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Newsletter IEA Bioenergy Task 37: 04/2024

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The amount of renewable energy capacity added to energy systems around the world grew by 50% in 2023, reaching almost 510 gigawatts (GW), with solar PV accounting for three-quarters of additions worldwide, according to Renewables 2023, the latest edition of the IEA's annual market report on the sector. The largest growth took place in China, which commissioned as much solar PV in 2023 as the entire world did in 2022, while China's wind power additions rose by 66% year-on-year. The increases in renewable energy capacity in Europe, the United States and Brazil also hit all-time highs. The report shows that under existing policies and market conditions, global renewable power capacity is

now expected to grow to 7,300 GW over the 2023-28 period covered by the forecast. Solar PV and wind account for 95% of the expansion, with renewables overtaking coal to become the largest source of global electricity generation by early 2025. For the first time in the IEA's renewable energy market report series, there is a special dedicated section to biogas. Europe is clearly leading the biogas production with 700 PJ/a followed by China, North America and India. A biogas forecast is also provided and discussed for the four leading regions.

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Integration of anaerobic digestion with Power to X technologies

This IEA Bioenergy Task 37 report employs an overarching perspective on circular economy approaches that could be used to integrate anaerobic digestion with Power to X technologies. It provides a menu of options that could be possible, whilst recognizing that all solutions are bespoke. It is expected that a near zero carbon electricity system will be achieved in many jurisdictions around 2035. In many countries it is seen that the future resource of renewable electricity (from wind and photovoltaic) will surpass the demand for electrification; hydrogen will be produced via water electrolysis to utilise larger resources of electricity or to facilitate electricity produced at times of low electrical demand. However, there will be a future role for renewable power to produce other energy carriers and chemicals. Generically known as 'Power to X' technologies, these technologies will produce renewable hydrogen molecules, which can be integrated with anaerobic digestion systems for production of methane (CH₄) and for production of methanol (CH₃OH: worldwide production of 110 million tons per annum). Power to X also includes for production of ammonia (NH₃) which has worldwide production of 160 million tons per annum.

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Biogases: Beyond energy

Biogases will play a pivotal role in delivering Europe's long-term energy security and climate mitigation objectives, as part of a forward-looking and balanced renewable energy mix. Besides, their benefits go far beyond the reduction of greenhouse emissions. Biogases are the cheapest and most scalable form of renewable gas available today. They are a dispatchable energy carrier. Moreover, biomethane can directly substitute natural gas and it can be stored using existing gas infrastructure and end-use technologies. During 2023, "Biogases: beyond energy" of the European Biogas Association explored the multiple solutions that biogases are already providing in the development of a European bioeconomy through 6 factsheets including Energy system integration; Regenerative agriculture; Transport; Heating and Industry. The last one on Sustainability appeared in December 2023.

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BIP reveals biomethane production costs from real industry data

The European Biomethane Industrial Partnership (BIP) has concluded a comprehensive study on biomethane production costs through real industry data. The study revealed that the average cost of biogas production and upgrading was €84/MWh for smaller plants and decreased to €54/MWh for larger plants. Notably, economies of scale played a significant role, with capital costs being 2-3 times higher per MW of capacity for smaller facilities compared to larger biomethane plants.

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Too much biogenic waste ends up in the grey waste bin

Every 10 years the Swiss Federal Office of the environment makes an extended Waste Bag Analysis. The 2022 campaign shows that still more than 35% of household waste consists of biogenic waste. 167,112 tons (kitchen waste, food, fruit and vegetables) are currently disposed of in waste incineration plants in an inefficient manner. Across all waste categories, the proportion of green waste represents the greatest potential for more environmentally friendly material recycling. The need for action is high and a rapid expansion of green waste collection services in urban areas and municipalities is recommended.

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North American RNG Projects Visual Map

The RNG Projects Visual Map, prepared by BiogasWorld and partially funded by Natural Resources Canada, is live and contains the information, pictures, and videos for over 600 RNG/biomethane projects from North America. The site allows to filter the plants according to the waste applied as major substrate. It is also possible to show the project list of more than 600 plants either in an ascending or descending alphabetical order or according to the year of construction.

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Updated map of gas injection points in France

France is the European champion when it comes to RNG injection. According to the updated map of February 2024, there are 674 injection points with an installed capacity of 12.1 TWh. The map offers a detailed selection of plants according to type of plant (agriculture, industry, WWTP, etc.), size of plant and grid operator. Besides the selection of the plants on the map, every single injection point is also listed in a table.

