in order to meet the needs of industry. However, there are also other interesting technological options that are similar to, and can complement, the biomethane approach. One example is the production of biosyngas through the gasification of biomass residues. Direct use of biosyngas, without further processing, may be an interesting alternative for certain industrial processes where high-temperature heat is required.





The practical problem: Biomethane production in Sweden is far too low

Current biogas/biomethane production of just over 2 TWh is only a fraction of what will be needed. Industry demand alone is expected to reach 10 TWh by 2030, which is estimated to account for about half of Sweden’s total biomethane needs at that time.^v Sweden is in an excellent position to increase biomethane production, not least from sustainable biomass from agriculture and forestry. There are good conditions here for achieving the large-scale expansion required for industry to switch to biomethane. However, even though policy instruments to increase biomethane production exist today, they are insufficient to drive such a development. In Chapter 7, the Industry Biomethane Commission proposes a combination of measures aimed at significantly ramping up Swedish biomethane production.

The long-term solution for weak incentives is a combination of increased demand for fossil-free products and a reduction in the price difference between biomethane and fossil-based feedstocks.

Targeted transition support is needed as a bridging solution for necessary investments here and now.

The economic problem: Weak incentives in the basic industries slow down the transition

As a result of policy instruments, there are now economic incentives to switch to biomethane, particularly in the transport sector and smaller industries. For Swedish basic industries, the incentives are significantly weaker. The chemical industry, which needs to replace fossil-based feedstocks with biomethane in the manufacture of chemicals, has the poorest economic conditions for transition. There are simply no financial incentives for the transformation of this sector, nor are there any new policy instruments that are expected to increase incentives in the foreseeable future. In the steel industry, too, the cost gap between biomethane and natural gas risks reducing companies’ ability to transition.

This problem (described in Chapter 2) risks slowing down the transition to fossil-free materials and products. Sweden needs to find a solution that increases the pace of the transition without undermining the industry’s global competitiveness. The long-term solution is a combination of increased demand for fossil-free products and a reduction in the price difference between biomethane and fossil-based feedstocks. We are not there yet. In Chapter 8, the Industry Biomethane Commission therefore proposes targeted transition support as a bridging solution for necessary investments here and now.

Sweden benefits from Swedish industry having access to biomethane

The company that can be among the first to bring fossil-free, high-quality products on the market at a reasonable price will be in a strong position. When industry gains access to biomethane at a competitive price, the national climate targets can be achieved while maintaining the competitiveness of Swedish industry. The climate transition will be an engine of growth for Sweden. Jobs and welfare will be secured. At the same time, security of supply will be strengthened. Domestic biomethane production will increase our resilience and make Sweden less dependent on imports, not least in the event of a crisis or war. Ensuring access to biomethane at a competitive price for Swedish industry is a strategic necessity – for the climate, the economy and security of supply.

The companies in the Industry Biomethane Commission account for a significant part of Sweden’s exports and employ thousands of people in Sweden.

In total, Swedish industry accounts for around 20 per cent of Sweden’s GDP and around 16 per cent of the country’s employment.^{vi}

Examples of Swedish companies with a significant need for biomethane



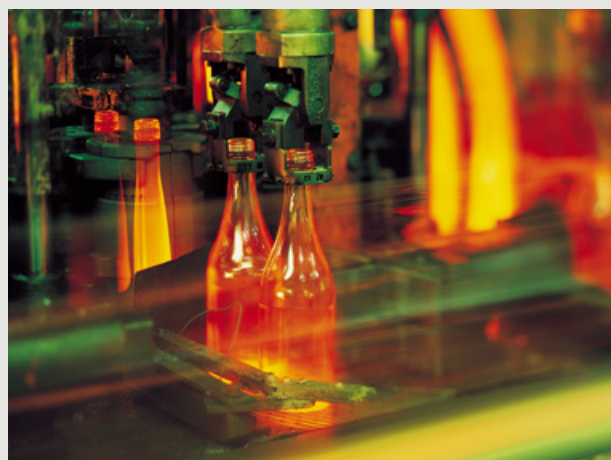
Perstorp

Perstorp manufactures chemical products that are primarily used by other industries as part of advanced materials, surface treatments and chemical lubricants. Perstorp's chemical products are found around the world in furniture, cars, buildings, paint and more. Production is currently almost entirely dependent on natural gas and fossil methanol.

“Our products are mostly made from natural gas and methanol. To manufacture these products fossil-free in Europe, we therefore need to replace 1.5 TWh of natural gas and 200,000 tonnes of fossil methanol used today. This is a huge challenge – but one that Perstorp is determined to succeed in,” says **Anna Berggren**, Vice President Sustainability, Perstorp.

Perstorp has already begun the transition and has launched an increasing number of fossil-free chemical products since 2010. The next step in the transition is to replace today's need for 200,000 tonnes of fossil methanol with sustainable methanol. Through Project Air, the sustainable methanol will be produced from biomethane and captured carbon dioxide in combination with fossil-free hydrogen. In order to produce sustainable methanol and replace all natural gas in other processes as well, a total of 3 TWh of biomethane per year would be required from 2030 onwards. If the plans become reality, Perstorp will reduce its climate emissions by 500,000 tonnes per year, which is equivalent to the emissions from domestic flights in Sweden.

“There are currently few or no incentives for the chemical industry to switch feedstocks and break its dependence on fossil fuels. Therefore, new, powerful policies are needed to increase biomethane production and support the chemical industry in its transition to biomethane,” says **Adam Kanne**, Vice President Public Affairs, Perstorp.



Höganäs

Höganäs is a world leader in the production of advanced ceramic and metal powders, and is driven by its vision to lead positive change through material innovation. More than half of all powder production takes place in Höganäs and Halmstad, Sweden. Metal powders are used in the manufacture of various metal components such as vehicles, gearboxes and sewing machines, as well as in applications such as high-strength surface coatings and flame spraying powders.

“Our ambition is to be the first company in the world to offer completely fossil-free metal and ceramic powders and to achieve net-zero emissions across our entire business by 2037. To succeed, the large amount of natural gas currently used in our processes must be replaced with biomethane,” says **Catharina Nordeman**, Global Sustainability Director, Höganäs.

In some processes, it is the carbon atom itself that is required and not just the energy. In others, the temperatures are so high that electrification is not an option, and in yet others, combustion is required.

“Höganäs has begun its transition to fossil-free operations. If our processes are to be converted, biomethane is currently the only known alternative. Already, 30 per cent of natural gas has been replaced with biomethane, but more than 300 GWh per year will be replaced,” says **Magnus Pettersson**, Energy Coordinator, Höganäs.

The challenge is that competition for available biomethane on the market is intense and prices can be very high. Unless the supply of biomethane increases, the entire transition of Höganäs' production, which has already been planned and initiated, will be jeopardised.



SSAB

SSAB is a global steel company and a world leader in high-strength steel and related services. Production takes place in Sweden, Finland and the United States, with an annual capacity of approximately 9 million tonnes of steel.

With a vision of contributing to a stronger, lighter and more sustainable world, SSAB's aim is to basically remove carbon dioxide emissions from its own operations. Investment decisions have been made to phase out blast furnace technology completely from production in Sweden.

"This is a huge transformation of our business, and it will eliminate 10 per cent of Sweden's total emissions," says Tomas Hirsch, Energy Director at SSAB.

SSAB is revolutionising steel production with two unique types of steels that produce virtually zero fossil carbon emissions. One is SSAB Fossil-free™ steel. It is produced using the revolutionary HYBRIT® technology, which replaces coal in the reduction of iron ore with hydrogen. The other is SSAB Zero, a steel made from recycled steel. Both technologies require fossil-free electricity and biomethane in the production. The result of using them is that fossil carbon dioxide emissions are eliminated.

Biomethane is needed in the processing of steel, where very high temperatures – over 1,000 °C – must be reached in a short period of time. In these parts of production, direct electrification is usually not an option.

"The production of SSAB Fossil Free and SSAB Zero using fossil-free electricity and biomethane means virtually zero emissions throughout steel production by 2030. And that's without using mass balance allocation or emission allowances," concludes Tomas Hirsch.



IKEA

IKEA is a well-known furniture company with operations all over the world. IKEA's vision of creating a better everyday life for the many people has, in the wake of climate change, been interpreted as making sustainable living affordable and accessible to the many people.

"If many people cannot afford sustainable products, there is a risk that they will turn to competitors with a larger proportion of fossil-based products in their range. That is not a path that leads to reduced climate impact for anyone," says Thina Georgsson, Material and Innovation Developer, IKEA Supply Services.

The goal is to reduce the carbon footprint of all IKEA operations by 50 per cent by 2030, including the manufacture of feedstocks and products. The transition has already begun. Since 2016, emissions have been reduced by over 25 per cent by switching to renewable energy in production facilities, logistics centres, transport and department stores.

The next step is to minimise carbon dioxide emissions from the production of the materials used in IKEA's products. These are more difficult to address. In 2016, materials accounted for half of IKEA's total carbon footprint, and this share has not decreased at the same rate as emissions from other parts of the business. The glue in the chipboard used in IKEA's furniture accounts for 5 per cent of IKEA's total carbon footprint. This is because it is made from methanol and urea, both of which are produced from natural gas.

"In order to offer fossil-free wooden furniture, the natural gas used in chemical production needs to be replaced with biomethane. Access to biomethane is therefore an important part of IKEA's work to reduce its carbon footprint," adds Thina Georgsson.

2. Weak incentives slow down the transition to fossil-free materials



The transition to fossil-free materials must begin here and now. It is crucial for climate change mitigation and for Swedish competitiveness and security of supply.

