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RENEWABLE GAS

SPECIAL REPORT | 25 - 30 OCT. 2017
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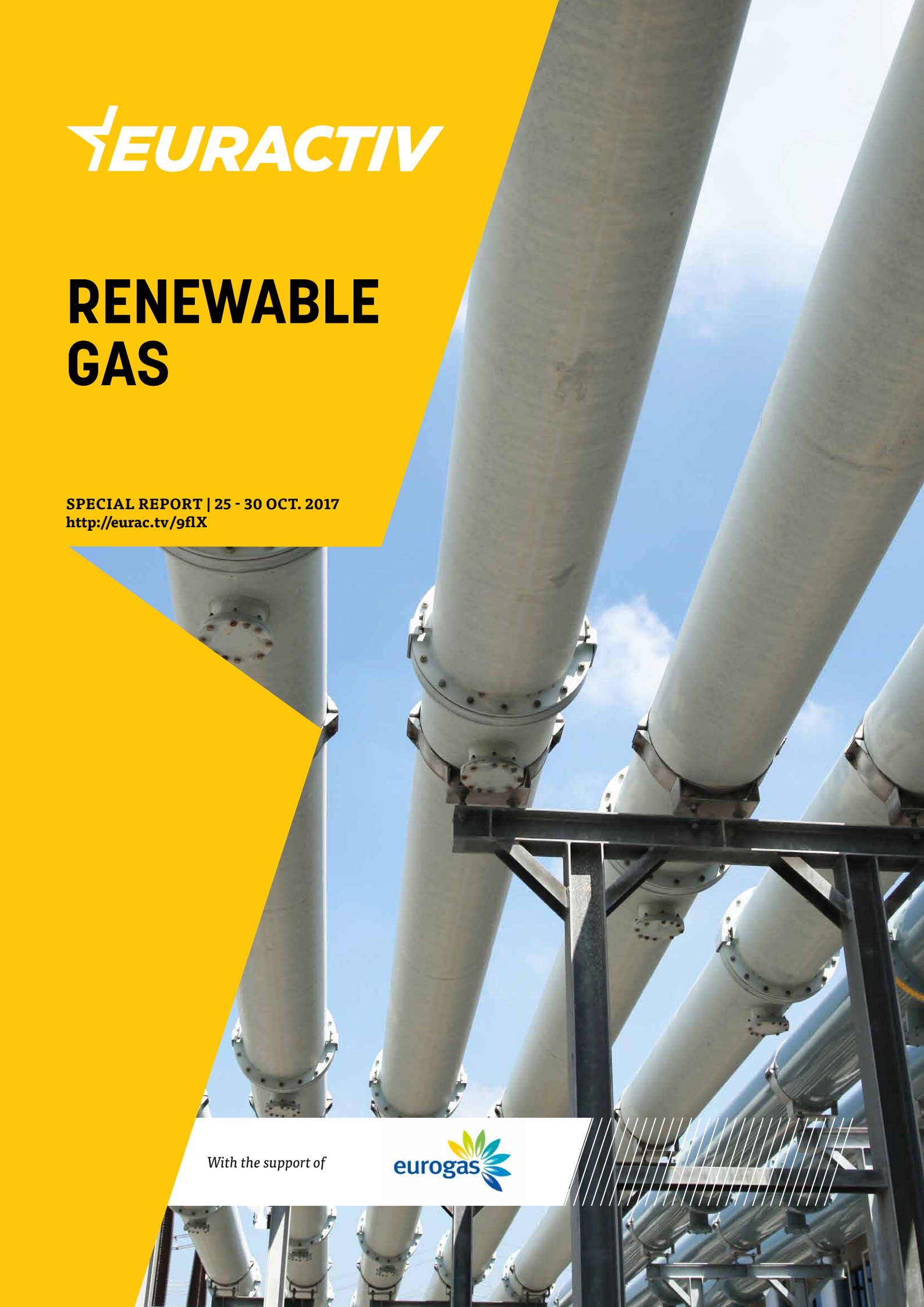

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INTERVIEW

Gas lobby chief: 'In 2050, 76% of gas could be renewable'

By Frédéric Simon

"Power-to-gas is a very energy-intensive process but if you have excess electricity, why not put it to good use?," says Beate Raabe. [© 2017 Eurogas]

The excess wind and solar electricity generated at times of oversupply could be used more systematically to produce synthetic gas, providing a convenient way of storing renewable energy that would otherwise be lost. The potential is huge, and can be used to heat homes during winter, argues Beate Raabe.