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Third Year of Record Growth for U.S. Biogas Industry

Newly-released data from the American Biogas Council (ABC) indicates that 2023 was the third year of record growth across the U.S. biogas industry, with nearly 100 new projects coming online last year— representing \$1.8 billion in capital investments. ABC expects this growth to continue into 2024, with more than 100 new projects already projected to go into operation this year. In 2023, 96 new biogas projects became operational in the U.S., pushing the total number of active U.S. biogas projects to 2,251, which represents \$39 billion in capital investment. The new projects produce 66,000 standard cubic feet per minute (SCFM) of biogas—an electricity equivalent to 4,000 football fields of solar panels, or powering 600,000 homes, or the fuel equivalent to eliminating 600,000 gasoline cars from the road. Landfill gas (LFG) continues to dominate in terms of both total investment and biogas output. The U.S. currently has 566 LFG projects, including 23 new projects added in 2023. This growth accounts for 57% of 2023 capital investments and a corresponding 67% of new U.S. biogas production capacity. The agricultural sector experienced 13.4% growth. Seventy new farm-based projects came online in 2023, contributing 21,000 SCFM of additional biogas output and resulting in capital investments exceeding \$700 million. While power projects that make renewable electricity from biogas account for 69% of all biogas produced in the U.S., RNG projects represented 91% of all new projects that came online in 2023.

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Deloitte Report Highlights Potential for RNG To Displace Natural Gas Demand

A new report from Deloitte has found that renewable natural gas (RNG) produced from waste could displace around 4.4% of current total U.S. fossil fuel demand, 16.5% of core gas customer demand and more than half the demand in the chemical sub-sector. The report, "A Ripe Time for Municipal Gas and Waste Renewable Natural Gas Partnerships," details how strategic partnerships between public gas utilities and waste facilities could position RNG to play a crucial role in decarbonization and resilience. According to Deloitte, waste from landfills and wastewater treatment is the third largest source of U.S. methane emissions, which are still mostly uncaptured, unutilized and unmonetized. Less than one-tenth of the country's municipal wastewater treatment plants (WWTPs) currently capture biogas, and only 2 percent of these are upgrading the captured biogas to RNG. Of the 1,641 publicly owned municipal landfills in the U.S., Deloitte reports that 248 are capturing biogas through anaerobic digestion, mostly for electricity generation. Of these 248 facilities, only 28 are actively producing RNG, with much of the production capacity serving natural gas vehicle fuel demand, and only five of these facilities service local demand.

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Current data and diagrams on bioenergy

Bioenergy is currently the most important renewable energy source in Germany. In 2022, bioenergy and biogenic waste accounted for around 57 percent of renewable primary energy consumption. Around 84% of renewable heat alone is provided by biomass. With a saving of around 74 million tons of CO₂ (eq.), heat and electricity from biomass and biofuels make a significant contribution to achieving climate targets. This means that the use of energy wood, energy crops and biogenic residual and waste materials achieves around a third of the greenhouse gas savings from renewable energy. The recently published 20th edition of "Basic Bioenergy Data" contains almost 100 tables and diagrams on 56 pages with all the important information on bioenergy production and use. Use the bioenergy market data, information on the cultivation of energy crops and on biogas/biomethane production and use, on the use of energy wood in households, trade and industry as well as on climate protection aspects.

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ADEME publishes its new technical notice

The document of the French Energy Agency stresses that methanization is mainly based on agriculture, with a potential of 90% by 2050, made up of livestock effluents (manure and slurry), crop residues, and plant cover obtained between two main crops and to be managed in compliance with agro-ecology principles. The latter do not compete with food production. Although they account for a much smaller share, other sources should not be overlooked. These include biowaste from local authorities, sewage sludge and organic matter from industry. The agency is also quick to place this benefit in its document, putting forward some very evocative figures, including the 1,451 plants commissioned in 15 years. A small minority of 95 units are based on urban wastewater treatment plants, 108 on the industrial fabric (agri-food, paper, chemicals), and 1,238 on group or individual farms. The latter have been growing at a rate of 100 to 150 new sites over the past 3 years. In its scenarios for achieving carbon neutrality by 2050, ADEME puts the renewable gas capacity generated by 6,000 methanization units at between 90 and 130 TWh. This could represent 82% to 88% of French consumption. Provided, however, that energy-saving tips are applied, which would halve requirements compared with today.

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Bioenergy in the European Union

This publication is a technical report by the Joint Research Centre (JRC), the European Commission's science and knowledge service. It aims to provide evidence-based scientific support to the European policymaking process. This report presents an assessment of the state of the art of key technologies for bioenergy production. Several biomass technologies are available for heat and power production from biomass, namely combustion, anaerobic digestion, as well as intermediate energy carriers produced by torrefaction, pyrolysis, hydrothermal processing, and gasification. Anaerobic digestion is a relatively established, commercial technology, with minimal environmental impacts when using manure, food and agricultural waste or sewage sludge.

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