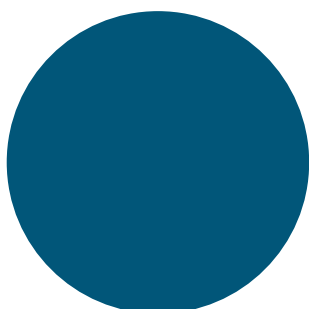
Scaling up domestic biomethane production is a very important step along the way, but it is not enough. Swedish industry needs the economic conditions to transition to biomethane while maintaining its competitiveness. For parts of industry – especially when switching from fossil-based feedstocks – the current economic incentives are far too weak.

Politics creates economic incentives for transition

Based on politically agreed climate targets, politicians in Sweden and the EU are creating economic incentives for companies and individuals to switch from fossil fuels to fossil-free alternatives. This is being done with the help of various policy instruments. One example is the EU's emissions trading system, which means that more and more companies have to pay more for their climate emissions. For certain areas of use, gradually increased taxes are applied to fossil fuel alternatives. In other sectors, there are quota obligations that require a growing proportion of companies' sales to consist of sustainable products, otherwise a fee must be paid.

Incentives to switch?

There are many factors that influence a company's financial incentives to transition. These include the types of products the company sells and where its customers and competitors are located in the world. The conditions vary between different companies. In this chapter, we have chosen to focus on policy-driven incentives, where similarities can be found for companies with similar operations.



Different economic conditions in different industries

As a result of the design and scope of the policy instruments, the politically created incentives are stronger in some areas of application and weaker in others. This affects the ability of actors to pay for biomethane and its sustainability characteristics. In industries where the economic incentives are strongest, a payment capacity is created that cannot be matched by industries with weaker incentives. The industry with the strongest incentives becomes the price setter. The result is that the transition to biomethane is gaining momentum in certain industries, while others have limited financial opportunities to switch to biomethane. In general, road transport and smaller industries, including the food industry, have so far had the best economic conditions for transition. This is illustrated in Figure 1.

Worst economic conditions for switching feedstocks

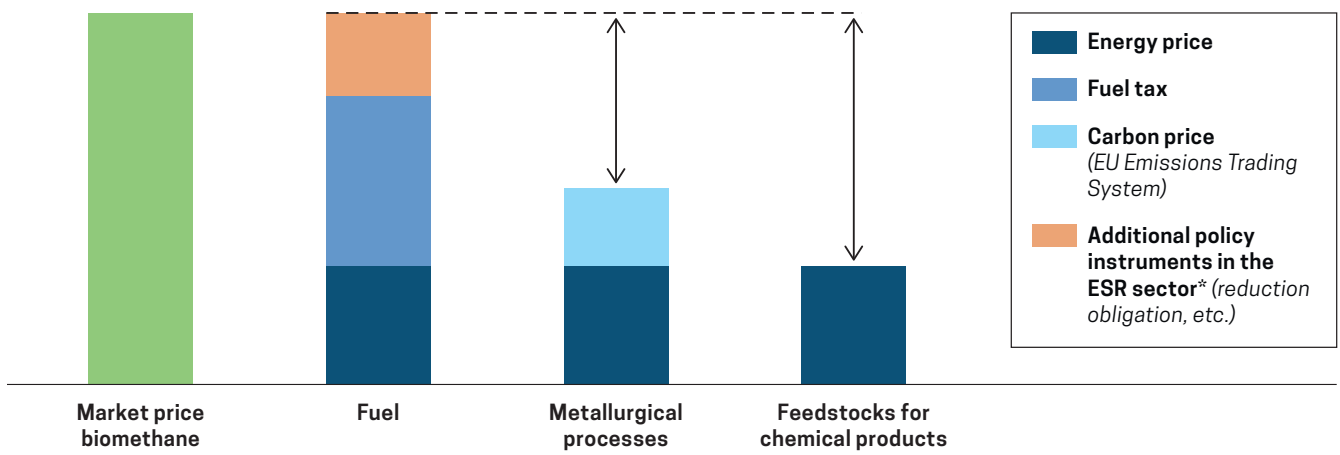
The incentives to switch to biomethane are weakest when fossil-based feedstocks for chemicals and materials are to be replaced. Here, the gap between companies' ability to pay and the market price of biomethane is too large (see Figure 1). There is simply no economic incentive for this sector to switch, nor are there any new policy instruments that are expected to increase incentives in the foreseeable future. Although the chemical industry, like the steel industry, is included in the EU's emissions trading scheme, companies do not pay any emission allowances for the carbon that becomes the building blocks of chemicals and materials, as the carbon is stored in the material itself and does not lead to any emissions during manufacture. Taking plastic as an example, climate emissions only occur when fossil-based plastic is incinerated in the electricity and district heating sectors. The EU's emissions trading system therefore creates no economic incentives for industries to replace fossil-based feedstocks with biomethane.



Economic challenges also in metallurgical processes

Also, in other areas of use – such as when biomethane replaces natural gas in metallurgical processes – the cost gap between biomethane and natural gas risks reducing companies' competitiveness and thus their ability to transition. In this sector, the cost gap will certainly narrow as emissions trading drives up the price, but the Swedish steel industry competes in a global market. If the steel industry in Sweden and the EU is to remain competitive, conditions must not deviate too much from those of competitors outside the EU.

Figure 1: As a result of the design and scope of the policy instruments, the policy incentives are stronger in some areas of use and weaker in others. The industry with the strongest incentives becomes the price setter.



* ESR emissions are regulated by the EU Effort Sharing Regulation (ESR). The ESR sector mainly includes road transport, agriculture, buildings, waste and small industries.



It is important to seek a solution that does not undermine the competitiveness of the industrial sector

The uneven playing field described in this chapter is a real problem that is effectively slowing down the transition to fossil-free materials. This is particularly true for companies whose transition requires biomethane as a raw material for chemicals and products. Sweden needs to find a solution that promotes transition without undermining the global competitiveness of companies. If companies shut down their Swedish operations or move them to countries with cheaper feedstocks, the Swedish economy and welfare system will be the biggest losers. Therefore, the solution does not lie solely in introducing national or European policy instruments that increase the cost of fossil-based feedstocks. It needs to be combined with measures that strengthen global demand for fossil-free materials and products. The Industry Biomethane Commission would like to see political measures taken to strengthen that demand, both at EU level and globally. But that will take time, and we simply do not have much time for the transition.

The solution for Sweden is targeted transition support

Weakening or removing the policy instruments that create pressure for change in other sectors is not a solution. It would hinder efforts to reach climate targets and slow down the expansion of new biomethane production. What is needed to level the play-

ing field for the various sectors is instead targeted transition support that focuses on industrial sectors with the poorest economic conditions for transition. In Chapter 8, the Industry Biomethane Commission presents proposals on how such support could be designed. The transition support could be designed as production support to further strengthen the biomethane production, but it should in that case be a prerequisite that the biomethane being used in industrial activities that have the worst economic conditions for switching to biomethane. The details of how this distinction should be made need to be investigated.

The transition support should be a bridging solution

The transition support should be long-term enough to drive investment, but it should also be time limited. The long-term solution is a combination of increased demand for fossil-free products and price levels for biomethane and fossil-based feedstocks converging. We are not there yet, but when we get there, Swedish industry can be a world leader in fossil-free materials and products. The transition support should serve as a bridging solution that helps Swedish industry gain access to fossil-free feedstocks (biomethane) at a competitive price. Together, industry and government can thus ensure that investments in fossil-free materials and products can be made here and now. With economies of scale achieved, the hope is that competitive prices for biomethane will eventually be reached without government support.

3. Sweden needs to produce much more biomethane

To meet industries' and society's need for biomethane, Swedish biomethane production must at least increase fivefold to 10 TWh by 2030.^{vii} This is a rapid increase, but it still only corresponds to half of the total biomethane demand in the same year.

Securing access to biomethane in Swedish industry is a strategic necessity – for the climate, for the economy and for our security of supply. But it is also an enormous challenge that requires a completely new approach to Swedish biomethane investment. It requires a politically decided production target for Swedish biomethane.

The need is 20 TWh by 2030

In Sweden, total demand for biomethane is estimated to reach around 20 TWh by 2030. Around 10 TWh is expected to be used in industry, of which 6 TWh will be used as raw material and input in the chemical and steel industries. Current biogas/biomethane production of just over 2 TWh, with roughly the same amount of biomethane imports, corresponds to only a fraction of the demand in 2030.

Swedish biomethane production is increasing far too slowly

The increase in Swedish biomethane production has been modest so far. With current policy instruments, there are plans and investment decisions that correspond to a doubling of current production in the coming years, to around 4 TWh by 2028. This is a big and important step forward, but it is not enough.

