BIOMETHANE IN THE EU

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Biomethane production remains tiny at the moment in Europe but the industry has big plans for the future, provided costs can be lowered and environmental issues addressed. In this special report, EURACTIV looks into the challenges and opportunities facing the sector.
Europeans confront biomethane cost reduction challenge

Calls grow for EU-wide certificates to boost market for ‘green gas’

No future for gas without greening as soon as possible

Academic: Higher carbon price needed to ramp up EU biomethane production

The future of biogas in Europe: it’s a local affair
Biomethane production costs are expected to fall in the coming decade as more biogas plants come on stream. But analysts warn that massive cost reductions like in the solar and wind power sector are unlikely and policy measures will be needed to prop up this fledgeling renewable energy industry.

Try bringing up the issue of biomethane production costs and the comparison with cheap fossil gas inevitably comes up.

“No, it’s impossible,” energy expert Marc-Antoine Eyl-Mazzega replies when asked whether biomethane has any chance of reaching cost parity with imported natural gas, whether coming from Russia or Norway.

What is possible, he adds, however, is that biomethane becomes an attractive alternative to imported fossil gas – provided all the wider economic, social and ecological benefits of biomethane are taken into account.

But that requires policy support and a much higher price of CO2 on the EU carbon market – around €50 per tonne – or about double the current price, he argues.

**POSITIVE EXTERNALITIES**

Eyl-Mazzega is energy director at the French Institute for International Relations (IFRI), a think tank. Earlier this year, he authored a study looking at the biogas sector in three EU countries – Germany, Denmark and Italy.

And his assessment on production costs is unwavering. “If you compare the cost per unit, biomethane these days is 5 to 6 times more expensive than natural gas,” he says, partly also because gas prices are currently near historical lows.

Over time though, the balance is expected to shift gradually in favour of biomethane as policymakers support locally-produced sources of renewable energy over imported fossil fuels. As more projects are being developed, and with growing competition coming from Chinese companies, the costs can be expected to decrease slightly, Eyl-Mazzega says.

But will that be enough to make biomethane competitive with...
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imported natural gas? The answer very much depends on policy.

According to Eyl-Mazzega, the current production costs of biomethane hover around €95 per megawatt hour (MWh). However, these costs do not take into account the wider benefits of biomethane, such as rural development, local job creation, and avoided CO2 emissions, which he evaluates at around €40-60/ MWh.

If those are added up, the overall price of biomethane could fall to around €35-55/MWh, which is close to the current average wholesale price of electricity, he says. “And that is not far from the natural gas prices, which currently are historically low. It also somehow compares with some of the wind breakeven prices that are out there,” he points out.

“By integrating all these externalities, and having a higher price for CO2, then clearly it will make more sense to produce biomethane locally rather than importing natural gas”.

However, even industry sources admit there is little chance of bringing costs down spectacularly, like in the case of the wind and solar power sector.

“Looking at the production costs, it’s really difficult to bring them down so much because of the feedstock costs,” says Susanna Pflüger, secretary-general of the European Biogas Association (EBA). "Biogas is expensive, also in comparison to most other renewables,” she says.

The main question nowadays focuses on the support measures that could help drive costs down for the industry. And EU policymakers in Brussels will be able to draw from a wealth of experience collected at the national level.

In Germany, the biogas sector saw a boom around ten years ago thanks to a favourable feed-in tariff for renewable electricity that helped support Combined Heat and Power (CHP) generation. The scheme allowed the sector to develop successfully: in 2018, biogas represented 14.2% of the country’s renewable electricity generation, Eyl Mazzega says.

However, support for the sector came to a halt in 2014 after criticism mounted over the costs and environmental impact of the scheme, which relied almost exclusively on dedicated energy crops – mainly maize.

“The system is considered too costly for the taxpayer,” says Eyl Mazzega. “In Germany, from the government's perspective, you already have the burden of solar and wind deployment plus the grid development. And then on top of that, you add the biogas costs. And that’s why it came to a halt.”

As soon as the feed-in tariff was removed in 2014, the commissioning of new biogas plants started slowing down. “So yes, we have still around 10,000 biogas plants in Germany but the number is not really increasing and Germany doesn’t have big ambitions for biogas or biomethane in the future,” Pflüger says.

“On gas, Germany is more looking at hydrogen,” she points out.

MULTIPLE COST-DRIVERS

The cost-drivers of biomethane are indeed numerous. To start with, there is a wide range of inputs potentially making their way into biogas plants, which can take feedstocks from dedicated energy crops like maize, but also agricultural wastes, sewage sludge, biodegradable wastes or wood residues coming from industry, households or commercial uses.

The gases produced from these different feedstocks have varying degrees of quality and often contain large amounts of CO2. Therefore, they need to be treated and purified before they can be injected into the gas grid or used as fuel in trucks.

But with increased biogas production in China, there is now growing interest from the industry to reduce the cost of purification. In May, Beijing announced plans to produce 30 billion cubic meters (bcm) of biogas from agricultural waste and manure by 2030, hoping this will reduce the country's coal consumption by 50 megatonnes, and clear out some of the smog from its polluted cities.

To achieve this target, China plans to build approximately 3,000 to 4,000 upgrading facilities over the next decade, according to media reports. And Chinese renewable gas companies like Xebec Adsorption Inc, are expected to grow stronger as a result, building on their domestic market to expand their operations in Europe.

FRANCE SEES THE OPPORTUNITY...

In Europe, France has sensed the opportunity, seeing the multiple advantages of developing a national biomethane industry – both as a source of locally produced renewable energy and an additional source of income for farmers.

France is aiming for a massive increase in biomethane production by 2030, with a national target of around 90 terawatt-hours (TWh), says Susanna Pflüger of EBA. “This is huge compared to current production, which is about 1 or 2 TWh,” she told EURACTIV.

The French government set an objective of injecting 10% of biomethane into the country’s gas network by 2030, similar to what Denmark is already doing. And energy company Engie wants to bring this up to 100% by 2050, adding other low-carbon gases to the mix, such as hydrogen.

Those plans are informed by a study from Enea, a consultancy, which

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attempted to map all the positive economic, social and environmental benefits from biomethane production and use in France.

