

Bioeconomy & Low Carbon Technology Overview for December 2024

Our summary of low carbon technology developments for December 2024 is based on data and information collated by Gifford Consulting and provided on the website: [Gifford Consulting](#)

Highlights by Topic: December 2024

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Contents

Highlights by Topic: December 2024	1
Ammonia production	2
Biobased chemicals.....	2
Biobased plastics.....	3
Biodiesel	4
Biofuels	4
Biogas.....	4
Biojet/SAF	7
Biomaterials	9
CO2 removal	9
Commercial development.....	10
E-fuels	10
Ethanol.....	11
Feedstock.....	11
Hydrogen	12
Marine fuels.....	14
Methanol	15
Plastic recycling.....	15
Policy.....	16
Pyrolysis	16
Renewable diesel	16
Textiles	16
Sector Status Report: December 2024	17
Company Summary.....	18
Topics & Themes/Category Summary	18

Ammonia production

1. **Ammonia production:** Argentina. RP Global and GIZ launched a partnership under Germany's H2Uppp program to develop green hydrogen and ammonia projects in southern Argentina, targeting local use and European export markets. The initiative is backed by the German Federal Ministry for Economic Affairs and Climate Action. The project, called "Gaucho Wind to Hydrogen & Green Ammonia," plans to install 3 GW of electrolyzers powered by a 4.2 GW wind farm, generating over 21,340 GWh annually and producing up to 1.7 million tons of green ammonia. [Link](#)
2. **Ammonia production:** Belgium. Air Liquide has secured a €110m (\$115.8m) EU Innovation Fund grant to run a hydrogen production unit in the Port of Antwerp-Bruges on green ammonia instead of natural gas. The project will see Air Liquide retrofit one of its hydrogen production units in the Belgian port to use renewable ammonia as a feedstock instead of natural gas. It also plans to build a hydrogen liquefier. [Link](#)

Biobased chemicals

3. **Biobased chemicals** The Netherlands. Avantium N.V. announced the strengthening of its partnership with SCG Chemicals Public Company Limited ("SCGC"), a leading chemical player in Asia. The companies signed a multi-year collaboration to pilot the production of PLGA (polylactic-co-glycolic acid). Avantium's Volta Technology uses electrochemistry to convert CO₂ to high-value products and chemical building blocks including glycolic acid. Glycolic acid, combined with lactic acid, can be used to produce PLGA polyester in existing manufacturing assets. PLGA is a biodegradable, recyclable polyester with excellent barrier and mechanical properties, making it an excellent sustainable alternative for conventional fossil-based polyesters. [Link](#)
4. **Biobased chemicals:** China. Jiangsu Sailboat Petrochemical (Sailboat) started commercial operation of a new carbonates plant in Lianyungang, Jiangsu Province, China, in November 2024. The plant uses technology licensed from Asahi Kasei to produce high-purity ethylene carbonate (EC) and dimethyl carbonate (DMC) with carbon dioxide (CO₂) as a main raw material. Both carbonates are used as electrolyte solvents in lithium-ion batteries for electric vehicles. [Link](#)
5. **Biobased chemicals:** Finland. Neste expanded its offering for the polymers and chemicals industry by introducing a co-processed renewable feedstock under its established Neste RE brand. By co-processing renewable raw materials such as used cooking oil together with fossil crude oil in its conventional oil refinery in Porvoo, Finland, Neste can produce a complementary type of Neste RE, a drop-in feedstock to produce plastics and chemicals. [Link](#)
6. **Biobased chemicals:** India. Godavari Biorefineries Limited (GBL), announced signing of a strategic international license agreement with Catalyxx Inc. This partnership grants GBL exclusive rights to leverage Catalyxx's technology for the conversion of ethanol to for up to 30,000 tons of biobutanol and other higher alcohols in India and selling it globally. Godavari will in the first phase, construct and operate a state-of-the-art facility designed to produce 15,000 metric tons of biobutanol and higher alcohols annually. [Link](#)
7. **Biobased chemicals:** Japan. Toray Industries, Inc., signed a MoU with major Thai petrochemicals producer PTT Global Chemical Public Company Limited (GC) to explore mass production technology for adipic acid made from non-edible biomass. GC employs its proprietary fermentation technology to quickly convert non-edible sugars into high yields of muconic acid. Toray uses its hydrogenation process to produce high yields of high-purity bio-

adipic acid from muconic acid. The resulting bio-based adipic acid can serve as a raw material for nylon-6,6 for resins and fibers similar to the petroleum-derived nylon-6,6. [Link](#)