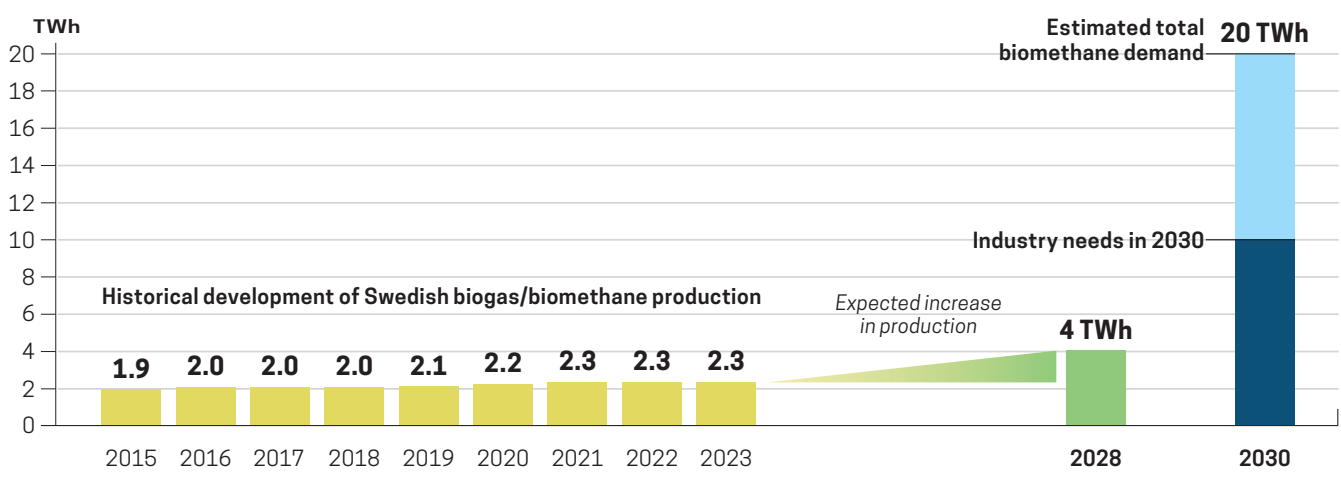
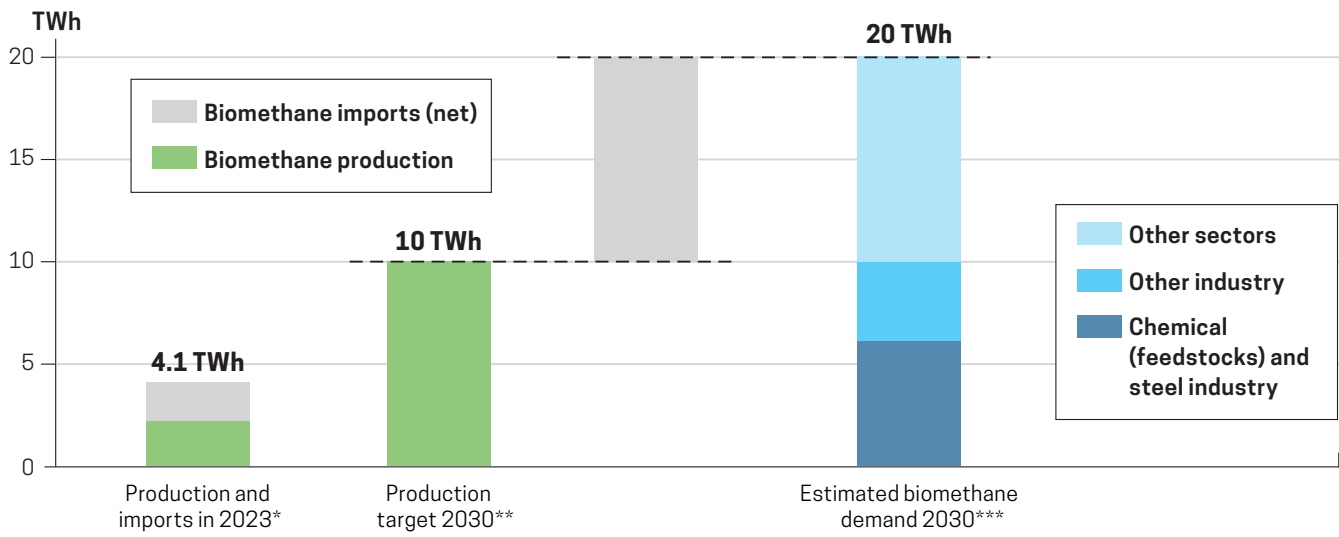


Figure 2: Biogas/Biomethane production in Sweden 2015–2023 and expected production increase to around 2028. The increase in production is far too slow in relation to expected demand in 2030. Source: Swedish Gas Association.



* *Produktion av biogas och rötresterna och dess användning år 2023* (Production of biomethane and digestate and its use in 2023), Swedish Gas Association, 2024

** Industry Biomethane Commission's proposed production targets

*** *Gasbranschens uppgraderade färdplan för fossilfri konkurrenskraft* (The gas industries' updated roadmap for fossil-free competitiveness), Swedish Gas Association, 2024

Sweden needs a national target: 10 TWh biomethane by 2030

To meet the rapidly growing demand for biomethane, biomethane production must at least increase fivefold to 10 TWh by 2030. This is a rapid and challenging increase, but it is necessary and in line with several previous assessments and the EU's target. As early as 2019, Biogasmarknadsutredningen (the Biogas Market Inquiry) proposed that Sweden set a production target of 10 TWh of biogas/biomethane by 2030.^{viii}

Even with such a large increase in production, extensive imports will be required alongside domestic production (Figure 3). After 2030, production will need to continue to rapidly increase to meet the sharp rise in demand. In this way, Sweden can meet the needs of industry and society for biomethane while gradually achieving a higher degree of self-sufficiency.

Sweden has excellent conditions for increasing biomethane production (see Chapter 4). Despite this, it is a major challenge to achieve a fivefold production increase in 5 years. This requires a completely new approach to Swedish biomethane investment, shifting the focus to large-scale production from new substrates and using new technologies. It requires long-term policy decisions so that stakeholders dare to make the necessary investments. It requires a politically decided production target for Swedish biomethane.

The EU has ambitious targets for increased biomethane production: 350 TWh by 2030

In 2022, the European Commission presented its plan for how the EU will become independent of fossil fuels from Russia by 2030. The REPowerEU Plan^{ix} includes an ambitious production target for biomethane. By 2030, at least 350 TWh of biomethane should be produced in the EU, which means a tenfold increase in a decade.

Figure 3: Sweden's total biomethane demand by 2030 is almost ten times greater than current production. With a production target of 10 TWh by 2030, as proposed by the Industry Biomethane Commission, extensive biomethane imports will still be required to meet demand.

In five years, between 2018 and 2023, the EU has increased its production of biomethane by almost 140 per cent. This can be compared to an increase of just under 20 per cent in Sweden during the same period. Although Sweden is a pioneer in biomethane technology, we lag far behind other EU countries when it comes to increasing our own biomethane production. Our neighbour Denmark is one of the countries that has been successful in this regard. In Denmark, biomethane production increased by 270 per cent in the period 2018–2023 (from 2 TWh to just over 7 TWh).^x

A Swedish target of 10 TWh is in line with the EU's target of 350 TWh

Sweden accounts for around 3 per cent of the total biomethane potential in the EU.^{xi} If this were to be converted into a share of the EU's target of 350 TWh, it would correspond to Swedish production of 11 TWh of biomethane by 2030. It is therefore fully in line with the EU's production target that Sweden – which, compared to many other countries, also has a relatively mature biomethane market – decides on a national 2030 target of at least 10 TWh of biomethane production.

There is no plan for how Sweden will contribute to the EU's biomethane target

Member States are required to show how national policies contribute to the EU's common energy and climate targets in national energy and climate plans. In addition to the targets in the Renewable Energy Directive^{xii}, Member States are encouraged to show how they intend to contribute to the targets in the REPowerEU Plan. Sweden has still not described how it will contribute to the EU's biomethane targets. Nor has any national target been quantified.

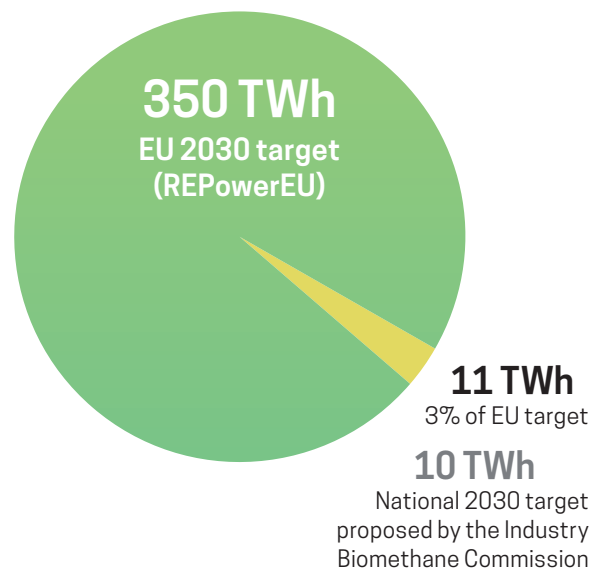
Biomethane as a strategic resource for strengthening Sweden's security of supply

More than three years after Russia's full-scale invasion of Ukraine, Europe faces a harsh geopolitical reality. Gas supply is important for the EU's security and total defence. Industry depends on gas for its production, and a stable gas supply is crucial regardless of the geopolitical situation. Today, most of the gas used in Sweden is imported, and total demand for biomethane is expected to increase from 4 TWh to around 20 TWh by 2030. Sweden has the potential to produce the amount of biomethane demanded by the market, but current production only covers half of current needs. A significant increase in domestic biomethane production is a strategic necessity – not only for the climate and the economy, but also for Sweden's national security.

Biomethane for a more secure supply of feedstocks, energy and food

Biomethane is a unique asset for society – more important now than ever. Domestic biomethane production increases our resilience and makes us less dependent on uncertain supplies from abroad, especially in the event of a crisis or war. Biomethane contributes to a climate-neutral, circular and domestic supply of feedstocks and energy. Increased biomethane production also has the advantage of increasing the availability of bio-fertilizer, which strengthens security of supply in the food sector. The need for imported mineral fertiliser is reduced, and Swedish agriculture becomes less exposed to the fluctuating international price of mineral fertiliser.

Sweden accounts for 3% of the biomethane potential in the EU*



* European Biogas Association, Guidehouse (2024)

Figure 4: EU's joint biomethane production target is 350 TWh in 2030. Sweden accounts for 3 per cent of the biomethane potential in the EU, which corresponds to 11 TWh. The Industry Biomethane Commission's proposed national target of 10 TWh is thus in line with Sweden's share of the estimated potential in the EU.