- High among them are rural development aspects, including local job creation.
- The study also points to avoided CO2 emissions, estimating those are seven times lower for biomethane than for natural gas.
- There are also environmental benefits for the agriculture sector, which can use digestates from biomethane production as organic fertilisers, reducing the need for nitrogen and fossil-fuel-based inputs.
- Finally, the study also points to avoided network development costs for the wider energy system. Because biomethane can easily be stored in the existing gas network, it can provide seasonal storage for winter heating needs, or sent for burning in a power plant to help balance the electricity grid.

In total, these benefits would add up to €55-€75 per megawatt hour (MWh) by 2030, according to Enea, a range that is broadly in line with estimates from the French energy regulator.

**BUT CONDITIONS SUPPORT ON COST REDUCTION**

Thanks to those measures, “most likely, France will become a leader,” Pflüger predicts. “They’re definitely a country we highlight at the moment.”

However, the government’s support for biomethane in France also came with strings attached, and is conditional on the industry’s ability to reduce production costs.

French authorities have given the industry three to four years to cut costs by around 30%, moving from about €95 per megawatt hour (MWh) to about €60/MWh. But the industry says it needs until 2030 to do this.

“And so that is the key problem we now have in France,” Eyl-Mazzega says. “The industry says it doesn’t have enough time. And the government says further support is conditional on real results in terms of cost reduction.”

The jury is still out as to whether the industry will be able to meet its production targets and cost reduction objectives. But industry sources are asking for patience, saying solar and wind power took years to become competitive with fossil fuels.

“We are asking the same for biogas – a little patience,” says Didier Holleaux, executive vice-president at Engie, saying time “will allow us to industrialise and lower production costs.”

According to Holleaux, the first thing Europe could do to support the industry’s development is to include biomethane in its green finance taxonomy, which at the moment excludes anything else than wind and solar.

Brussels could also show support by “clearly backing biogas as one of the possible futures of the natural gas network,” he told EURACTIV.

The European Green Deal announced by Ursula von der Leyen, the president-elect of the European Commission, “should contain a clear commitment to decarbonise the gas sector and develop green gas” by adopting a dedicated “gas decarbonisation target” and fixing a minimum share of renewable and decarbonised gases in networks, Engie argues.

Holleaux says France could even increase its 10% target for biomethane injection into the gas grid, provided incentives are put in place. “With the right support, we could do a lot more,” he told EURACTIV, saying network operator GRDF – which is partly owned by Engie – even proposed a 30% target for renewable gas injection into the network by 2030.

One of the policy drivers is to reconsider gas and electricity jointly as part of an integrated energy system – a concept backed by the European Commission, which sees potential for gas as a way to reduce network development costs.

**POLICY MEASURES**

That will require regulatory measures, including rules for the injection of biomethane into the gas grid, drawing up new obligations on gas infrastructure operators, and setting out new rules on gas quality. Regulations are also needed to ensure biomethane plants are properly operated, in line with safety and environmental standards, Eyl-Mazzega says.

“And lastly, very importantly, I think we need a real general system for guarantees of origin,” Eyl-Mazzega says. “And that is something that needs to be harmonised at EU level in order to create a clear, EU-wide opportunity for biomethane development.”

One conclusion that stands out is that biomethane development in Europe won’t happen without a higher price of carbon on the EU Emissions Trading Scheme. The Enea study, for instance, assumes a carbon price of €100 per tonne of CO2, which is a far cry from the current price of around €26-27 per tonne.

“Clearly, anything around €50 per tonne would help biomethane,” Eyl-Mazzega says.

But ultimately, he warns that massive cost reductions are unlikely. “This is not a technology where you can expect to see the same cost decrease trajectory that happened with solar and wind. And that has to be very clear. You can’t say that in five years, the costs will be 70% less than what we have now, this won’t happen.”
The market for Guarantees of Origin (GOs) linked to renewable gas is currently in its infancy. But with demand building up, industry figures – and environmentalists – are calling for existing certification schemes to be harmonised and made mandatory across the European Union.

The European market for renewable energy certificates broke new records in 2018, with the supply of Guarantees of Origin for hydro, wind and solar electricity reaching nearly 600 terawatt hours (TWh) last year.

That’s according to ECOHZ, a Norwegian company that trades renewable electricity certificates, mainly in Europe and North America.

At the moment, the market for GOs is almost entirely focused on corporate purchases of green electricity, with hydro clearly dominating the European market. But wind power is now the fastest-growing sector while interest in solar and – surprisingly – biomass is also picking up, according to Tom Lindberg, managing director at ECOHZ.

“As a percentage, demand for biomass GOs has almost doubled in 2018. And that was also a bit surprising to us,” Lindberg told EURACTIV.

For years, demand for biomass certificates has been sluggish. Corporate buyers of electricity...
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remained cautious due to fierce public debates about sustainability and fuel accounting – what actually goes into biomass power plants. However for the first time, demand in 2018 has caught up with supply, Lindberg said.

“We don’t know why this happened,” he admits, suggesting that over time, consumers and buyers of Guarantees of Origin (GOs) may have “come to grips with biomass being a sensible fuel”.

In Europe, companies like Microsoft, Google, and Facebook are increasingly turning to corporate renewable Power Purchase Agreements (PPAs) as part of zero-carbon power supply objectives. One way to trace and prove their renewable energy consumption is to buy both the renewable power and the accompanying Guarantees of Origin (GOs).

“The rise of corporate renewable Power Purchase Agreements (PPAs) has been a game-changer, providing energy-intensive consumers with a cheap, clean and reliable power supply” said WindEurope, a trade association.

GOS FOR GAS

But while the market for green power certificates is already mature and growing, the issuing of GOs for biogas, hydrogen, and heating & cooling only started since December last year, when the EU formally adopted its revised Renewable Energy Directive.

“That opens a platform for commercialising GOs for gas that’s injected in the pipeline network,” Lindberg told EURACTIV, saying the details are laid out in article 19 of the directive.

Green Gas Certificates enable companies to make 100% renewable gas claims. In Europe, these are documented by the European Renewable Gas Registry (ERGaR), which brings together national registries across Europe.