Beate Raabe is Secretary General of Eurogas, the trade association representing the interests of the gas industry in Europe.

She spoke to EURACTIV's energy and environment editor, Frédéric Simon, ahead of Eurogas's Annual Conference: "Renewable gas: balancing our energy" taking place on 27 October at The Hotel in Brussels.

"Renewable gas": that sounds a bit like an oxymoron. Is this not an attempt to make natural gas look greener than it really is?

Our objective is to inform people that gas is not just natural gas but can also be renewable. People are familiar with the term biogas for instance. But not all renewable gas is biogas. And that's why we are saying "renewable gas" in order to cover the whole range of renewable gases that exist.

So what are the gases that can be considered renewable?

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Let's start with biogas. People know that biogas is made from manure and that many farmers produce it and use it directly on the farm or in cooperation with other farmers. Because it's gas that has impurities so it cannot be injected directly into the grid. You can use it to produce power straight away, you can use it locally in combined heat and power (CHP) plants. So there is a lot of biogas that goes directly into CHP.

But you can also upgrade biogas and bring it up to a standard that makes it suitable to be injected into the gas grid – and then be blended with natural gas. That's biomethane. That's the beauty of it – you can use the existing gas grid in order to transport and store this renewable gas.

And there are lots of sources from which you can produce biogas – manure, sewage and waste, whether agricultural waste or municipal waste. We have millions of tonnes of waste in Europe and a lot of that would be suitable to be turned into biogas and biomethane. So it's a great opportunity to contribute to the circular economy and solve the issue of heaps of waste that municipalities have to deal with.

Some of that waste – in particular plastics, metals and paper – is supposed to be recycled.

Yes, but a lot of waste is still going to landfill or is simply burnt. And that waste can be used in order to produce gas – which is called gasification of waste. Cutting-edge gasification technologies can effectively process a very wide bandwidth of wastes, including municipal waste.

Returning to renewable gas, it's also about hydrogen, right?

Yes, this is the less well-known area of renewable gas – hydrogen and synthetic methane.

You can use the excess electricity of wind and solar that would have to be curtailed otherwise at times of oversupply to split water molecules into hydrogen and oxygen. And then you obtain hydrogen as a gas. This is called "power-to-gas".

It is a very energy-intensive process, but if you have excess electricity, why not put it to good use? And there are times when the electricity is very cheap – the price can even be negative. And then it makes sense to use that electricity to produce hydrogen.

Hydrogen can be injected into the gas grid to a certain extent, which is a drawback. There are studies underway to establish how much can go into the grid without causing problems with household appliances, like your gas burner.

At the moment, there is a consensus that about 10% of hydrogen in the gas grid would be very safe. So you could operate your appliances normally – whether for cooking, heating, etc. However, there is an ongoing project in Leeds to change the entire natural gas grid to hydrogen.

Synthetic methane goes one step further. You can make that hydrogen react with CO_2 – and you can use the CO_2 out of the air or from industrial processes. You combine the H atoms with the C atoms of the CO_2 molecules and you get CH_4, which is methane. And that way you are producing synthetic methane which has exactly the same composition as natural gas.

How energy-intensive is this process?

Producing synthetic methane is also relatively energy-intensive, so you would lose efficiencies doing it. But at the moment, this is the only large-scale and seasonal storage of energy available. Batteries are being developed. But there is no development in sight at the moment that would allow electricity to be stored in a battery on a large scale over a longer period of time.

For example, you can balance seasonal differences in heating demand with synthetic gas. In winter, demand for heating can be five times as high as it is in the summer. The gas grid can deal with that. But if all heating was electric, you would have a problem because the electricity grids cannot cover these fluctuations. On the other hand, if you have used the excess electricity to produce synthetic methane, you can use that to heat your home when it's particularly cold.