"Today's gas supply system is built for a different reality than the one we see right now, and we must now work together to create a modern and more robust system."

Karl Björklund

Head of Unit, Secure Energy Supply,
Swedish Energy Agency

"The most important way to ensure long-term security of gas supply is to increase Swedish biomethane production and feed it into the gas grid, and to achieve production that matches consumption."

Carolina Wistén

Customer & Marketing Manager,
Nordion Energi

"A significant increase in production capacity in Sweden would make us considerably more resilient in the event of a crisis or war. It would also make us more flexible. Biomethane can be used for other essential purposes than industrial production when needed."

Adam Kanne

Vice President & Head of Public Affairs, Perstorp

"If Sweden wants to build robust crisis preparedness, and at the same time transition to a fossil-free Sweden, the biomethane issue needs to be prioritised. It is about strengthening the competitiveness of industry, reducing our climate footprint and building Sweden's resilience in a time of growing uncertainty."

Maria Malmkvist

CEO, Swedish Gas Association

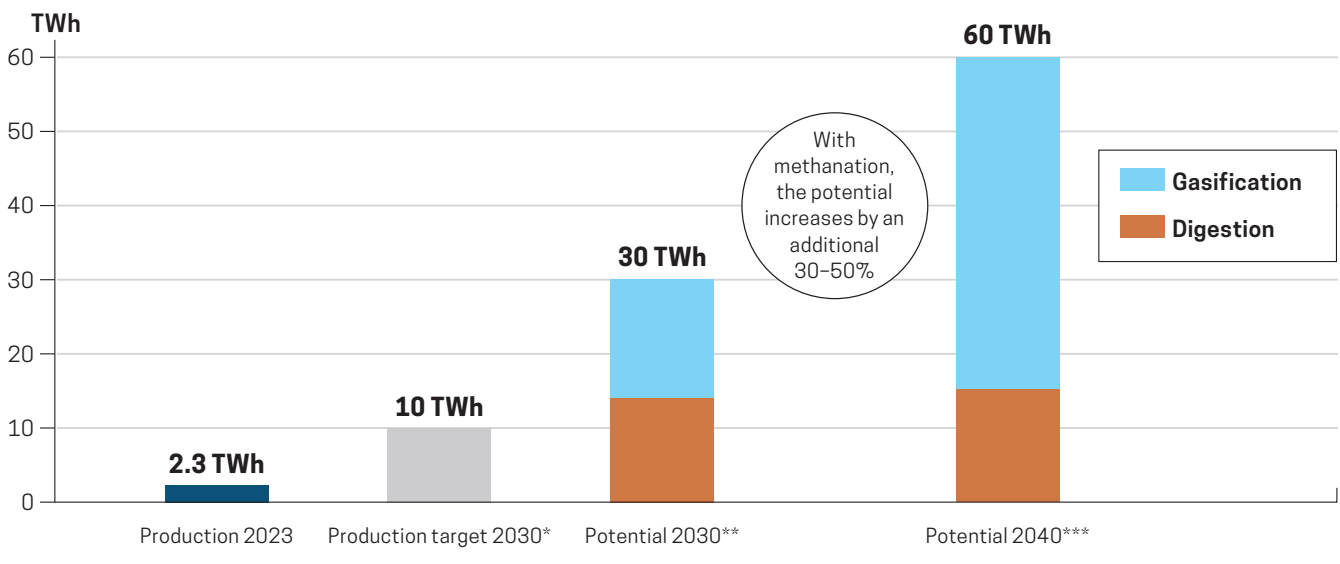
4. Great potential for increased biomethane production



Increasing biomethane production fivefold in five years is a huge challenge, but it is also entirely achievable in a country like Sweden. There is great untapped potential to produce much more biomethane from waste and residual products and from sustainable biomass from agriculture and forestry. Sweden is in an excellent position to significantly increase biomethane production.

Excellent starting point for a significant increase in biomethane production

The approximately 2 TWh of biomethane produced in Sweden today represents only a fraction of our country’s enormous biomethane potential. Sweden has the potential to produce at least **30 TWh of biomethane** from available waste and residual products, as well as sustainable biomass from agriculture and forestry. This was confirmed by the Government’s inquiry *Biogasmarknadsutredningen*^{xiii}, which included several studies of potential with a 2030 perspective. A major European study has calculated the biomethane potential country by country throughout the EU, with a slightly longer perspective to 2040. For Sweden, a potential of **60 TWh of biomethane** is indicated here. Sweden is identified as the EU country with the greatest potential for producing biomethane through the gasification of wood waste and forestry residues.^{xiv}



* Industry Biomethane Commission's proposed production targets
 ** Biogasmarknadsutredningen (Biogas Market Inquiry), SOU 2019:63 (2019)
 *** European Biogas Association, Guidehouse (2024)

Figure 5: There is enough sustainable raw material available in Sweden to multiply biogas/biomethane production in Sweden. This is shown by several studies of potential. In addition to this, additional biomethane can be produced through the methanation of carbon dioxide.



Scaling up Swedish biomethane production – with a broader raw material base and new technologies

Figure 6 (on the next page) and the text below describe how biomethane production can increase to at least 10 TWh by 2030, and then further to 30 TWh during the 2030s. Biomethane production in Sweden can be doubled through increased collection and digestion of today's substrates, but for larger volumes, the raw material base needs to be broadened. The really big potential lies in wood waste and forest residues, but this raw material requires the commercialisation of new technologies. Methanation of captured carbon dioxide also offers the possibility of increasing biomethane production by a further 30–50 per cent.^{xv}

In order to succeed in a fivefold increase of biomethane production by 2030, it needs to become more large-scale. The development we are beginning to see with new collaborations – where, for example, a number of farmers join forces and build large-scale biomethane plants together with biomethane producers – is the way forward.

Step 1: Doubled production through increased digestion of existing substrates

Swedish biomethane is currently produced by anaerobic digestion of various types of waste and residual products from households, the food sector and agriculture. Biomethane production can be more than doubled simply by increasing the collection and digestion of current substrates such as food waste and manure. Investment decisions have already been made to build several new, relatively large facilities of this kind. There are currently concrete plans for new, larger-scale biomethane production that will double current biomethane production over the next 2–3 years.

Step 2: Digestion of new substrates from agriculture can produce much more biomethane

Production can be further increased by utilising more types of substrates. There is great potential in straw, grass, intermediate crops and other sustainable¹ biomass from agriculture, but also in park and garden waste. However, newer substrates such as these may require some development of pre-treatment and digestion processes. Such development is already underway: for example, straw is now being digested on a commercial basis in Denmark. The development of biorefineries where biomethane is one of several products can increase biomethane production without requiring additional land or biomass. One example^{xvi} of an interesting concept with great potential is industrial protein extraction from legumes or ley crops, where the residual product is used for the production of biomethane and plant nutrients. Intensification of agriculture, through the cultivation of intermediate crops in combination with biomethane production, can also yield significant volumes of biomethane.

Step 3: Large volumes of biomethane from forest residues using new technology

The greatest potential for biomethane production in Sweden lies in residual products from forestry and the forest industry, but also from wood waste, for example. We have the best conditions for this in the entire EU. However, this requires the commercialisation of new technologies, such as thermal gasification with biomethane as the end product. There is an opportunity here to establish truly large-scale facilities with the capacity to produce 1–2 TWh of biomethane per year. Sweden is at the forefront of gasification technology, and biomethane has been produced in both pilot and demonstration facilities. There is unique expertise here that gives Sweden a competitive advantage when the technology is commercialised globally.

1 Biomass that is sustainable according to the sustainability criteria of the Renewable Energy Directive, including so-called Low-ILUC biomass. This refers to energy crops and other biomass from agriculture that is not expected to lead to other agricultural production being displaced, which in the long term can lead to indirect greenhouse gas emissions. ILUC stands for Indirect Land Use Change.

Achievable development towards 10 TWh biomethane production



Conditions

Many small biogas plants – often without upgrading. Few installations are connected to gas grids and there are only a few liquefaction plants. Carbon dioxide that is captured is not utilised. Low degree of standardisation and many, often local, players in markets.

Conditions

Several new large co-digestion plants (> 100 GWh/year) in operation and liquefaction enable the expansion of existing plants. More large plants are connected to the gas grid. Product development of digestate into more fertiliser products.

Conditions

Increased collaboration between farmers, waste management companies, biomethane producers and gas customers creates many new large-scale biomethane plants. These are connected to gas grids or produce liquefied biogas (LBG). Biomethane production becomes part of new industrial biorefinery concepts. The digestate is used for precision fertilisation and the market for soil carbon storage has started. New installations are being prepared for carbon dioxide methanation.

Conditions

The gas grids have been expanded, and large-scale liquefaction is also taking place at the gas grids. Most small-scale plants use liquefaction. There are standardized large-scale installations also for more advanced substrates. High value creation of all residues in advanced biorefineries. New technologies such as gasification and methanation have been commercialised and different technologies are combined.

Expanded
biomethane production
in the long term

30 TWh

- The potential of current substrates is fully exploited
- Most agricultural residues are digested or gasified
- Widespread use of ley crops, intermediate crops and other sustainable agricultural crops
- Extensive large-scale gasification of forest residues and wood waste
- Methanation of carbon dioxide is standard in new plants

Conditions

High efficiency biorefinery concepts are standard where biomethane is one of several high-quality products. New actors produce biomethane and cross-sectoral collaborations provide new opportunities. Large market for recycled coal and carbon sequestration.

Figure 6: Swedish biomethane production can be increased through increased collection of existing substrates. However, in order to achieve larger volumes, a broader raw material base and new production techniques are required.