ERGaR currently has members in ten countries, enabling cross-border trading of gas certificates between Austria, Belgium, Denmark, France, Germany, Ireland, Italy, the Netherlands, Switzerland, and the UK.

“What ERGaR is trying to do is making sure the system works across borders within the European market. So that what’s injected into the grid in Italy can be used in Sweden and certified as biomethane across borders,” said Susanna Pflüger, secretary-general of the European Biogas Association (EBA).

However, membership is purely voluntary and, with growing demand for gas certificates, calls for a harmonised EU system are becoming louder.

“What we’re asking for is that all countries producing biomethane put in place national registries,” Pflüger said. “The national certificates for biomethane should be aligned all over Europe, issuing similar certificates that are accepted by all European registries and in our view, they should also name the feedstocks used for biomethane production,” she told EURACTIV.

Environmental activists share the same view. A harmonised system of GOs for gas “would be desirable,” said Lisa Fischer from E3G, a climate think tank. However, she insists that any certification scheme needs to rely on “good definitions of the product,” making clear how the gas was produced, including the feedstocks used.

“And we haven’t cracked that yet,” Fischer said.

DEFINITIONS MATTER

Indeed, the environmental footprint of biomethane can vary depending on the feedstocks – whether those came from dedicated energy crops like maize, agricultural and forestry waste or livestock manure, for instance.

“This is where definitions matter. Regulators need to know what’s meant exactly by sustainable biogas. And those definitions aren’t there yet,” Fischer said.

According to Pflüger, the problem actually goes beyond the environmental traceability of gas – it’s also about avoiding fraud.

“Once biomethane is injected into the grid, you can’t separate it from natural gas, the molecule is the same. So we need to trace what goes in and what goes out of the pipeline in order to avoid double counting,” Pflüger said.

In order to validate the “renewable origin” claim, the green gas producer and the green gas consumer should be attached to the same pipeline network so that a physical link between producer and consumer can be ascertained, ECOHZ said.

But the system works best if every country is hooked to the same hub and has the same accounting methods in place. And part of the problem is that the Renewable Energy Directive doesn’t say much about guarantees of origin.

“The directive says nothing about harmonisation, also on the power side,” Lindberg explains. “And that’s unfortunate because it took 15 years to get these countries to harmonise on the electricity side”.

Certification is more developed on the electricity side, where the issuing of GOs is done in a standardised way, under oversight from the Association of Issuing Bodies (AIB), which brings together national registries under a harmonised system.

However, it took years for the AIB to take shape, starting on a voluntary basis. “It was all driven by market players until a sufficiently large number of countries started to
cooperate,” Lindberg explains. “And this is how the AIB came about – it was afterwards”.

Moreover, even though the AIB is widely recognised, membership is not mandatory and some countries are still not hooked to the system, Lindberg points out, with only 22 countries currently registered as active members, including some outside of the EU.

“And that to me seems very strange – they shouldn’t have a choice. So I’m pretty sure the Commission is after them,” Lindberg said.

On the gas side, developments are following the same pattern, with ERGaR membership still voluntary for the time being. And the vague definitions in the Renewable Energy Directive don’t help speed things up.

While the directive obliges member states to issue GOs for renewable gas, it makes it optional to issue GOs for non-renewable, decarbonised gases, such as hydrogen produced from fossil gas with Carbon Capture and Storage (CCS).

For some in the industry, the two must be clearly distinguished. “Where GOs are issued also for non-renewable, decarbonised gas, a clear distinction between renewable and non-renewable GOs must be possible,” one industry source said.

GO FURTHER: LINKING UP ELECTRICITY, GAS AND HYDROGEN

Others go even further, saying an ideal system of GOs should be interoperable to allow trading of certificates between different energy carriers – electricity, gas and hydrogen – as well as between countries.

Such a system, they argue, should be based on an EU-wide methodology on how to issue, register, transfer and cancel GOs or convert them between energy carriers.

“Rules must be clear and avoid double counting or fraud,” the industry source said, calling for “standardised minimum information on GOs across Europe” to reflect things like the types of installations used, their location, the energy carrier, or whether the installation received financial support.

If regulators and the gas industry are successful in putting together a reliable system for GOs, it could go a long way to decarbonise the gas sector – and help the European Union reach its climate objectives for 2030 and 2050.

“It can be a super impactful incentive for green investments,” said Tom Lindberg of ECOHZ, saying GO trading could add a revenue stream to biogas producers, like it did for producers of renewable electricity.

What’s more, there seems to be strong appetite on the market. “About 50% of renewable power production in Europe in 2020 will be certified,” Lindberg said. “And that’s going to increase – we’re looking at 1,600 TWh certified power in 2030.”

Considering that each GO sells for around €1-2.5 per megawatt hour, “over the next ten years, we’re looking at a huge revenue stream,” Lindberg points out.

“And if the gas market looks at this, they might choose a more rapid path to the GO market than the power sector did ten years ago,” he said.
In the search for alternatives to fossil fuels, gas as an energy vector has the capacity to play a decisive role. To do this, it is absolutely necessary to green our gas as much as possible, writes Jean-François Carenco.

Jean-François Carenco is President of French energy regulator, the Commission de Régulation de l’Énergie (CRE).

The worrying news on the climate change front requires us to commit ourselves resolutely to reducing the environmental footprint of our societies. This requires first and foremost a reduction in greenhouse gases.

Greening gas is neither a matter of fashion nor a wishful thinking; it is a fantastic challenge to make the energy transition happen, writes Jean-François Carenco. [Equinor / Ole Jørgen Bratland]
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gas emissions from energy consumption. The challenge before us is daunting because energy has always been an essential factor in economic progress and social cohesion. It is now necessary to act on all the components of our energy system in order to move towards greater sobriety and the implementation of a “decarbonised” energy supply.

In the essential search for alternatives to fossil fuels, gas has the capacity to play a decisive role.

Natural gas now represents one fifth of the final energy consumed in France, making it a pillar of our energy system. This situation is shared by most European Union countries where gas covers a very large part of the heating needs of both industry and households sectors. In recent decades, Europe has thus developed gas infrastructures that largely irrigate our territories.

