



Technology Collaboration Programme
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Integration of anaerobic digestion with Power to X technologies

Early 2024, IEA Bioenergy Task 37 has published a report on combinations of AD and P2X with focus on renewable fuel and chemical manufacturing. Many countries and geopolitical regions have ambitions of achieving net zero carbon by 2050 (US and EU), 2060 (China) and 2070 (India). In advance of this, it is expected that a near zero carbon electricity system will be achieved in many jurisdictions around 2035. Beyond that date excess electricity from wind and PV will be used to produce hydrogen. The practicality of net zero emissions is extremely challenging. Decarbonising electricity and electrification of heat and transport is seen by many as a key pathway to net zero, but other pathways will be needed to abate the emissions from the very difficult to electrify (hard to abate) sectors of aviation, shipping, and long-distance haulage. One of the primary pathways of Power to X is power to methane ($4\text{H}_2 + \text{CO}_2 = \text{CH}_4 + 2\text{H}_2\text{O}$) whereby biogenic carbon dioxide (CO_2) is reacted with renewable hydrogen. A significant part of the report outlines the logistics of such systems when integrated with biogas facilities. But for net zero, decarbonisation must go beyond energy systems and extend to chemical manufacturing. Power to methanol is examined as a substitute for natural gas sourced methanol. Green methanol is seen as the route to decarbonising shipping. Many chemicals which we depend on (and produce in significant quantities) such as ammonia (NH_3) and methanol (CH_3OH) are sourced from natural gas. Biogas and hydrogen might be ready to replace at least part of the natural gas.

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Database of available resources in Germany and the EU

Biogenic waste and residues have a growing potential for a sustainable and bio-based economy. DBFZ makes freely available and systematically processed data available for the first time. The DBFZ's open-source database provides detailed information on the availability of various biomasses, including biowaste from private households, cereal straw and industrial residues. Using time series, extensive information on input materials for energy and material use can be read quickly and intuitively, and a biomass potential atlas can be used to trace the developments and potential of individual biomasses throughout the EU back to 2010. In addition to the database, the background paper "Biomass potentials of waste and residues" has also been published.

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From plant to grid: navigating biomethane injection

The European Biogas Association (EBA), within the framework of the GreenMeUp project, has evaluated regulations regarding grid connection cost sharing, gas quality, metering systems, and injection fees in 28 European countries analyzed to understand what it takes today to move biomethane from the plants to the gas pipelines. According to the EBA's database for 2022, 75% of biomethane plants today are connected to the grid (58% to distribution and 17% to transmission grids). Regulations with respect to enabling grid connection for biomethane plants are mostly addressed at the national level, and diverse approaches exist between countries. 10 out of 28 (EU+UK) countries have grid connection costs shared between biomethane producers and grid operators. France and Germany, for instance, split the connection costs in percentages between the biomethane producer and the grid operator for constructing pipelines from the biomethane plant to the grid injection point. In addition to the cost of constructing pipelines to the injection point, some countries also charge an injection fee, which aims to cover the installation and maintenance of metering and measurement systems, grid access charges, and costs for ensuring gas quality. This fee is applicable in 11 out of the 28 countries analyzed.

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The state of the US RNG market in 2024

The market for biogas and its upgraded product, renewable natural gas (RNG), in the United States has seen tremendous growth over the past decade. Still, the market remains small, with RNG production estimated between 0.2 billion to 0.4 billion cubic feet per day (bcf/d) in 2023 versus domestic geologic gas production of just over an estimated 103 bcf/d. The growth has predominantly taken place in the on-road transportation market. The two primary drivers behind the growth have been the federal Renewable Fuel Standard (RFS), a program that requires fuel consumed in the US transport sector to contain a minimum volume of renewable fuel, and the California Low Carbon Fuel Standard (LCFS), a program designed to decrease greenhouse gas emissions, lower carbon intensity (CI) in the transportation sector, and encourage use of low-carbon fuels in the state of California. State-level clean fuel programs in Oregon and Washington, modeled on the LCFS, also support RNG adoption in transport. To date, these incentives have led to widespread adoption of RNG in the natural gas vehicle transportation market, with an 84% market share in 2022 in the segment. However, historically volatile prices for renewable fuel credits and potential regulatory changes to these programs potentially put these additional revenue streams at risk. More adoption of RNG in the voluntary market, where utilities and corporations are beginning to take on a visible purchasing role, could help the market evolve beyond its traditional transportation sector footprint. Domestic RNG production is still anticipated to remain a small subset of total US available natural gas supply. If the full estimated potential for RNG in the US were completely realized, it would amount to less than 10% of today's geologic gas production. Various publicly available forecasts peg RNG production between 2 to 4 bcf/d by

2050. While transportation is considered a core market for RNG due to the support derived from various state-level credit programs and the RFS, non-transportation end uses are expected to create additional demand. Some utilities are pursuing avenues to decarbonize their grids. In some cases, they are working toward decarbonization through plans to blend clean hydrogen or inject RNG into their networks. RNG can provide a more short- to medium-term solution than clean hydrogen given its commercial availability today and the related infrastructure to support its use.

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2023 NGVAmerica Annual Report ready for download

End of February, NGVAmerica has released its 2023 Annual Report. The report highlights the national trade organization's 2023 legislative successes, including the introduction of bipartisan legislation to create a new \$1.00/gallon RNG motor fuel tax credit and expansion of Clean Fuels Standard program conversations in state capitols across the nation. Federal and state regulatory programs improved through NGVAmerica advocacy efforts are discussed as well as summaries on association outreach to fleets and NGV industry promotion and education activities. Details on NGVAmerica's Technology and Development Committee work to advance gaseous fuels technology development, codes and standards, best practices and other industry safety are also listed.