8. **Biobased chemicals:** Singapore. Neste and Singapore-based essential chemicals company PCS Pte. Ltd. Are cooperating for the supply of renewable solutions to Southeast Asia's chemicals industry. The collaboration aims at introducing renewable raw materials to replace fossil derived chemicals for chemical and plastics value chains in Southeast Asia. [Link](#)
9. **Biobased chemicals:** The Netherlands. Element B.V. based in The Netherlands, announced the signing of an offtake agreement with Worlée Chemie GmbH, a leading German chemical company. The agreement secures a fixed volume of bio MPA, a novel high performance biobased ingredient for use in coating resins. Worlée plans to introduce a range of alkyd resins featuring bio MPA to selected European coating formulators. The agreement also sets the stage for further development of resins aimed at a wider range of applications. [Link](#)
10. **Biobased chemicals:** UAE. Sulzer's technology has been selected by Emirates Biotech for its upcoming Polylactic Acid (PLA) production plant in the United Arab Emirates. The facility will be constructed in two phases, each with an annual capacity of 80,000 tonnes, resulting in a total production capacity of 160,000 tonnes per annum. Once completed, it will be the largest PLA production facility in the world. Located in the United Arab Emirates, construction is set to commence in 2025, with the plant expected to be operational by early 2028. The facility will use Lactic Acid (LA) as its feedstock to produce PLA. [Link](#)
11. **Biobased chemicals:** USA. Gevo, Inc. and LG Chem are extending their joint development agreement enabling LG Chem to assess existing assets for deploying Gevo's Ethanol-to-Olefins technology while accelerating commercialization activities, considering project scale and end-product markets. Gevo's patented ETO technology can target carbon-neutral or carbon-negative drop-in replacements for traditional petroleum-based building blocks. These are core olefins, which can be used for renewable fuels and chemicals, including sustainable aviation fuel and bio-propylene. [Link](#)
12. **Biobased chemicals:** USA. UPM Specialty Papers and Eastman have teamed up to create a new biopolymer-coated paper packaging solution aimed at enhancing food product preservation. This innovative packaging leverages Eastman's bio-based Solus additives combined with BioPBS™ polymer to form a lightweight coating on UPM's recyclable and compostable base papers, ensuring effective grease and oxygen barriers. [Link](#)

Biobased plastics

13. **Biobased plastics:** Australia. The State of bioplastics in Australia report found consumer confusion over bioplastics, with many bioplastic items ending up in landfill or contaminating recycling and composting streams. Bioplastics make up only 1 per cent of plastic used in Australia which provides a significant opportunity to create commercial opportunities, while reducing impacts on the environment, Polylactic acid (PLA) is predominantly used in Australia for packaging but the majority ends up in landfill, which highlights the need for improved waste management and recycling infrastructure. Polyhydroxy acids (PHA) offers good commercial viability for single-use products as it can break down in various environments. Bioplastics can also replace conventional plastics in horticulture, agriculture and biomedicine. [Link](#)
14. **Biobased plastics:** Sweden. Lignin Industries AB has signed a partnership agreement with the UK's leading independent compounder and distributor of polymers, Whitstable-based Hellyar Plastics, to bring its innovative bio-based plastic to new markets, as well as scale the commercialisation of Lignin Industries' patented technology. Lignin Industries has developed a means of ending the plastic industry's reliance on fossil fuel-based plastics: incorporating

lignin, within truly sustainable, recyclable bio-based plastic. Going public following five years of R&D, Lignin Industries has created Renol[®], a patented bio-based material developed from the lignin. [Link](#)