We can make these infrastructures an asset for the energy transition, and this is an idea shared by all European regulators. Gas infrastructure can contribute to making gas a vector for the development of renewable energies as a complement to electricity, it is the duty of regulatory authorities to make this possible. To do this, it is absolutely necessary to green our gas as much as possible: this is an essential question.

Seen as hypothetical a short while ago, greening gas is more and more a solution. Production techniques have made considerable progress, making it possible to envisage large-scale developments. Not all sectors are at the same stage of maturity, but we believe it is essential to promote research and development without discrimination in order to identify breakthrough technologies and viable models over the long term. In this respect, at CRE, we have organized a reflection among the best French experts within our “Prospective Committee” in order to draw perspectives for the development of synthetic gases.

First, the production of biogas by methanisation, from organic material, is experiencing strong growth. Although it still requires significant public financial support, the prospects for improving the competitiveness of the sector are promising. More generally, the positive impacts in terms of the environment, energy independence, waste management and market opportunities for the agricultural sector are all favourable factors for its promotion. Distribution and transmission system operators are already adapting to this new gas source, which replaces natural gas.

Secondly, the other technologies, power-to-gas or pyro-gasification, are still in an embryonic stage, and we must thus support the research and development efforts of the sector’s stakeholders. In this respect, the CRE is in favour of pilot projects by French operators, while remaining within the scope of network regulation, i.e. a clear separation from gas transmission and distribution activities.

There are still many areas of work, particularly with regard to the mobilisation of biomass resources or the labelling of different production techniques, an important element of the economic model for the actors involved in the sector. Labelling must pave the way for tradable certificate systems that could make a decisive impact on the development of green gases.

Greening gas is neither a matter of fashion nor a wishful thinking, it is a fantastic challenge for the whole life cycle, from production to recycling, from the short circuit to the diversification of the energy mix, to make the energy transition the concrete effort of those who want to improve the world.
The price of CO2 credits on Europe’s emissions trading scheme needs to rise to around €50 per tonne in order to drive the long-term development of Europe’s biomethane industry, says Marc-Antoine Eyl-Mazzega, a French researcher.

Marc-Antoine Eyl-Mazzega is the director of the Centre for Energy at the French Institute for International Relations (IFRI). He spoke to EURACTIV’s energy and environment editor, Frédéric Simon.

INTERVIEW HIGHLIGHTS:

- In Germany, incentives were cut because biogas was considered too expensive for the taxpayer – and environmentally questionable.
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due to the sector's over-reliance on dedicated energy crops.
• But other countries like Denmark have successfully developed biomethane based on agricultural waste and livestock manure to the extent that it now represents 10% of what's injected into the country's natural gas grid.
• Even if biomethane is more expensive than natural gas, solar and wind power, it also has a number of positive externalities that are currently not taken into account – including avoided CO2 emissions, rural development and circular economy benefits.
• If added up, those benefits result in a price of biomethane in the range of €35-55/MWh, down from €95/MWh currently, which is not far from the price of natural gas, and compares well to the current average wholesale price of electricity.
• Biomethane development also has to be seen in conjunction with hydrogen, because part of the equation is what to do with the existing gas grid infrastructure.
• Guarantees of origin (GOs) have to be harmonised at EU level in order to drive growth of biomethane and other low-carbon gases like hydrogen.

Who are the leading countries in Europe when it comes to developing biogas? Are there any best practices worth highlighting?

One has to distinguish the very mature biogas industry and the newly developing biomethane industry which consists in upgrading biogas to biomethane – basically CH4, which can be injected into the gas grid.

The leaders clearly are Germany and Denmark. Germany especially has developed the biogas industry in the last 10 years.

Germany is currently the biggest producer in Europe, correct?

Yes, Germany has 9,500 or so biogas plants, more than half the total currently in operation across the EU. The key about Germany is that biomethane was developed at small scale installations that were designed to produce mostly electricity combined with heat. And the inputs into the biogas plants were mainly agricultural crops.

And this scheme has developed very successfully – the feed-in tariff was good, and the support scheme led to the industry’s development. In 2018, biogas accounted for 14.2% of the country’s electricity generation from renewable sources.

But this has now come to an end, mainly because the assessment was made that this was getting too costly for the German taxpayer. And also because using agricultural crops to produce biogas was not considered optimal. In 2017, an auction model and annual growth target for biomass (including biogas) were introduced as a way to incentivise cost reduction. As a result of these tariff reductions, the commissioning of new biogas plants has significantly slowed down.

Another excellent example is Denmark. Denmark’s biogas production started in the 1920s, at wastewater treatment plants, and the first manure-based biogas plant was built in 1975. Following the adoption of the “Energy Agreement” in 2012, they developed biomethane to the extent that it now represents about 10% of what’s injected in the natural gas grid, which is a lot.

But the scheme in Denmark was a bit different because the Danes opted to basically use agricultural waste and especially manure waste rather than dedicated crops. And that led to the development of a very mature industry, which is probably a European leader.

But, here again, the Danish government is not going to let this grow further. As in Germany, a tender-based system for new biomethane plants will come into force in 2020.

Why is that? For Germany, it was a question of cost, did Denmark reach the same conclusion?

The system is considered too costly for the taxpayer. In Germany, from the government’s perspective, you already have the burden of solar and wind deployment plus the grid development, and then on top of that, you add the biogas costs.

And that’s why it came to a halt. A decision was made to basically reduce biogas measures and move to an auction-based system, with price ceilings, which really slows down the level of investment.

Is it because production levels in Germany had reached some sort of limit, with regards to the land available or the agricultural crops available?

Yes and no. The objective in Germany was not to complement natural gas – it was to produce electricity and heat. That’s different from Denmark, where the objective was to have less natural gas imports and more domestic greener gas production.

Denmark committed to carbon neutrality by 2050 and this requires replacing natural gas with biomethane and other renewable gases. Because biomethane can be produced at a steady pace and can be stored as well, it is seen as a pillar in Denmark’s future integrated energy system. Yet, concerns over subsidy costs remain high.