More biomethane with methanation

When biomethane is produced, carbon dioxide is also formed. Today, carbon dioxide is usually released into the atmosphere without being utilised. However, there are techniques for allowing the carbon dioxide to react with renewable hydrogen, thereby producing even more biomethane from the same amount of organic material. This is called methanation. The hydrogen is produced using electricity in an electrolyser. The biomethane that is produced from carbon dioxide and hydrogen is called e-methane.

With methanation, a plant can increase its biomethane production by at least 30–50 per cent^{xvii} without having to add additional organic material. This means that an estimated biomethane potential of 30 TWh actually represents a potential of at least 40 TWh of biomethane. Demonstrations of methanation are underway in several places and the technology is close to commercialisation.

However, it is difficult to make methanation economically viable today, mainly due to the high cost of hydrogen. Market developments for hydrogen and electrolysers will be crucial for the technology's impact. It is also important that the production of e-methane is eligible for support in the same way as other biomethane production.

5. Developed infrastructure enables large-scale production

Gas infrastructure is a prerequisite for the transition to biomethane. There is great potential to produce much more biomethane in Sweden, and it is necessary to do it on a large scale. There is also a high demand for biomethane from users who are transitioning from fossil fuels to fossil-free fuels.

For this reason, it is important that the infrastructure is in place. The infrastructure ensures the delivery of biomethane, from producer to user. To a large extent, the gas infrastructure already exists today – both gas grids and distribution systems for liquefied gas – which ensures efficient distribution of biomethane.

Make maximum use of existing gas infrastructure

A well-developed gas infrastructure is a basic prerequisite for increasing biomethane production and enabling biomethane to reach industry. There are currently regulated gas grids on the west coast and in the Stockholm area. In addition, there are a number of local biomethane grids that supply industries and filling stations with biomethane.

First and foremost, existing gas infrastructure must be utilised as far as possible – both through existing gas grids and in the infrastructure for liquefied gas. Natural gas has paved the way by bearing the costs of expanding gas grids, terminals and storage capacity. Obviously, these investments should be utilised – there should be no parallel systems for biomethane. Co-distribution with natural gas in shared infrastructure, where the proportion of biomethane gradually increases, is the way forward. It is therefore crucial that there is an effective and credible system for verifying biomethane purchases in co-distribution with natural gas, based on mass balance and applicable in all relevant regulations.

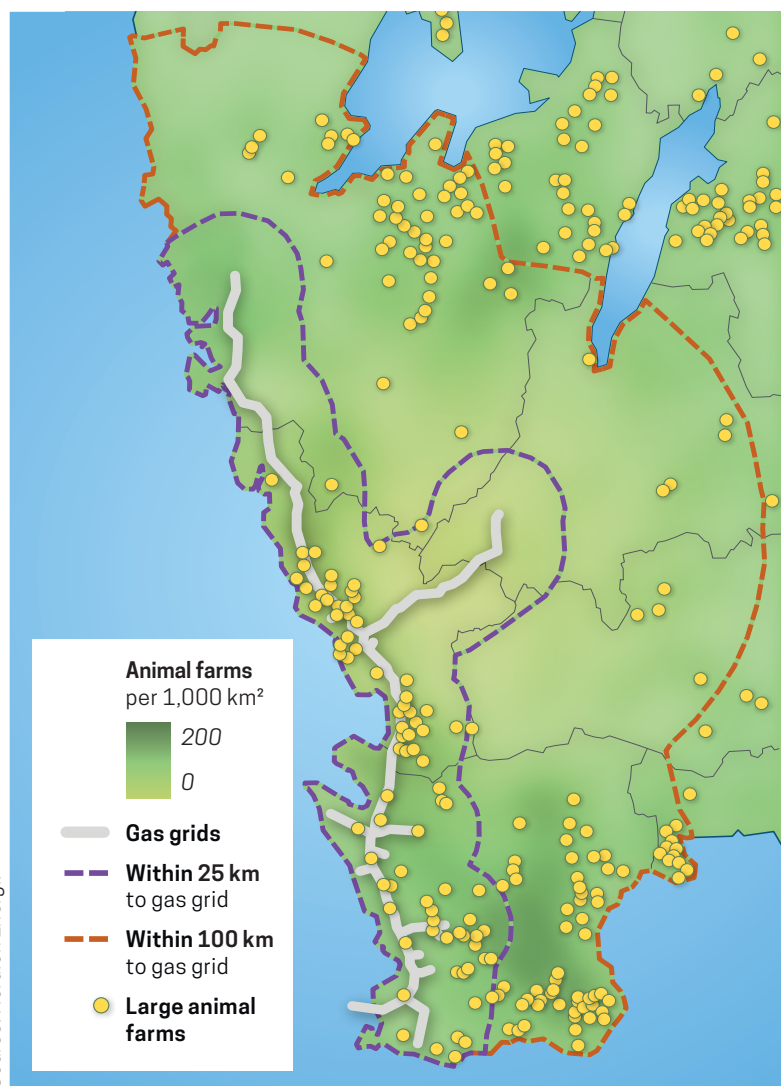
The existing gas infrastructure is well utilised but has the potential to transport and distribute larger quantities of gas to users, regardless of whether they are connected to a gas grid or not. The western Swedish gas grid supplies 33 municipalities and several combined heat and power plants and industries with gas, and plays a central role in enabling the use of biomethane in Sweden. There is also a well-developed infrastructure for the distribution of biomethane outside the grids. At present, the volumes distributed on the gas grid are roughly the same as those distributed outside it.

Figure 7: There is a good supply of substrates for biomethane production in south-western Sweden. As shown on the map, there are areas with many livestock farms with high biomethane potential from manure within reasonable distance from the western Swedish gas grid. Expanding the gas grid to some of these areas could be an opportunity to enable more large-scale biomethane production and increase feed-in to the gas grid. This could complement the expansion of liquefied biogas plants that is underway and planned around Sweden where there is no proximity to the gas grid.

Investments in new gas infrastructure provide the conditions for more large-scale biomethane production

However, investments are needed to develop, expand and supplement existing gas infrastructure. This is necessary for several reasons. It is crucial in order for the increased demand for biomethane to reach users in a cost-effective manner, but also to create conditions for increased domestic production. It is also necessary to strengthen security of supply and preparedness.

Biomethane production needs to become more large-scale, and the biomethane should be fed into a gas grid, or liquefied and distributed to customers as liquefied biogas. Expanding existing gas grids will create the conditions for establishing large-scale biomethane production, which can then effectively reach customers in a large market through the gas grid. Investments also need to be made in liquefaction plants and other infrastructure for liquefied biogas connected to the gas grids. In this way, biomethane fed into the gas grid can also





Gasum's new plant in Götene, which will produce 120 GWh of liquefied biogas per year, mainly from manure.

reach important users outside the gas grids without each producer having to invest in their own liquefaction plant. Connecting the gas grid to the distribution system for liquefied gas strengthens the redundancy and readiness of the gas supply.

There are already plans in place for new gas infrastructure. One example is Nordion Energi's planned liquefaction plant in Gothenburg, which is connected to the gas grid. An investment decision has been made for a plant that will be able to produce 250 GWh of liquefied biogas per year from biomethane fed into the gas grid. This plant will improve the conditions for expanding the gas grid to connect new production. As a result of this investment, St1 Biokraft and Nordion Energi are now working together to see if St1 Biokraft's planned plant in Perstorp, which would produce 130 GWh of liquefied biogas per year, can now be connected to the gas grid by expanding it to Perstorp. This way, the biomethane can reach both customers connected to the gas grid and customers outside the gas grid through Nordion Energi's upcoming liquefaction plant. Such cooperation facilitates large-scale biomethane production by contributing to greater flexibility and cost-effectiveness, while improving preparedness and security of supply on the gas grid in the long term.

Another similar example can be found in Stockholm, where the Stockholm gas grid is currently being connected to St1 Biokraft's newly built liquefaction plant in Huddinge. A number of connected biomethane plants in Stockholm can thus reach customers in a broader market while ensuring long-term security of supply in the gas grid.

Distribution of liquefied biogas enables large-scale biomethane production throughout Sweden

Large parts of Sweden lack access to gas grids. In such cases, liquefied biogas is the way forward for achieving large-scale biomethane production. There is currently a well-functioning infrastructure and distribution system for liquefied biogas. However, further investment is needed in liquefaction plants, storage and distribution of liquefied biogas around the country if the full potential of biomethane is to be realised. Expanded infrastructure for liquefied gas creates good conditions for the establishment of larger biomethane plants through collaboration between farmers, forestry companies, waste companies and biomethane producers. This is the way forward to achieve the large scale required, and policy instruments need to prioritise such development.

There are several planned large-scale liquefied biogas plants where farmers in an area collaborate with a biomethane supplier. One example is Gasum's plant in Götene, which is scheduled to be commissioned in 2025. It will produce 120 GWh of liquefied biogas per year, mainly from manure. The plant is the result of a collaboration between Gasum and a large number of farms on the Västergötland plain. The farms deliver manure and other waste products to the biomethane plant and receive an excellent biofertilizer from the digestate in return. At the same time, emissions from the farms are greatly reduced by avoiding methane emissions from conventional manure management. Through Gasum's nationwide infrastructure for liquefied biogas, the biomethane can reach customers throughout Sweden. Gasum is currently planning and building four similar plants in southern Sweden.

6. With current policy instruments, biomethane production is increasing too slowly

With current policy instruments, Swedish biomethane production will increase from today's 2 TWh to around 4 TWh in 2028. This is not enough. To meet the rapidly growing demand for biomethane, production must increase to at least 10 TWh by 2030.

Current policy instruments take us an important step on the way, but we will not achieve the large scale production required for the industry transition. Production is increasing too slowly. The greatest biomethane potential, which lies in agriculture and forestry, remains untapped. New technologies do not reach commercialisation.