So that's the main upside, renewable gas can be used as a backup for renewable electricity.

It would become more than a backup. It would become a renewable fuel in its own right, which forms an interface with the electricity sector. And that's why it is so important to have sector coupling – looking at the electricity in connection with the gas grid to see how the two can best interact.

What is the current market share for renewable gas? And how much do you see it developing in future?

We have about 18 billion cubic meters of renewables gas at the moment – most of that is biogas – in a gas market of about 450 bcm. So that makes about 4%. It's very small, it's a technology that is still under development, let's not forget that. But the potential is huge – whether for biogas, synthetic gas or hydrogen – and we need to develop that potential.

Assuming your expectations are met on the policy side, can renewable gas ever replace fossil fuel gas?

We asked E3MLab at the University of Athens to use the PRIMES model in order to do a scenario study on renewable gas. And they came up

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with a scenario where, in 2050, there would be about the same demand for gas as today, but 76% of that gas would be renewable. So that is the potential they came up with.

Is this a realistic projection or is it theoretical?

At the moment it is a theoretical figure because we are talking about a distant time-horizon. But if the framework is correct, this is thinkable, it is a scenario based on realistic assumptions.

How can EU legislation help increase the share of renewable gas? Does the proposal to revise the Renewable Energy Directive meet your expectations in this regard?

It is helpful in the sense that Commission proposed that guarantees of origins are now also discussed for renewable gas. But there are also some gaps. For example, a level playing field would need to be created with respect to subsidies.

And we're talking about much less subsidies than renewable electricity has received. For example in Germany in 2000 the subsidy for photovoltaic was up to €500 per megawatt-hour, and power-to-gas today would require a subsidy of around €130/MWh. So although we need the support to do research and development on renewable gas, the subsidy would be much less than for renewable electricity in the past. And we could see the same learning curves for renewable gas that we have seen for photovoltaic.

So equal treatment between renewable electricity and renewable gas is something we see as necessary. And there are little bits and pieces missing in the treatment of renewable gas – not just at EU level but also at the national level.

For example in Germany, if you produce synthetic gas through power-to-gas, you have to pay all the taxes and levies that apply. So you buy the electricity, paying the grid fee, energy tax, renewables charge and concession fee. That is quite a big chunk of cost that renewable gas has to face today.

Do you see the market driving down costs naturally in future? If there are so many advantages to renewable gas, why doesn't the market do its magic, without regulatory support?

What we're asking for is equal treatment with renewable electricity. So we're not asking for special regulatory treatment for gas. And as I mentioned before, we're asking that the electricity and gas grids are considered in combination.

How much would that require in terms of infrastructure upgrade and investments?

Not much at all. Because you take the electricity out of the local grid, run it through the power-to-gas plant and the gas goes straight into the existing gas grid. So all it needs is a power-to-gas plant and a connection to the gas and electricity grids.

And in places like Northern Germany where there is a lot of wind, this is where there are the best synergies for building a power-to-

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gas plant. Power-to-gas started in Germany in fact because of the push for wind and solar energy, which have created excess electricity. But it is now also being developed elsewhere, in Italy and Switzerland for example.

Germany also has issues with the transmission of electricity from North to South. The South cannot benefit from the wind that is produced up North unless large interconnectors are built. And there is local resistance to building interconnectors. So there is a role for power-to-gas there.

Is the industry ready to make a commitment to raise the share of renewable gas, assuming you get the necessary policy backing?

It's a matter of economics. If you have a reasonable return on your investments, you go for it, it's very simple.

In terms of targets, there is already a renewable target at EU level and national renewable targets up until 2020. And renewable gas can contribute to achieving those targets. In the Netherlands, for example, 30% of renewable energy is actually biogas.

And at EU level, can you give an assessment of the potential of renewable gas to the EU's overall renewable energy target for 2030?