Obviously, you could have grown this industry much bigger by using more dedicated crops. But you have to look at the entire carbon footprint of that system – for example, the trucks

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and tractors running on diesel that are needed to transport the crops to the biogas unit. And then there are leakage problems and the overall cost challenge.

So overall, the decision was made to slow this down, or at least require significant cost reductions for new projects. And that decision was made at a very high level, which is why the German example is remarkable.

Today, the two interesting cases are France and Italy. In Italy, the biogas industry has been working for 10 years and it is very mature. But the decision was made in 2018 to really push for biomethane production, and use it to help decarbonise the Italian transport sector where renewable energies currently play a marginal role.

Italy already had 1 million cars running on compressed natural gas (CNG). And so they decided to have an integrated strategy focusing on the agricultural and food sector, the gas sector and the transport sector. And part of it will also be connected to the gas grid. All this was aimed at basically creating new demand for biomethane.

**And that is considered a successful policy?**

We’ll see because this is now only one and a half years old. But if you look at the number of projects that are being developed – over a thousand – and the overall scheme that was put in place, everything is there to make it successful.

A key feature of the Italian support scheme is that it is based on biofuel blending obligations, which avoids creating an additional burden on electricity and gas consumers. But it’s too early to judge, we have to wait for another two, three years.

**What about France? You recently published a study looking at the biogas sector in Germany, Denmark and Italy,**

**but not France. Why is that?**

The reason is that France’s strategy was still in the making in the field of biomethane. And France has very little biogas production so far, it’s almost non-existent. So France decided to go directly to biomethane, skipping the biogas phase. This is why we didn’t cover France in the study, because there was nothing to write about.

Now, the key thing about France is that the French government has been pretty hesitant about biomethane to say the least. Clearly, the industry wants to develop biomethane, and the agricultural sector too. The gas industry in particular is very pushy, because it wants to use its existing infrastructure in order to avoid stranded assets as the country moves to complete decarbonisation.

But the government also saw the cost. Because if you compare the cost per unit, biomethane these days is five to six times more expensive than natural gas. That’s also because natural gas prices at the moment are probably the cheapest we’ve ever seen.

And so the French government said they were ready to support the sector, but slowly, in the form of start-up aid and cost-efficiency targets. This is mainly because the government realised that biomethane helps the agricultural sector and has a number of positive externalities such as territorial development, agro-ecological transition, job creation, and so on.

But, but the cost issue is still tremendous. And so the French government said the support will depend on the industry’s ability to reduce costs very quickly.

And that’s the key point. The industry says it can reduce costs by around 30% – moving from about €95 per megawatt hour (MWh) to about €60/MWh. But they say they need 10 years to do it, not 3 or 4 years like the French government wants them to do.

And so that is the key problem we now have in France. The industry says it doesn’t have enough time. And the government says further support is conditional on real results in terms of cost reduction.

And the fundamental problem is how do you assess the costs and benefits? Because even if biomethane is much more expensive than natural gas, solar and wind, it also has a number of positive externalities. And if you take those into account, its production costs need to be decreased by a number of things, which have to be valued.

• The first, of course, is the CO2 that is not emitted.
• The second is the jobs that are created in territories, where there are little chances of employment.
• The third is related to the circular economy aspects, which in France is to use agricultural waste not dedicated crops. And maybe a few intermediary crops, which do not interfere in the usual agricultural production for food and export.

What we see now increasingly in France is that you have basically a biomethane plant that will be integrated in a system whereby it will supply a fuel for the local city buses, and school buses and logistics companies that are located nearby. And so this circular economy aspect is being closed by the opportunity to use the digestate from the biomethane as fertiliser.

Now, that’s the theory. What we still see though, is that there’s a number of fundamental issues that need to be addressed.

The first is what you put into your biomethane plant. If you mix certain types of industrial waste and municipal waste without sufficient quality controls, obviously you end up with digestates that will not be fit at all as fertiliser. That’s the first point.

The second point is that you have to have very strict and competent expertise on the site, to manage the installation on a daily basis. And what we’ve seen in different places is that
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obviously, there's still a big learning curve here. Because you cannot operate a biomethane plant without the right skills, without the right expertise. And that is especially the case to avoid leakage of methane, which as you know, is a very potent greenhouse gas, about 70-80 times worse than CO2.

Another very important aspect related to methane leakage is that you need a lot of water in order to test whether the infrastructure is sealed and watertight. And here, there is clearly an environmental issue that has to be addressed.

And lastly, what really matters is that you have the right scale of installations. Not too big because otherwise you will tend to collect the substrates from a very wide distance to put into your production unit, and that increases your carbon footprint. But not too small either, because otherwise, you don't have the benefits of economies of scale. Also, you really have to make sure that the biomethane units are located close to the natural gas grid or that there are filling stations for vehicles on-site, for example. Because these connection costs can be very expensive.

Now, the other key issue to have in mind is that the biomethane industry is only starting to grow in Europe. So far, the whole industry produces only about 2 billion cubic meters (bcm) of gas per year. And total EU gas consumption currently stands around 470 bcm per year.

So at the moment, it's nothing, it's peanuts. But as more and more projects are being developed (an average project costs around €7-10 million), with the growing competition that is coming, the more there will be interest from the industry to reduce the cost of purification that's needed. And the costs can be expected to decrease slightly.

However, this is not a technology where you can expect to see the same cost decrease trajectory that happened with solar and wind. And that has to be very clear. You can't say that in 5 years, the costs will be 70% less than what we have now, this won't happen.

**This is because the whole production process is more complex, I guess. You need to have clean inputs which are hard to come by...**

Yes, it's more complex, and one has to have a real system approach to that.

**It's kind of odd that France is not a leader in developing biomethane because it's the biggest agricultural country in Europe. Is it not also the place where the potential is highest?**

Yes, absolutely. The potential is tremendous in France. But this has to be put in a wider context. France has been slow on every possible renewable energy technology – be it offshore wind, solar, hydrogen, and now biomethane.

So you can be surprised, but this is typical of France's insufficient strategy towards supporting low-carbon energy technologies.

**Which is probably due to France's obsession with nuclear, right?**

No, I don't think so. EDF, for example, is very involved in solar and wind. It's more because of the overall budgetary situation of France, which is not good. Too much debt has piled up over the last decades, without enough reforms. And as a consequence, there's not enough money available for developing biomethane.