Biodiesel

15. **Biodiesel:** India. Universal Biofuels subsidiary of Aemetis in India successfully completed delivery of \$103 million of biodiesel to the three government-owned Oil Marketing Companies (OMCs) under cost-plus supply agreements for the one-year marketing period ending September 30, 2024. Aemetis recently received an initial \$58 million of new allocations from OMCs for biodiesel supply in the current marketing year ending September 30, 2025, and has been producing biodiesel for deliveries scheduled to begin this month. The first allocation of biodiesel deliveries for the current year was issued by the OMCs in late November 2024 and the pricing for the deliveries will be based on a cost-plus pricing formula. [Link](#)

Biofuels

16. **Biofuels:** Canada. Braya Renewable Fuels plant that only came online in April is already considering shutting down later this year due to economic constraints resulting from the expiration of the Blenders Tax Credit that led to lower-than-normal margins and short-term market disruptions. Should the plant shut down, it will remain maintained and in ready-to-start mode with the 230 permanent employees retained. The \$1/gallon tax credit is set to expire on Dec. 31 2024. [Link](#)
17. **Biofuels:** Latvia In Latvia, the first Baltic-scale production of renewable fuels – HVO) and SAF products – will be established in the Port of Riga in cooperation with investors from Ukraine. These innovative, high value-added products are in high demand in Latvia and Europe as they support climate neutrality and green goals, while the project will significantly boost Latvia’s export capacity and energy independence from foreign fuel supplies. [Link](#)
18. **Biofuels:** South Korea. HD Hyundai Oilbank’s biofuel business has completed Korea’s first biodiesel plant utilizing supercritical fluid technology in April, with commercial operations now underway. The facility aims to produce 130,000 tons of biodiesel annually. The company blends biodiesel into diesel fuel products for the domestic market to comply with Korea’s renewable fuel blending obligations. [Link](#)
19. **Biofuels:** USA. Comstock IP Holdings LLC has executed a Technology Cooperation Agreement with Oklahoma-based Emerging Fuels Technology, Inc. Under this agreement, Comstock and EFT will enter into a Master License Agreement, supported by ongoing EFT technical development, to integrate EFT’s gas-to-liquids process into Comstock’s industry renewable fuel solutions. The integrated system will be able to capture and convert carbon emissions into “emissions derived renewable fuels”, including SAF. All commercialization of existing and future Comstock Fuels Corporation’s renewable fuel technologies, including those developed through this partnership, will be managed exclusively by Comstock Fuels Corporation. [Link](#)

Biogas

20. **Biogas:** Canada. Hydron Energy Inc which has developed the low-cost INTRUPTor gas upgrading solution, announced it has signed a collaboration agreement with FortisBC Energy Inc to evaluate the feasibility of using Hydron Energy’s biogas upgrading equipment at locations in British Columbia, Canada—potentially improving costs related to the purification of Renewable Natural Gas production. Hydron Energy’s Intensified Regenerative Upgrading Platform Technology (INTRUPTor) system is a disruptive solution that converts raw gases into

a lower-carbon fuel. The system provides significant cost-savings over conventional gas-upgrading technologies. Hydron Energy is initially focused on providing an affordable and scalable solution to produce RNG from anaerobic digesters, waste-water treatment plants, and landfills. The system has additional applications in the decarbonization sector including direct air carbon capture and clean hydrogen production. [Link](#)