That is difficult to say. The overall potential is big. You would need to work it backwards to see the conditions that are needed. The time-horizon for a large-scale take up of renewable gas would be 2030-2050.

But don't forget that natural gas is the fossil fuel with the lowest CO2 emissions. And there is a lot you can do as well by replacing coal with natural gas. If you just increased the running hours of gas-fired power stations, most of which are not running much at the moment, you could actually exceed by 2030 the EU's 40% greenhouse gas reduction target by 6%. And that would just be based on using more natural gas than coal – without replacing coal completely.

So that's why our horizon is long-term – we can achieve a lot at lower cost by first replacing coal with natural gas and then increasingly adding renewable gas to the natural gas.

Biogas or biomethane could run into similar environmental issues as biofuels when it comes to land use change, food prices, or deforestation. Have you given some thought to these issues?

We are focusing in particular on making use of waste rather than arable land, or forests. So we don't have the same issues.

At some point, you will run out of waste, however.

You won't run out of waste because you will always have agricultural waste, municipal waste, or animal waste. We're a wasteful world.

OPINION

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Making the energy transition possible through green hydrogen and power-to-gas

Tackling climate change is an ambitious project. [Uniper]

Tackling climate change is an ambitious project. The EU's flagship Clean Energy Package sets ambitious targets to reduce CO2 emissions and achieve decarbonisation. Emissions should therefore drop rapidly and significantly across all sectors, writes Dr. Axel Wietfeld.

Dr. Axel Wietfeld is managing director of Uniper Energy Storage GmbH

While the power generation (and partly the heating) sector has been undergoing change for many years, relatively little has been done in the transportation sector so far.

Politicians are now calling for a rapid switch to electric cars and some even call for a total electrification of the mobility sector. However, they underestimate significant challenges associated with such a scenario: in addition to expanding charging infrastructure, it will be extremely difficult to ensure the constant availability of large amounts of electricity to fuel a car.

The solution may be simpler: "green" hydrogen produced from

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renewable sources can be used to future-proof our economy and make it more environmentally friendly. This can be done with the "power-to-gas" process. It means using electricity generated from renewable energy sources to split water into hydrogen and oxygen (electrolysis). From a technical perspective, power-to-gas is ready to enter the market and enable rapid results for our climate.

The production of green hydrogen allows the use of renewable energy in new applications in various commercial sectors, which reduces CO2 emissions. The key word here is "sectorial integration", e.g. green hydrogen can be used in the petroleum industry in refinery processes, thus replacing "grey" hydrogen produced from natural gas and crude oil.

Furthermore, green hydrogen can be used in the transport sector. Many automobile manufacturers are already developing fuel-cell vehicles. In rail transport, green hydrogen is considered as a zero-emission alternative fuel, with the first fuel-cell train due to begin trial operations in Germany next year.

But the power-to-gas technology can do even more. It is a "master key" to unlock the energy transition potential, enabling more efficient integration of intermittent power generated by wind and solar plants by decoupling production and consumption. Power grid constraints often lead to curtailment, and there is no way to use this surplus energy or store it for times of higher demand. Even the largest batteries can only help balance demand over the course of a few hours for a limited number of consumers. In 2015, almost five billion kilowatt hours of renewable energy were curtailed in Germany. This would have been enough to power a city the size of Hamburg for four months.

Power-to-gas offers a solution: using the process of methanation to convert green hydrogen into synthetic methane, which can be used on its own or blended with natural gas, in any energy sector. This synthetic natural gas can store green energy, not just for the short term but for any length of time, in a well-established system of natural gas infrastructure with networks and storage facilities already in place. This also solves the challenge of transportation from wind power production centres to areas of high demand – a lot of potential is unleashed when combining electricity and gas grids to a smart energy grid.

Given these excellent conditions, why do we not have more power-to-gas plants yet?

Initially, it seemed easier to continue expanding renewable electricity, switching heating and transport to electrical sources. However, the massive infrastructure costs of such a policy — required networks and charging infrastructure — are only now starting to become fully apparent. And barely any consumer is aware of the consequences of such a scenario, namely that at times of low availability of renewable electricity sources, there is no guarantee of a reliable power supply. Moreover, the gas sector feels more confident to promote renewable gas now that a number of projects have been proving its potential.