**And lack of government will maybe as well?**

Yes, absolutely. Clearly, the money goes elsewhere, it goes first to repaying our past debt. Then it goes to the military, and other priorities. Let's also see the big picture, France doesn't have the same spending structure as other EU countries.

But the key issue here, though, which must be said, is that France does not have the same pressure than Germany or Denmark to decarbonise its electricity system.

**And that's thanks to nuclear.**

Yes, thanks to nuclear, of course.

**You were referring to the cost issue in Germany. Do you think the cost of biomethane or biogas has any chance of reaching parity with natural gas at some point?**

No, it's impossible. But still, what is possible is that by integrating all these externalities, and having a higher price for CO2, then clearly it will make more sense to produce biomethane locally rather than importing natural gas.

**What kind of CO2 price do you think is needed to incentivise biomethane production?**

We are now around €26-27 per tonne of CO2 emitted. And clearly, anything around €50 per tonne would clearly help biomethane.

But if you value all the externalities of biomethane, assuming that everything's done spick and span, you can probably come to a value in the range of €40-60 per cubic meter.

And so that's interesting because the current production cost is around €95 per megawatt-hour (MWh). And if you take out these €40-60/MWh of benefits that you can get, you come to a price which is around €35-55/MWh. And that compares well to the current average wholesale price for electricity. And that is not far from the natural gas prices, which currently are historically low. It also somehow compares with some of the wind breakeven prices that are out there.

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So you would say it’s worth pursuing?

Yes, it’s definitely worth pursuing. But I think we need stronger regulation, stronger oversight. And we need to go through the learning curve.

What kind of stronger regulations are you talking about?

I think we need regulation related to the injection of biomethane into the gas grid. Rules on who has access to the grid, what is the obligation on the gas transmission system operators, rules on gas quality, etc.

We also need rules on how the units should be maintained and operated in terms of safety standards, environmental standards, and so on.

And lastly, very importantly, I think we need a real general system for guarantees of origin. And that is something that needs to be harmonised at EU level in order to create a clear, EU-wide opportunity for biomethane development.

These guarantees of origin would also apply to the whole range of gases – including hydrogen and synthetic gases, right?

Yes, this is really a missing piece of the puzzle. And I’m very confident that work is being undertaken at the European Commission’s energy directorate to clarify this.

Now the question is whether there will be a fourth gas package, or whether that will be diluted in different policy streams. My take is that a fourth gas package, right now, is not the biggest political priority for the Commission. Following the European elections, and the drive towards carbon neutrality, there are clearly other areas to work on.

Guarantees of origin are meant to ensure that the gas – whether biogas or synthetic gas – is environmentally-friendly. But there are also sustainability criteria, which have been added to the renewable energy directive. Wouldn’t that be sufficient? Or are those criteria too vague in your view?

That is a tricky question because you can produce biomethane from any possible type of waste.

But clearly, some pose a number of issues. In France for example, there were public protests related to the odorous pollution related to a few units. And that pollution comes when improper intakes are put into the biomethane units. A second type of problem comes when the biomethane units are not properly operated.

And obviously, here, looking into environmental performance, economic performance, and social acceptance, that is something that needs to be looked at as well.

Do you think targets for biomethane or biogas, like for electricity coming from renewables, would be desirable?

No, I don’t think targets are desirable. If you start putting targets for biomethane, then you’ll also want to put targets for Blue Hydrogen, Green Hydrogen, Grey Hydrogen, and so on.

And then you end up with a system that is probably not going to be optimal. Because, it may be that France and Italy are the best-suited countries for biomethane, but Slovakia or the Czech Republic might not be, for different reasons. So targets would be very tricky to do, and I wouldn’t go for it.

But putting a carbon price on biomethane under the ETS system, and further expanding carbon pricing to transport and buildings – I think that would make sense. It would send a signal to the automotive industry, for instance.

You know, let the member countries develop their own strategies towards achieving carbon neutrality. Some will want to put all the emphasis on biomethane and less on offshore wind. These are national choices to be made.

The industry says targets are needed in order to give a boost to the sector...

I know, the industry claims it could go up to 50 billion cubic meters (bcm) of biomethane by 2030.

But frankly, we are now at 2 bcm per year. And, do we need 50 bcm to have 10% of the EU gas market? Well, by 2030 total gas demand in the EU could be much less – it could be around the 420 bcm or so.

The second thing is, let’s not put targets, let’s just set the right conditions for the market to decide which technology to invest in, what is more appropriate given the local circumstances, while making sure everybody plays by the same rules.

My take is that we could reach around 20 bcm of biomethane production by 2030 in the European Union. That’s assuming the UK stays in the EU, of course. Without the UK, it would be slightly less.

That’s already huge...

It’s quite a lot, yes. But I believe these 20 bcm are possible, if we have clear strategies of sector coupling, for example for use in transportation. And in that case, I think we can reach that level.

Local acceptance is also a strong hurdle for biogas development in many countries and rushing to meet overambitious EU targets could actually strengthen social resistance.

I’m also convinced that biomethane has to be seen in conjunction with hydrogen. Because part of the equation is what to do with the existing gas grid infrastructure. And so clearly, biomethane would also have to be looked in conjunction with the forthcoming development of hydrogen injection into the natural gas grid.

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**What do you think should be put in place to achieve 20 bcm by 2030? What are the main ingredients to do this in your view?**

First, the industry has to show that technically and environmentally, the plans that are now being developed, are working properly.

Second, we have to see a decrease in the cost of deployment for those installations. And clearly here, scale will help because there will be growing competition from different suppliers. An important element here is that Chinese companies are increasingly coming into that segment. Because there is a serious ambition to develop biomethane in China.

Thirdly, the carbon price has to increase and decarbonisation targets for 2030 have to be strengthened, above 40%. And this is the ambition of Ursula von der Leyen, the incoming President of the European Commission.

Biomethane development is also related to the future of the Common Agricultural Policy. Because, let’s be frank, biomethane support schemes are also meant to support the agricultural sector. In France, for example, there are already support measures in place via the energy sector, allowing farmers to put solar roof panels on their hangars and to cash-in a very high feed-in tariff.