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Quality of biomethane for injecting into natural gas grid

Biomethane stands as a critical component in the decarbonization of the natural gas supply chain, although its market share remains modest in many countries, it has a growing trajectory. Despite this, biomethane is theoretically interchangeable with natural gas. In its newest publication, MARCOGAZ has undertaken the task of gathering data on the quality standards necessary for biomethane injection into natural gas networks across various European nations, facilitating a comparative analysis of national approaches. This document is an update of the document published in 2019 and available on MARCOGAZ website. Main changes are: Collect information for 14 European countries, two more than in the previous version. Changes in the quality parameter requirements in some countries.

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By 2023, the share of Bio-GNC has reached almost 40% in France

According to figures published by France Mobilité Biogaz, bio-GNC accounted for almost 40% of CNG consumed in 2023. Driven by demand from transporters and a growing willingness on the part of operators to go organic, biomethane continues to make headway in France. With 3.45 TWh sold in 2023, overall CNG consumption is up 16% on 2022. On the bio-CNG side, consumption reached 1.35 TWh in 2023, or 39.2% of the total CNG consumed over the period. This is also 26% more than in 2022. In terms of regional consumption, Ile-de-France remains in first place. With 1.2 TWh of CNG consumed, 18% more than in 2022, it alone accounts for 35% of all CNG sold in France over the past year. Cumulatively, total CNG consumption (CNG + LNG) for 2023 is thus set at 4.6 TWh, of which almost a third is organic.

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GRDF reconfirms its objectives for 2030

At its annual press conference, GRDF reaffirmed its objective of increasing the proportion of biogas in its networks to 20% by 2030. GRDF expects biomethane production to accelerate sharply in the coming years. While production passed the symbolic threshold of 12 TWh/year at the end of 2023, the company plans to increase the share of biogas in its networks to 20% by 2030. Production will then leap to 60 TWh/year, equivalent to the power of 11 nuclear reactors. According to the interactive map of biomethane production sites, France currently has almost

700 injection sites in operation, including over 550 connected to the GRDF network. In transport, bio-CNG already counts for almost 40%. Well ahead of the overall network trend, biomethane has made its mark in the transport sector. According to figures released by France Mobilité Biogaz via the Open Data Réseaux Énergies (ODRÉ), the proportion of bio-CNG reached 39.2% in 2023. A total consumption of 1.35 TWh equivalent to just over 10% of national biomethane production.

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[Study analyzes Minnesota RNG potential](#)

March was a milestone month for the renewable natural gas sector, as New Mexico became the fourth state to enact a clean fuel standard. The bill signing on March 5 came after years of effort from Gov. Michelle Lujan Grisham and is the latest example of a growing trend of states being interested in supporting RNG projects. A study examining Minnesota's RNG development potential further underscored the importance of state-level incentive programs. Researchers at the University of Wisconsin-Madison found that RNG from a range of project types could replace about 7.5% of Minnesota's natural gas use, but: "No projects are financially feasible without state or federal renewable fuel credit programs because direct sale of RNG alone does not cover project costs." The average profitability of different types of RNG projects is also influenced by incentives — manure anaerobic digester projects "have the lowest levelized cost of energy, the highest total revenue, and the shortest payback period" compared to landfills and wastewater treatment plants, because they're rewarded more by renewable fuel credit programs, the researchers confirmed.

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[EBA: Exploring digestate's contribution to healthy soils](#)

The European Biogas Association is launching a new exclusive report: Regulatory Framework Analysis for Digestate. The Regulatory Framework Analysis explores the specific requirements governing digestate management across 20 EU countries. To compile this invaluable resource, the EBA conducted extensive interviews with representatives from national biogas associations and leading biogas companies. While the analysis primarily focuses on regulations at the national level, it is important to note that there may be additional regulations at the regional level. This report is a crucial complement to our recently launched white paper, which explores digestate's contribution to healthy soils. Together, these publications offer a comprehensive overview of the potential of digestate in fostering healthy soils and advancing sustainable agricultural practices across Europe. Unfortunately, only members have access to the Framework Analysing

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[Making the Case for landfill methane emissions reduction](#)

A new study published in *Science* by Carbon Mapper, the U.S. EPA, the NASA Jet Propulsion Laboratory and others adds to the growing evidence of the outsized climate impact of point sources in the waste sector. Landfills emit high volumes of methane — many over months to years — and were responsible for 14.3% of methane emissions in the U.S. in 2021, according to EPA. The recently completed [study](#) is the largest measurement-based landfill methane assessment to date that identifies major emission sources missing from traditional model-based accounting that can be prioritized for immediate action. Sustained direct measurement tools use emerging surface-, air-, and space-based monitoring technologies. Key findings include: A) High emissions point sources are more prevalent in landfills versus oil and gas infrastructure. Of the landfills surveyed, 52% had observable point source emissions. This far exceeds the 0.2% to 1% detection rate observed for super-emitters from surveyed oil and gas infrastructure. B) Landfill emissions are generally more persistent compared to oil and gas production. C) There is a big difference between observed and reported emissions. On average, aerial emission rates were an

average of 1.4 times higher than the EPA's Greenhouse Gas Reporting Program.
Carbon Mapper's methane data from all over the world is publicly available on its portal.

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