For power-to-gas to be economically viable and to contribute to a successful energy transition, the political framework must be improved. This can be done, for example, by defining power-to-gas plants as storage or energy conversion facilities instead of "end consumers". This would eliminate the cost allocations and levies which currently hamper commercial viability in Germany. In addition, the European Parliament and Council now have a chance to treat renewable electricity and renewable gas equitably in the Renewable Energy Directive and to link the electricity sector with the gas sector in the Electricity Regulation.

Finally, incentives must be created to use green hydrogen in industry as it would reduce investment costs and enable further applications. This has to happen fast – for the sake of our future energy supply and the fight against climate change.

Do everyday citizens care about renewable gas?

By Sam Morgan

The virtues and shortcomings of renewable gas are being talked about more and more. But are people actually aware of it? [Shutterstock]

The idea of renewable gas is relatively new and the average European citizen would be forgiven for not knowing what it entails. Industry and institutional representatives are split over how much people actually need to understand.

Renewable gas is being touted as a way for Europe to make natural gas supply greener, decarbonise the agricultural sector and utilise surplus renewable energy, which continues to be wasted as storage issues persist.

Sector representatives discussed the future of the gas industry at an annual conference organised by industry association Eurogas in Brussels on Friday (27 October) and the focus was on the prospects of renewable gas in Europe.

Eurogas President Klaus Schäfer welcomed the fact that "the EU is progressively recognising the role of gas in the energy transition. The topic of power-to-gas is also gaining traction."

He added that making use of "quick wins" and using existing infrastructure and resources more efficiently could help the European Union smash its 2030 targets. Synthetic gas fits into this plan nicely, as it can be injected into existing grid systems.

But Climate Action Network Europe's Stephan Singer warned that the Paris Agreement targets, in particular the full decarbonisation of the economy, mean that continued use of fossil fuels in the transition has to be carefully approached. He pointed out that 25% of the EU's emissions

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come from gas.

Singer suggested that the gas industry should focus its efforts on encouraging and investing in renewable electricity generation, as this would have the knock-on effect of boosting power-to-gas and renewable hydrogen potential.

MAKING THE BEST OF IT

Doing more with what Europe already has was a central theme of the conference. President of the European Biogas Association, Jan Štambaský, revealed that existing infrastructure is capable of "methanising" 400TWh of electricity every year to create biomethane.

That figure is the same as France's entire annual electricity production.

The biogas expert also added that utilising technology like power-to-methane is the only way to decarbonise agriculture, which is "a sector that is as intensive as transport".

Axel Wietfeld of German energy company Uniper also highlighted the problem of wasted electricity, which he claimed stood at 4TWh in 2015. That amount of energy is enough to power the city of Hamburg for four months.

Storage issues still persist and the environmental impact of the production of batteries, due to cobalt mining in the Congo and Chinese production standards, is still a concern.

A PUBLIC CONCERN?

But are the general public even aware of renewable gas? The question was put to the panel and drew a variety of responses. Most agreed that citizens know little about the technology but opinion differed over how much the man on the street really needs to understand.

Štambaský acknowledged that a lack of awareness could be problematic but insisted that it is not a surprise the technology is unknown because it is still early days, adding that renewable electricity generation is still relatively in its infancy.

Head of advanced energy production at the European Commission José Cotta shared a different view: "It doesn't matter if citizens know what it is. It only matters if misperceptions affect policymaking. Technology take-up it more important than awareness."

Cotta referred back to a remark made by Klaus Schäfer earlier in the morning, where he compared the gas industry to mobile phone company Nokia and urged his sector to learn from the Swedish firm's loss of market leader position.

The Commission official elaborated, saying: "People never knew that they needed smartphones. We never knew that we needed an automobile instead of a horse. But look at where we are now."

As the issue of what to do with surplus energy continues, renewable gas looks set to play a greater role than before in the EU's energy transition. Whether everyday people will realise it is powering and heating their homes will remain to be seen.

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