And that raises a fundamental political question: do you want to push biomethane further because you consider that this is an efficient support measure for the agriculture sector that has other benefits? Or do you want to use another form of support scheme – for example, direct subsidies to buy new tractors?

So this is a related debate, but which is important in my view. And this debate will have to take place because the Common Agricultural Policy is one of the issues that will be looked into by the next European Commission.

**Good, so that’s the perspective for 2030. Do you have any idea about biomethane projections for 2050?**

Well, no. My take is that 2030 is the right horizon because obviously, there’s not an unlimited potential for biomethane. One needs to avoid the mistakes that were made when coal power plants were switched to take in wood pellets. In the South of France, we came to a situation for example, where loads of wood were imported from Brazil to the Port of Marseille and transported for burning in an electricity plant.

**That is the same issue that Europe had with biofuels, right? With deforestation in places like Indonesia and Brazil. Do you think the same risk looms with biomethane?**

Yes, of course there is a risk. But this is a broader question because you also have the same issue with plastic waste. The localisation aspect will be key in that regard.

And the size of the plants will be important too. You need infrastructure that is not too small in order to have economies of scale but you cannot have super-large infrastructure either. One has to look at the optimal size: not too small, but too big might carry a risk in terms of imported deforestation.

This is why I think 2030 is the right target to look at. And much of the potential, I think by then can be already fulfilled.

**If I understand you correctly, biomethane has to be seen mainly as a local source or energy, depending on the local agricultural production, and the local transport, electricity and gas infrastructure. Is that the main message you would have for policymakers looking to develop the biomethane industry in order to avoid the past mistakes made with biofuels?**

Oh, yes absolutely. Biomethane is to a large extent about local territorial development.

**Your 20 bcm projection for 2030, how did you come up to it?**

First, we looked into existing plants and their current production. We then looked at the number of plants that are being developed, and we made an assumption about how many are going to be realised or not. And that’s how we came up with this number.

So basically it’s qualitative in the sense that we didn’t take into account how countries are going to transform their subsidy scheme, and so on. And still, we came out with that 20 bcm figure.

**That’s a lot less, of course, than what the industry came up with…**

Yes, but it’s still 10 times more than what we have now, which is a real step forward.

**Anything you want to add?**

I think the biomethane debate has to be seen in the context of the wider greening of gas, which includes hydrogen. And a lot of support schemes will also go to hydrogen. It’s not like biomethane is the only technology option available, there are also others. So it’s part of the solution.

**It’s a small part of the solution, though…**

Yes, but there is no big part of the solution. That has to be understood. It is a small part of the solution, like CCS, like hydrogen, etc. The bigger parts of the solution are energy efficiency, wind, solar, and nuclear.

So that’s clear, biomethane cannot be a big part of the solution. But it’s a very important small part because if you don’t have the small parts, then you don’t have the energy transition.
The future of biogas in Europe: it’s a local affair

By Frédéric Simon | EURACTIV.com

The prospects for biogas in Europe look bright, with conservative estimates pointing to a tenfold increase in production by 2030. However, the industry will need to stay rooted in the local economy and come clean on environmental credentials if it wants to avoid a green backlash, analysts say.

Biogas production remains tiny at the moment. The whole industry in Europe currently produces about 2 billion cubic meters (bcm) of biogas per year, a small fraction of total EU gas consumption, which currently stands at around 470 bcm per annum.

“At the moment, it’s nothing – it’s peanuts,” says Marc-Antoine Eyl-Mazzega, energy director at the French Institute for International Relations (IFRI), a think tank.

Most of the production is currently located in Germany, which hosts 9,500 or so biogas plants, more than half the total number of installations currently in operation across the EU.

But the industry has big ambitions

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for the future, with France and Italy now seen as the new European leaders. A study commissioned by Gas for Climate, an industry consortium, claims production in Europe could skyrocket to 98 bcm of biomethane by 2050 – a 4,800% increase on current levels.

Those estimates are controversial however. The International Council on Clean Transportation (ICCT), a green NGO, evaluated the potential for sustainable biogas production in Europe at 36 bcm per year by 2050, much less than industry projections.

So why do estimates diverge so widely? Essentially because of projected costs, which are linked to environmental concerns.

**GERMANY’S MISFORTUNES**

In Germany, the inputs going into biogas plants were almost entirely agricultural crops – mainly maize – that were grown specifically for the industry.

However, the intensive agriculture it required, as well as the overall environmental footprint of the industry, attracted growing criticism and the government decided to halt its support.

Today, even industry representatives acknowledge that the German experience with biogas was not convincing.

“Germany was the trouble child of Europe because of the huge amount of maize that was grown as a primary crop for use in biogas production,” says Susanna Pflüger, secretary general of the European Biogas Association (EBA), a trade group.

“All these sustainability issues were raised and the German government put the support scheme on ice,” she told EURACTIV.

When the German government decided to roll back support in 2014, production soon began to stagnate.

“Nowadays, they only support biogas when it is produced in very small installations, basically farmer’s installations, using mainly manure as a feedstock,” Pflüger said.

“So there is no more support for primary energy crops used for biogas anymore in Germany,” she told EURACTIV.

These days, the industry prefers to focus on less controversial feedstocks such as livestock manure, or agriculture waste and residues, which do not compete with farmland used for food production.

This is the model championed by Denmark, which opened its first manure-based biogas plant in 1975. The country started developing biomethane at scale after the adoption of its national “energy agreement” for 2012-2020. As a result, “biomethane now represents about 10% of what’s injected in the natural gas grid, which is a lot,” Eyl-Mazzega says.

The Danish model has now become the gold standard in Europe, and has largely inspired others, like France and Italy.

**A CIRCULAR ECONOMY APPROACH, ROOTED AT LOCAL LEVEL**

In France, the government’s stated objective is to offer an additional source of income to farmers and stimulate the local economy in rural areas. There are environmental benefits too: biomethane production from agricultural waste and residues produce digestates which provide an alternative to chemical fertilisers. Those in turn enable avoided carbon emission, which is a good thing for the climate.