Existing policy instruments important for increasing biomethane production

Since 2022, there has been a government production subsidy aimed at increasing Swedish biomethane production. In addition to reduced climate emissions, increased preparedness and reduced vulnerability have also been cited as reasons for the Government extending and strengthening the production subsidy. Investment support within *Klimatklivet* (the Climate Leap) has been in place since 2015. As *Klimatklivet* supports the most cost-effective climate investments, a significant portion of the support funds (approximately one quarter of a total of SEK 16.8 billion) has gone to investments in biogas/biomethane production. The plants that have received support from *Klimatklivet* are expected to contribute 1.8 TWh of biogas/biomethane per year, corresponding to 80 per cent of current production.^{xviii} Some of the plants have been commissioned. Some are under construction.

“To reach 10 TWh of biomethane by 2030, and take further steps after that, we also need to invest in large-scale plants with new technologies and new substrates – and we need to start now.”

Maria Malmkvist, CEO of Swedish Gas Association

The companies currently investing in new biomethane production in Sweden state that both production subsidies and *Klimatklivet* have a significant impact on their financial ability to make these investments.^{xix} This also applies to the largest plants currently under construction, which have a capacity of approximately 0.1–0.2 TWh of biomethane per year. Today, it is these investments that are increasing Swedish biomethane production, with production capacity expected to double in the next 2–3 years and likely to continue to increase thereafter. Against this background, it is important that existing production and investment support is strengthened and extended.



Production support too uncertain to bring about the necessary upscaling

To meet the rapidly growing demand for biomethane, it is not enough to simply continue with what is already being done. Facilities capable of producing up to 1–2 TWh of biomethane per year are also needed. Here, the Government needs to help reduce the financial risk during the operational phase. However, such large facilities are not covered by existing production subsidies.² But even if they were covered, the subsidies are too unpredictable and short-term to drive such large investments. It does not offer the risk sharing that is required. Support is applied for on a year-by-year basis, and the level of support is determined annually, based in part on the size of the support budget. There is a three-year plan for the support budget, which is subject to annual negotiations on the Government's budget.

The fact that production support has been extended and strengthened in stages is very positive for Swedish biomethane production. However, large-scale investment decisions require a broad political agreement that signals that Sweden's commitment to biomethane is long-term. There are other EU countries that can serve as inspiration here, for example Denmark.

² Existing production support falls under the EU's General Block Exemption Regulation (GBER). The EU regulation sets an upper limit on the size of facilities that may be granted support. Therefore, facilities with a capacity to produce more than 0.65 TWh of biomethane per year are not covered.



There are also regulatory barriers that slow down the expansion and increase the cost

Several regulatory barriers are currently slowing down the expansion of biomethane production. Here we outline the most important ones.

Protracted permit processes

Lengthy permit processes are one example of an obstacle that must be resolved immediately if biomethane production is to increase fivefold in five years. Today, it usually takes 3–4 years to obtain all the permits required to establish a large-scale production facility.

The green gas principle (mass balance) is not always applied

Another obstacle is that different methods are used to verify biomethane volumes when biomethane and natural gas are distributed together. The methods vary depending on regulations and whether the gas is distributed as a gas or in liquid form. In some cases, biomethane volumes may be verified through mass balance (the so-called green gas principle) in order to be counted as biomethane in, for example, tax legislation and emissions trading. This creates the conditions for an efficient market and infrastructure. In other cases, mass balance is not accepted, which needlessly drives up costs. For example, necessary investments in infrastructure linked to gas grids have not been able to utilise investment support within Klimatklivet.

Unclear and conflicting regulations on sustainable feedstocks for biomethane production

As a large proportion of future feedstocks for biomethane production is found in agriculture and forestry, it is important that these feedstocks are made available in an efficient and sustainable manner. Here, too, there are several regulatory barriers to overcome. For example, EU agricultural subsidies can sometimes hinder the development of biomethane production. There is also uncertainty about which feedstocks can be considered sustainable today and in the future. This must be clarified so that companies investing in production facilities know which feedstocks and technologies are worth investing in.

Lack of incentives for agriculture to switch to biofertilizer

The agricultural sector's willingness to pay for biofertilizer is somewhat limited, while demand and ability to pay vary across the country and over time. Getting better prices for biofertilizer strengthens the biomethane business as a whole, while also providing significant societal benefits in the form of more circular agriculture and greater resilience in Swedish food supply. At present, however, it is difficult for biomethane producers to charge for these benefits. There are simply not enough incentives and policy instruments for the agricultural sector to demand and use more biofertilizer.

7. Proposed measures for a significant increase in biomethane production



To enable the industrial transition, a significant acceleration in Sweden's biomethane efforts is required. The policy framework must be developed so that it better meets the need for a significant increase in production capacity.

In this chapter, the Industry Biomethane Commission proposes a combination of measures to work together and reinforce one another. Creating long-term predictability and removing regulatory barriers are key components. It is also a matter of promoting large-scale production, realising the great biomethane potential in agriculture and forestry, and commercialising new technologies.

The goal is to produce at least 10 TWh of biomethane in Sweden by 2030. If we are to have any chance of achieving this goal, measures must be taken here and now.

Set the level of ambition with a target for biomethane production

Decide on a national target of at least 10 TWh of biomethane to be produced in Sweden by 2030.

Ensuring access to biomethane for Swedish industry is a strategic necessity – for the climate, the economy and security of supply. But it is also an enormous challenge that requires a completely new approach to Swedish biomethane investment. It requires a politically decided production target for Swedish biomethane. Such a decision would provide clear direction and targets against which policy instruments can be evaluated at control stations and adjusted as necessary. It provides a long-term perspective which promotes major investments. A significant increase in biomethane production is necessary for the transition and competitiveness of industry, for greater security of supply, and for a resource-efficient and fossil-free society.

Create long-term stability by extending and strengthening current support

Increase investment security – make it clear, with broad political support, that biomethane production premiums are long-term.

For biomethane support to work effectively, those investing in new biomethane production need clear information that the premiums will remain in place for as long as they are needed. This can be achieved by developing a target trajectory with forecasts/targets for annual biomethane production and an estimated annual budget corresponding to the trajectory over at least ten years. It can be adjusted as necessary at subsidy checkpoints.

Encourage more large-scale biomethane projects – extend and strengthen Klimatklivet, and develop it so that investments in gas grid infrastructure can also receive investment support.

Klimatklivet is an important investment support scheme that should be retained and strengthened, particularly for large-scale facilities that can meet the sharply increased demand for biomethane. The budget and long-term perspective need to be secured so that operators dare to invest in both production and distribution. The authorisation framework also needs to be developed so that projects that are delayed do not prevent other projects from receiving support. In order for Klimatklivet to contribute to investments in the necessary infrastructure linked to the gas grid, the mass balance principle needs to be accepted. Klimatklivet should also be supplemented with more assessment criteria that strengthen supply capacity, in line with the proposals of Biogasmarknadsutredningen and the Swedish Environmental Protection Agency.^{xx}

Streamline and increase the pace by removing regulatory barriers

Make it easier and faster to build new biomethane production facilities in Sweden – ensure more efficient and faster permitting processes.

The government and regulatory authorities need to urgently ensure simpler and faster permitting processes to reduce the time it takes to build new biomethane production, storage and distribution facilities:

- Immediately provide sufficient resources to the regulatory authorities to be able to process applications quickly and provide assistance and guidance throughout the process.
- Implement Articles 15–16 of REDIII^{xxi} for biomethane investments, including fast-tracking of acceleration areas through the rules, prioritisation by being considered an overriding public interest, and continuous mapping of production potential and suitable land.
- Swiftly implement the rules on the authorisation procedure under Article 8 of the Gas Market Directive^{xxii} and appoint the Swedish Energy Markets Inspectorate as the body responsible for deciding on concessions. This is important in order to enable shorter authorisation processes for concessions for feeding biomethane into the transmission grid.
- Simplify the process for reviewing permits for increased production at existing facilities.

The Industry Biomethane Commission also has high hopes for the recent investigations commissioned by the Government in this area, which have resulted in proposals for measures aimed at shortening and streamlining the licensing processes in Sweden. A current example is the so-called Miljö tillståndsutredningen (Environmental Permit Inquiry), which submitted a comprehensive report to the Government in January 2025.^{xxiii} It is important that biomethane solutions are included in the regulatory simplifications and measures taken as a result of these inquiries.

Remove the uncertainty surrounding biomethane production from feedstocks from agriculture and forestry – clarify which biomass is considered sustainable.

The uncertainty surrounding which types of biomass from agriculture are sustainable according to the sustainability criteria of the Renewable Energy Directive, and how sustainability should be verified, must be eliminated. This is important in order for investments in biomethane production from, for example, energy crops, intermediate crops and ley crops to be realised. The same applies to biomass from forestry. Task the Swedish Energy Agency, together with the Swedish Board of Agriculture and the Swedish Forest Agency, with mapping and clarifying which types of feedstocks from Swedish agriculture and forestry can be considered sustainable according to the definitions in the Renewable Energy Directive (REDIII).

Ensure efficient trade and distribution of biomethane – and that the mass balance principle is applied in all relevant regulations to verify biomethane purchases when co-distributed with natural gas.

For a functioning gas market and efficient distribution of biomethane, the gas infrastructure must be able to be used to distribute biomethane together with natural gas. This requires a credible and administratively simple system for trading in biomethane and for verifying biomethane purchases in co-distribution. This applies to distribution both within and outside the gas grid, and both nationally and in the case of imports. This does not work satisfactorily today in, for example, tax legislation, the EU emissions trading system and Klimatklivet. There are also differences between regulatory frameworks, which hinders the development of biomethane and drives up costs. The Government should ensure that a uniform system based on the provisions of the Renewable Energy Directive^{xxiv} on mass balance is applied in all relevant regulations to verify biomethane purchases in co-distribution with natural gas.