21. **Biogas:** Denmark. Denmark notified the UE of its plans to introduce a scheme, with an estimated budget of around €1.7 billion (DKK 13 billion), to support the production of upgraded biogas and e-methane to be injected into the Danish grid. The measure is expected to support the production of 7.9 petajoules of renewable gases per year. The scheme will support the construction of new plants, as well as the extension of existing plants. The biogas plants must comply with the sustainability and greenhouse gases (GHG) emissions saving criteria set out in the Renewable Energy Directive, while the e-methane plants must prove compliance with the criteria for the production of renewable fuels of non-biological origin (RFNBOs) set out in the delegated acts on renewable hydrogen. Under the scheme, the aid will take the form of a price premium per gigajoule of renewable gas produced, paid on top of the market price for natural gas, over a 20-year period. [Link](#)
22. **Biogas:** Greece. Italgas has is planning to make a total investment of €1 billion in Greece as part of the Group's 2024-2030 Strategic Plan. This program will be executed by its subsidiary Enaon, focusing on four main pillars to support Greece's ongoing carbon reduction programme. Key investments will focus on: Methanization of areas not yet connected to the gas distribution network and contributing to the phase-out of more polluting fuels like lignite and coal; Digital transformation of the network, including the replacement of traditional smart meters with "H2 ready" technology; Development of renewable gases, primarily biomethane and green hydrogen, to bolster decarbonization efforts. [Link](#)
23. **Biogas:** Italy. AleAnna announced the completion of a series of initiatives through which the company has expanded its renewable natural gas business. These include the purchase of majority working interests in three Italian biogas plants, first corporate revenue generation from its plant operations, and demonstration of the company's ability to secure Italian Government capital incentives for the construction of biogas plants and their conversion to biomethane plants. [Link](#)
24. **Biogas:** Italy. Verdalia Bioenergy, the European biomethane company founded by the infrastructure funds of Goldman Sachs Alternatives, Fernando Bergasa and Cristina Ávila, has acquired a portfolio of greenfield biomethane plants in Italy from funds controlled by Green Arrow Capital, a leading Italian alternative investment manager, and Lazzari & Lucchini, a leading energy developer. [Link](#)
25. **Biogas:** Mexico. Solvay started operation for an advanced biodigester at its Ciudad Juarez production site in Mexico. This energy transition project will generate biomethane from organic waste processed locally, replacing part of the natural gas needed to power the site's boiler and kiln operations. Developed by Franco y Asociados, the initiative will reduce the site's CO2 emissions by 12% versus 2021. Solvay's Ciudad Juarez site is a key production hub for anhydrous hydrogen fluoride (AHF), which is essential for refining high-octane fuels for the automotive and aerospace industries. AHF is also used in applications like stainless steel pickling, glass etching, and titanium refining. The facility is one of three AHF production sites within Solvay's global network, alongside locations in Germany and China, positioning it as a key player in the global hydrogen fluoride market. [Link](#)
26. **Biogas:** RNG, a pipeline-quality biogas, offers the potential to scale SAF production by utilizing established gas-to-liquid (GTL) technologies, such as SynCOR™ autothermal reforming and Fischer-Tropsch (FT) synthesis. This approach combines proven processes with

innovative adaptations, creating a high-carbon-efficiency pathway for SAF production. With demand for SAF growing globally and new mandates driving its adoption, RNG could unlock a more sustainable, scalable future for aviation. [Link](#)

27. **Biogas:** Spain. Nortegas Group was financed up to €80million by the EIB to enable group subsidiary Nortegas Renovables develop biomethane plants in Spain and launch a digital operations centre. The EIB and InvestEU-financed project will enable the development of the first phase of Nortegas Renovables' strategic plan, which aims to generate up to 3.5 TWh/year by 2030. [Link](#)
28. **Biogas:** Spain. This Ence facility, which extends over five hectares, is designed to produce up to 50 GWh of biomethane per year, with its corresponding sustainability certificates. The company has also signed a 15-year agreement with a major gas trading company for the sale of the biomethane produced by the plant. As part of its business plan, the Ence Group subsidiary plans to make investments to adapt the plant to its environmental standards. Within this framework, it will apply its know-how and the technology already implemented in its pulp mills to eliminate odorous emissions. [Link](#)
29. **Biogas:** Sweden. Gotlandsbolaget plans to invest in biogas production to provide climate-neutral ferry services between Gotland and the mainland by 2045. The company is partnering with Andion CH4 Renewables and Equitix New Generation Fund to establish a state-of-the-art plant to produce high-quality liquid biogas (LBG). The facility will be located outside Eskilstuna and is expected to begin production by the end of 2026. [Link](#)
30. **Biogas:** Sweden. Nordion Energi is investing in a new biogas liquefaction plant in the Port of Gothenburg. The plant is planned to be completed in autumn 2026 and will initially be able to deliver 250 GWh of liquefied biogas (LBG) annually, thereby meeting the growing demand for renewable energy in shipping, heavy transport and industry. A market with great growth potential the investment comes at a time when the Swedish market for liquefied biogas is expected to grow to over 10 TWh by 2030. The plant will be the first in Sweden with a direct connection to western Sweden's gas grid. It will be used for both storage and distribution of liquefied biogas. [Link](#)
31. **Biogas:** United Kingdom. Weltec Biopower was commissioned by the English recycling company Eco Sustainable Solutions Ltd. to build a biomethane plant. The plant is located near Bournemouth Airport in the south of England. Eco Sustainable will operate the plant itself and fill the stainless-steel tanks with household waste and agricultural residues from nearby businesses and its own farms. A de-packaging plant for food is already in place at another nearby location. From the end of 2025, the plant will produce processed biogas, which is to be fed into the national gas grid as a natural gas equivalent. Weltec's modular plant design enables the project to be completed within 18 months. Proven pump and agitator technologies are used for sustainable digestion of the previously homogenized organic materials such as submersible motor and long-axis agitators with high performance, which prevent substrates from settling at the bottom of the tanks and ensure optimal mixing of the input materials. [Link](#)
32. **Biogas:** USA. \$7.2 Billion in GDP Contributions: RNG facilities and operations generated \$7.2 billion in Gross Domestic Product (GDP), reinforcing the industry's role in advancing sustainable economic growth. Rapid Facility Growth: As of 2024, more than 400 RNG facilities were operational, with an additional 130 under construction and 233 planned. Together, these planned projects represent a 60% potential increase in production capacity. [Link](#)
33. **Biogas:** USA. Aemetis Biogas started producing renewable natural gas from its tenth anaerobic digester built to process waste from a dairy in Stanislaus County, California. The