The economic and environmental benefits of biogas production – mainly centred on rural communities – are not called into question by environmentalists. The difficulty they point out, is to ensure installations are not too big and located in the right place in order to avoid transport-related costs and emissions.

The ICCT study, for instance, points out that biomethane production plants are typically scattered across a multitude of farms in the countryside, far away from urban centres where gas grids are typically located. Collecting all that biomethane from the farm, and bringing it by truck for injection into the urban gas grid involves additional transportation costs, and related carbon emissions, which also have to be taken into account, they point out.

This is why greens see biomethane mainly as a local source of energy.

“By far the most economic way of using biogas is to use it on site,” says Lisa Fischer, a researcher at climate think tank E3G. “But then, it doesn’t really generate additional income for farmers,” she adds.

“So it’s a bit either or – either you consume it on site, or you sell it to the grid,” Fischer told EURACTIV.

Still, France had the highest growth rate for biomethane plants in 2017-2018 due to favourable policy conditions, according to Bioenergy Europe, a trade association. The government’s aim is to reach 1,000 biomethane plants injecting gas into the grid by 2020.

And the French approach – for the time being – is indeed firmly rooted in a local, circular economy model.

“What we see now increasingly in France is that you have basically a biomethane plant that will be integrated in a system whereby it will supply fuel for the local city buses, school buses and logistics companies that are located nearby,” says Marc-Antoine Eyl-Mazzega of IFRI.

“And so this circular economy aspect is being closed by the opportunity to use the digestate from the biomethane as fertiliser,” he says.
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**METHANE LEAKAGE**

However, Eyl-Mazzega says this is only the theory. According to him, there are a number of fundamental issues that need to be addressed in order for biomethane production to become truly circular and environmentally-friendly.

The first relates to what comes in the biomethanation plant. If the gas is produced from the chemical breakdown of industrial or municipal waste, the digestates probably won’t qualify to be used as fertiliser, he points out. That means strict quality controls are needed on site, which requires competent staff to manage the installations on a daily basis.

Another aspect relates to location. Ideally, Eyl-Mazzega says biomethanation units should be located close to the natural gas grid or be fitted with fuelling stations for vehicles on site, “because these connection costs can be very expensive”.

One particular challenge relates to the process itself and the potential leakage of methane, a greenhouse gas which is about 70-80 times more potent than CO2. According to Eyl-Mazzega, specific skills are needed to test whether the installations are properly sealed to prevent methane from leaking. However, those tests require “a lot of water,” he says. “And here, there is a clearly an environmental issue that has to be addressed”.

Finally, the size of biomethane plants matters hugely, Eyl-Mazzega continues. “You need infrastructure that is not too small in order to have economies of scale but you cannot have super-large infrastructure either,” he cautions, saying this “might carry a risk in terms of imported deforestation.”

“One needs to avoid the mistakes that were made when coal power plants were switched to take in wood pellets. In the South of France, we came to a situation for example, where loads of wood were imported from Brazil to the Port of Marseille and transported for burning in an electricity plant.”

**SCALING UP: GUARANTEES OF ORIGIN**

All these issues don’t matter much for the time being because the biogas industry is so small. But the sector will come under increasing scrutiny as the industry grows in size.

France had the highest growth rate for biomethane plants in 2017-2018 due to favourable policy conditions, according to Bioenergy Europe, a trade association.

So to ensure trust in the industry, Eyl-Mazzega says a robust system of Guarantees or Origin (GOs) is needed to certify how the biomethane is produced, and with what kind of feedstocks. Because the environmental impact won’t be the same if the gas comes from agricultural residues or from dedicated crops, like the carbon-intensive maize that was once promoted in Germany.

The biogas sector itself is quick to point to the limitations of the German model, saying Denmark, Italy and France are now showing the way forward.

“What we are talking about – and what farmers are talking about – is using secondary crops for biogas production,” says Susanna Pflüger from the European Biogas Association (EBA). “This is already the practice in Italy: farmers there grow two crops per year, one for food one for fuel, which means they use the land more efficiently,” she says.

“Biogas is a very local product. We don’t want to start bringing feedstocks from far away. It must be as close as possible from where it’s consumed,” Pflüger insists.

Environmentalists agree. But they also warn that whether secondary crops are environmentally-friendly or not depends very much on local circumstances.

“You can do things like intercropping in Italy and that may be fine and sustainable because of the climatic conditions there,” says Lisa Fischer of E3G. “But this is not replicable necessarily elsewhere in Europe, especially if you move towards the north,” she points out.

Eventually, the industry’s ability to grow in size will depend on its capacity to demonstrate the environmental sustainability of its products. This is why the introduction of a European-wide system of Guarantees of Origin (GOs) is considered essential for the sector.

“What we’re asking for is that all countries producing biomethane put in place national registries,” Pflüger says. “The national registries should be harmonised all over Europe, issuing the same certificates and naming the feedstocks used for biomethane production.”

According to Pflüger, the European Commission is currently evaluating a scheme developed by the European Renewable Gas Registry. The scheme is currently voluntary but could receive the nod from EU policymakers and become mandatory in the future.

“Our problem is not just tracing sustainability,” she says. “Once biomethane is injected into the grid, you can’t separate it from natural gas, the molecule is the same,” she points out. “So we need to trace what goes in and what goes out of the pipeline in order to avoid double counting”.

Until a robust traceability system is in place, growth projections for the industry are likely to continue diverging.

“What we say for 2030 is that we can have something like 45 bcm from

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anaerobic digestion and biomass gasification,” Pflüger says, referring to the potential of intercropping and use of residues from the agriculture and forestry sector.

Eyl-Mazzega, for his part, comes up with more modest numbers. “My take is that we could reach around 20 bcm of biomethane production by 2030 in the European Union,” he says – much less than what the industry came up with, but still 10 times more than current production levels.

Policymakers will ultimately decide where they want to place the cursor. But Eyl-Mazzega says the biomethane debate has to be seen in the wider context of the greening of gas: if regulators get it right with biomethane, they will increase their chances of success when it comes to promoting other low-carbon gases like hydrogen.

And this could matter hugely for the success of Europe’s transition to a 100% renewable energy system.