Include biomethane production and gas infrastructure in regional energy and climate plans.

By identifying and prioritising sustainable biomethane solutions in local and regional energy and climate plans, the conditions for smooth processes in land allocation, detailed plans and permit processes for biomethane investments are improved.

Implement Bioekonomiutredningen's proposal on revenue guarantees

Implement Bioekonomiutredningen's (the Bio-economy Commission's) referred proposal on revenue guarantees^{xxv} and ensure that biomethane and intermediate products that are further processed into biomethane are covered if other criteria are met.

In order for large-scale production of biomethane from forest residues and wood waste based on new technologies such as gasification to take place, the Government needs to help reduce the risk during the operational phase by guaranteeing secure revenues for at least 10–15 years. The same applies to large-scale e-methane production from carbon dioxide and electricity. An auction-based production subsidy with revenue guarantees for at least 10 years needs to be introduced for this type of facility.



It is also important to ensure that the revenue guarantee system stimulates the production of biomethane as a raw material for materials and products. Certain procurements for revenue guarantees should therefore be carried out with adjusted assessment criteria that level the playing field with tenders relating to, for example, biofuels. The Industry Biomethane Commission proposes that 30 per cent of the assessment basis be based on the tender's contribution to fossil-free materials and chemicals.

Investigate new targets and measures for increased integration with Swedish agriculture

Strengthen incentives for circular resource flows – develop targets for the use of recycled nutrients in Swedish agriculture and appropriate policy instruments to achieve the target.

Biofertilizer is the most important co-product of biomethane. If the market for this product grows, it'll create another revenue stream and make biomethane production more profitable. Greater use of biofertilizer also reduces dependence on imports of fossil-based artificial fertilisers and strengthens the resilience of Swedish food supply. Task the Swedish Board of Agriculture with proposing a target for the use of recycled nutrients in Swedish agriculture and investigating appropriate policy instruments to increase the use of and thus the willingness to pay for biofertilizer.

Investigate barriers and propose measures to remove them in order to make better use of agricultural biomass for sustainable biomethane production.

There are currently insufficient incentives for the use of agricultural biomass for biomethane production, for example from ley or intermediate crops. Regulations such as EU support for farmers can sometimes even constitute an obstacle, for example by not counting ley crops for biomethane production among the crops eligible for environmental compensation. Task the Swedish Board of Agriculture with identifying obstacles in regulations or policy instruments. They should also propose measures to make better use of agricultural biomass for sustainable biomethane production.

8. Proposal for targeted transition support: Industrial Contracts for Difference (CfD)

Weak economic incentives are slowing down the transition to fossil-free products, particularly the phase-out of fossil-based feedstock in chemicals and materials.

Biomethane is the only realistic alternative to fossil-based feedstocks, yet the gap between companies' ability to pay and the market price of biomethane is too wide (see Chapter 2).

To ensure that investments can be made here and now, the Industry Biomethane Commission proposes that Sweden introduce a targeted transition support scheme. In this chapter, we describe how such support mechanism could be designed.

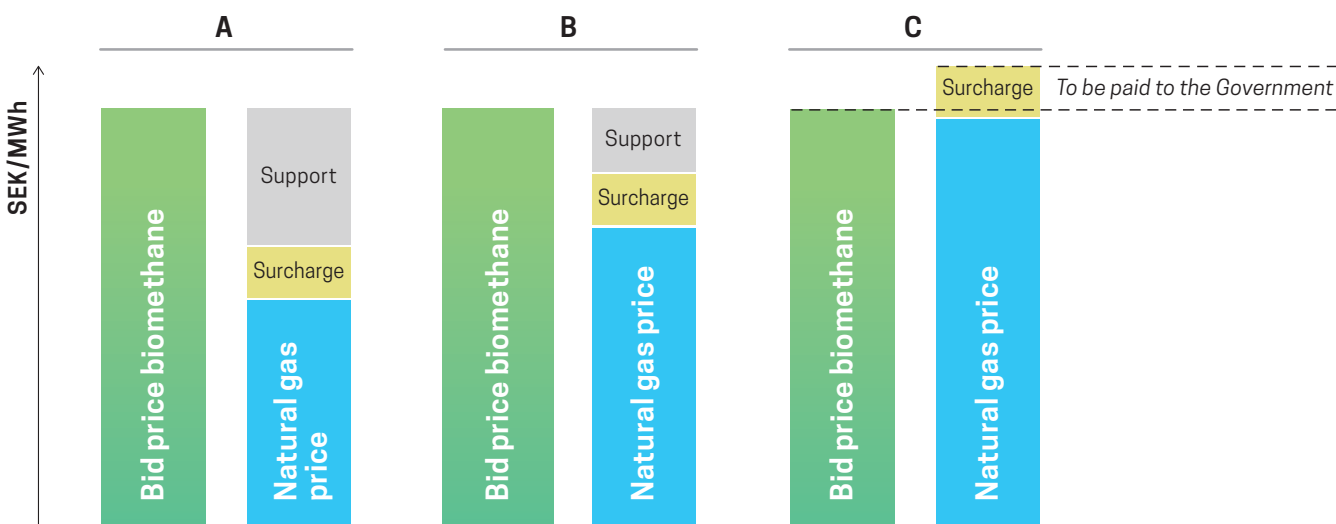
The support is designed as a CfD

The Industry Biomethane Commission proposes that support be allocated on the basis of a competitive tendering process. This principle is commonly known as CfD (Contracts for Difference). For 10–15 years, the Government guarantees a subsidy corresponding to the difference between the lowest price a producer is willing to supply biomethane for (bid price for biomethane) and the highest price an industry is prepared to pay for biomethane (natural gas price + surcharge). Which operators will receive the subsidy is determined through a competitive tendering process. This minimises the cost to the Government and the risk of overcompensation, while stimulating cost-effective biomethane production.

The winning operators sign a long-term contract with a government agency that pays the support on an ongoing basis throughout the support period and for the entire support volume covered by the contract.



Figure 8: The transition support is proposed to be designed as a CfD where the support level is the difference between the biomethane producer's tender price and the price the industry is prepared to pay for the biomethane (natural gas price + surcharge). When the natural gas price falls, the government subsidy increases (A in the figure). When the price of natural gas rises, the government subsidy decreases (B in the figure). In situations where the industry's ability to pay (natural gas price + surcharge) exceeds the bid price for biomethane, the aid recipient must pay the excess amount to the Government (C in the figure).





Biomethane producers are welcome to be beneficiaries

When designing the support, a decision must be made as to whether the support should be paid to the producer, or to the industry that will use the biomethane. This choice should be made by the Swedish authorities in consultation with the European Commission, which must approve the design of the support. If the user is the recipient of the support, this creates greater flexibility for the user. However, the Industry Biomethane Commission sees major advantages in designing the policy instrument as support for producers. This would directly contribute to increased Swedish biomethane production, security of supply and Swedish jobs. In this case, one condition for receiving support is that the producer can demonstrate through agreements that the entire eligible volume is used in industrial activities covered by the support.

Not all industrial biomethane use is eligible for support

The details of how the transition support should be defined need to be further investigated, but not all industrial biomethane use should be covered by the support. The support should only cover those industrial sectors where the economic incentives for transition are weakest in the short and medium term, and where companies compete on the global market. The support should also be limited to such use of biomethane where there are no sustainable alternatives that are profitable without co-financing from the Government.

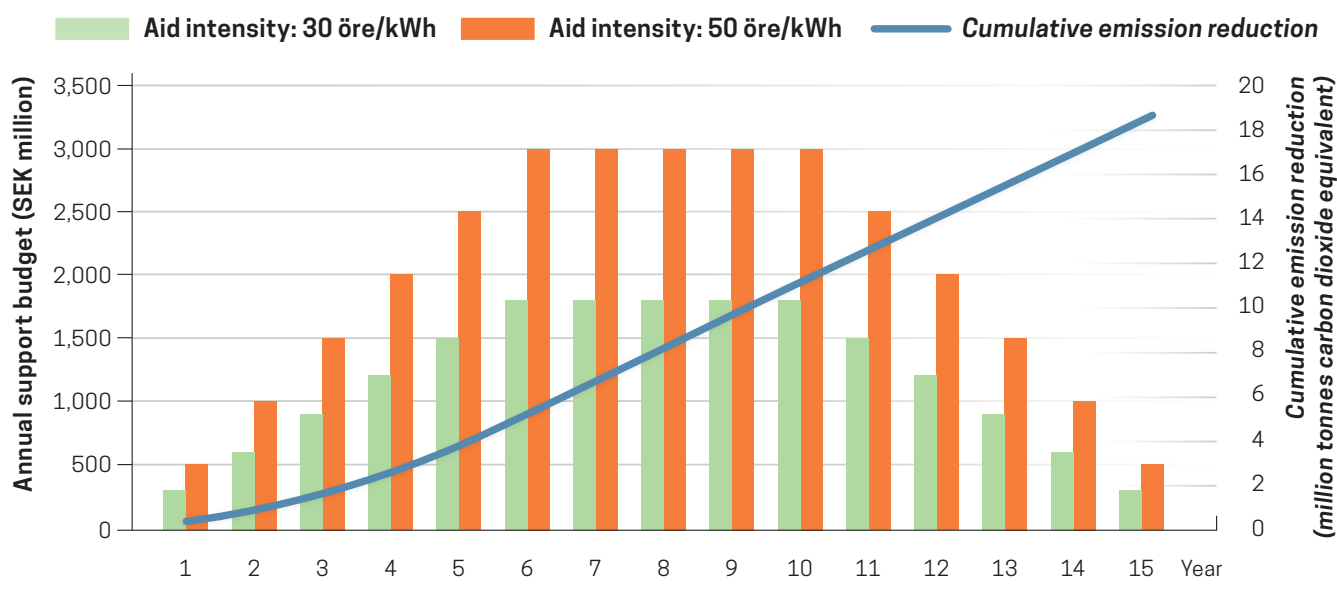
An example of industrial activity that should be covered by transition support is the use of biomethane as a raw material in the chemical industry. There are currently no financial incentives for transition in this sector, nor are there any new policy instruments that are expected to increase incentives in the foreseeable future. The EU's Emissions Trading System focuses on emissions and therefore does not provide any incentive for industries to replace fossil-based feedstocks with biomethane. Certain metallurgical processes may also need to be included, where the cost gap between biomethane and natural gas risks reducing companies' competitiveness and thus their ability to transition. For a more detailed description of the problem, see Chapter 2.

The Government sets a volume cap

When the policy instrument is implemented, a volume cap is set that specifies how much biomethane is to be allocated support during a given support period. If the support is designed as production support, the Government can, for example, decide that the policy instrument should generate 6 TWh of new biomethane production for use in industrial activities covered by the support. The biomethane volume can then be procured in one or more tender processes. The Industry Biomethane Commission's suggestion is that the first call for tenders is designed as a pilot with a smaller volume in order to be able to adjust details in the design for future calls for tenders, which will then cover larger volumes. The initial calls for proposals could then be directed at both existing and new production. This is to ensure that the policy instrument drives the transition even during an initial phase before new biomethane plants are ready for production. Control stations can then be used to assess whether future calls for proposals need to focus more on new production to ensure growing biomethane production on an industrial scale.

The transition support scheme should be a bridging solution

Support should be guaranteed for 10-15 years to drive investment, but it should be time-limited and phased out when it is no longer needed. The long-term solution is a combination of increased demand for fossil-free products and a reduction in the price difference between biomethane and fossil-based feedstocks. We are not there yet, but when we get there, Swedish industry should be a world leader in fossil-free materials and products. The transition support should serve as a bridging solution that helps Swedish industry gain access to fossil-free feedstocks (biomethane) at a competitive price. This way, industry and government will jointly ensure that investments in fossil-free materials and products can be made here and now. With economies of scale achieved, the hope is that competitive prices for biomethane will eventually be reached without government support.



Annual support budget and social benefits

The annual support budget for a full-scale industrial CfD will vary over time and depend on several factors, including the market price of natural gas and how quickly biomethane production is expanded. Figure 9 illustrates a calculation example where the support level ends up at 30–50 öre/kWh and where support is paid out for 10 years per tender. For each year, biomethane production is assumed to increase by 1 TWh, up to a total of 6 TWh before the support system is phased out and terminated after 15 years. The annual support budget is estimated to be at least approximately SEK 300–500 million and at most approximately SEK 1,800–3,000 million. The total cost of the support is estimated at SEK 18–30 billion, spread over 15 years. However, parts of this budget would probably otherwise go to existing production support if the industrial CfD proposed by the Industry Biomethane Commission is not introduced. The proposed industrial CfD could relieve the budget for existing biomethane support.

If the support were designed as production support, this investment would give Sweden an additional 6 TWh of biomethane production, where biomethane is used as a raw material and input for fossil-free materials and products. Swedish industry could build a market for fossil-free products, where Swedish industry stands strong in global competition. This would secure Swedish exports and Swedish jobs, thereby strengthening the economy and welfare. Sweden would also become less dependent on uncertain supplies from other countries, not least in the event of a crisis or war. At the same time, Sweden would reduce its climate emissions by a total of just over 18 million tonnes of carbon dioxide during the 15 years that the support system is in place.

Figure 9: Example of annual support budget for an industrial CfD. For each year, biomethane production is assumed to increase by 1 TWh, up to a total of 6 TWh before the support system is phased out and terminated after 15 years. During that period, the support is estimated to contribute to a reduction in Sweden's climate emissions of just over 18 million tonnes of carbon dioxide.

A cost-effective climate measure that provides security of supply and competitiveness

Under the proposed industrial CfD, the subsidy for reducing climate emissions by 1 tonne of fossil carbon dioxide would be in the range of SEK 1,000–1,600. This means that the subsidy compares favourably with other climate measures co-financed by the Swedish Government. A current example is the support for bio-CCS, where the Government is co-financing a project for the capture, transport and storage of biogenic carbon dioxide. The support amounts to SEK 20 billion, which will be paid out over a maximum of 15 years. The project is expected to store 11 million tonnes of carbon dioxide, which gives a cost of just over SEK 1,800 per tonne of carbon dioxide.^{xxvi}

In addition to climate benefits, the proposed industrial CfD contributes to other societal benefits that many other climate measures cannot provide: increased security of supply, circular resource flows, more sustainable agriculture and a competitive industry are some important examples.

This is the Industry Biomethane Commission

The Industry Biomethane Commission was formed in early 2024 and brings together Sweden's leading industrial players in steel, chemicals and manufacturing, producers, distributors and suppliers of biomethane, as well as organisations that are particularly affected.

The companies in the Commission account for a significant proportion of Sweden's exports and employ thousands of people in Sweden.

The Commission was formed in response to industry's urgent need for biomethane – a crucial resource for replacing fossil-based feedstocks in the manufacture of materials and products. Swedish biomethane production needs to increase significantly, and industry needs access to biomethane at a competitive price.

Over the past year, the Industry Biomethane Commission has worked to analyse the industry's need for biomethane and identify obstacles and solutions. Through hearings and seminars with companies, researchers and policymakers, the Commission has gathered extensive knowledge and built a broad understanding of the challenges.

Perstorp

Perstorp is a leading manufacturer of chemical products that provide specific properties in advanced materials, surface treatments and chemical lubricants. Perstorp has approximately 1,500 employees with manufacturing and customers worldwide. In Sweden, Perstorp has facilities in Perstorp and Stenungsund. Perstorp Holding AB has been part of the Malaysian Petronas Group since 2022.

Höganäs

Höganäs is a world leader in the manufacture of advanced ceramic powders and metal powders. Höganäs has 15 production facilities worldwide and a total of 2,200 employees. Half of all powder production takes place in Höganäs and Halmstad. Höganäs is owned equally by the Lindén Group and Wallenberg-owned FAM.

SSAB

SSAB is a global steel company and a world leader in high-strength steel and related services. Production takes place in Sweden, Finland and the United States, with a capacity of approximately 9 million tonnes of steel per year. With 15,000 employees, SSAB is represented in 50 countries worldwide.

IKEA

IKEA is best described as a production-oriented retailer, divided into different companies. The Inter IKEA Group has approximately 25,000 employees worldwide. The Inter IKEA Group owns the IKEA concept and develops, produces, purchases and communicates an inspiring range of home furnishings for further distribution via department stores or online. Europe and Asia are the main purchasing areas as well as the main sales areas. In the town of Älmhult alone, there are approximately 5,500 IKEA colleagues, most of whom belong to the Inter IKEA Group.

IKEM

Innovation and Chemical Industries in Sweden (IKEM) is an industry and employer organisation for companies working with chemicals, including the chemical and plastics industries, pharmaceutical manufacturers, refineries, and biochemistry and biotechnology companies. IKEM operates throughout the country and is represented in Stockholm, Gothenburg, Malmö, Växjö, and Örebro.

Nordion Energi

Nordion Energi owns, operates and develops energy infrastructure. The group consists of Swedegas, Weum, Falbygden Energi, Dala Energi and Nordion Energi H2. Through these companies, Nordion Energi owns and operates the Swedish gas transmission grid, several gas distribution grids in south-western Sweden, electricity distribution grid in Västra Götaland and Dalarna, and develops infrastructure for the distribution of hydrogen in northern Sweden. Nordion Energi is owned by EDIF II managed by Igneo Infrastructure, and has around 200 employees and is headquartered in Malmö.

Gasum

Gasum produces and distributes gas for industry and transport. Areas of expertise include biogas and liquefied biogas. Gasum produces biogas at plants in Sweden, Finland and Denmark, and purchases gas from certified European partners. Gas deliveries in Sweden are mainly made by truck and boat.

Uniper

Uniper is an international energy group with operations in more than 40 countries and approximately 7,400 employees. In Sweden, Uniper is a major electricity producer with hydroelectric and nuclear power plants around the country. Uniper also runs several industrial projects in Sweden to transform the process industry, shipping and transport.

Avfall Sverige

Avfall Sverige is the Swedish Waste Management Association. Its members include municipal and privately owned co-digestion plants. Through its members, it represents all of Sweden's residents. Avfall Sverige promotes sustainable waste management where waste is prevented, recycled and turned into a resource. The organisation works for a circular future where municipalities and their companies are the guarantors of a future without waste.

Energigas Sverige

Swedish Gas Association is the trade association for companies in biogas, vehicle gas, LPG, natural gas, syngas and hydrogen. Its 180 member companies include gas producers and distributors, as well as gas users, primarily in the industry and transport sectors. The vision of Swedish Gas Association is *Gas for a robust, circular and completely fossil-free society*, with the goal of all energy gases being fossil-free by 2035.



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Industry is the backbone of the Swedish economy. Successful export companies have long been – and remain – essential for our shared prosperity. We want it to keep it that way. However, our dependence on fossil fuels and fossil-based raw materials must end – and time is running short.

In this report, the Industry Biomethane Commission proposes a set of political and practical measures to significantly increase Sweden's biomethane production, which needs to be increased fivefold by 2030 to meet rapidly growing demand. At the same time, the economic conditions for industry to transition to biomethane must be improved. This is an ambitious but achievable goal, provided that decisive action is taken now. Securing access to biomethane for Swedish industry is a strategic necessity – for the climate, for the economy and for our security of supply.