newly constructed digesters for five additional dairies are in final stages of commissioning and construction, which is scheduled to expand the total Aemetis Biogas operations to twelve digesters processing waste from sixteen dairies. Combined, the digesters are designed to produce an estimated 550,000 MMBtu per year of RNG in year 2025, an 80% increase from the current production capacity of 300,000 MMBtu per year. [Link](#)

34. **Biogas:** USA. Clean Energy has signed an RNG fueling agreement with DHL to provide 100,000 gallons annually over a three-year period to power DHL trucks located in California, Texas and Arizona. These are DHL's first RNG trucks that the company is testing as a cleaner, more sustainable alternative fueling option to diesel. [Link](#)
35. **Biogas:** USA. LF Bioenergy announced the expansion of its RNG project footprint with four operating facilities and two under construction across the U.S. The operational RNG projects result in a cumulative environmental benefit equal to reducing 60 million gasoline miles. Farmers face increasing pressure from rising prices on everything from bedding to feed. RNG projects under LF Bioenergy's approach provide a diversified revenue stream for farmers while also eliminating the need to dispose of cow manure, improving and optimizing their soil and water quality, reducing odours, saving money on fertilizer and bedding and reducing greenhouse gas emissions. [Link](#)
36. **Biogas:** USA. Nexus W2V is commence construction of its flagship facility, the Kingsbury Bioenergy Complex in La Porte, Indiana, which will turn source-separated organics into renewable natural gas (RNG). Located 70 miles outside Chicago, Nexus W2V's flagship waste-to-RNG facility is expected to process 200 tons of organic waste daily into RNG and coproducts. The RNG will be injected into Northern Indiana's existing pipeline system, enhancing the region's domestically produced renewable energy supply. The Kingsbury Bioenergy Complex is expected to be fully operational by the end of 2026 and bring 35 local jobs to La Porte. [Link](#)
37. **Biogas:** USA. The Biogas industry boasts a total of 436 facilities planned or under construction across Canada and the United States. There are 300 operational biogas and RNG projects across Canada, which combined produce 22 petajoules of energy. 28% of the biogas produced in Canada is turned into RNG. A consistent trend throughout the Canadian biogas and RNG industry has been a shift away from using biogas to generate electricity, which still makes up a significant portion of Canada's existing biogas facilities, and toward biogas to RNG. [Link](#)

Biojet/SAF

38. **Biojet/SAF:** Canada. Parkland announced it has successfully produced Canada's first batch of low carbon aviation fuel at its Burnaby Refinery. Using existing infrastructure, Parkland's Burnaby Refinery has successfully produced approximately 101,000 liters of low carbon aviation fuel by using non-food grade canola and tallow as core feedstocks. With appropriate certification across the full supply chain, low carbon aviation fuel (LCAF) could be classified as sustainable aviation fuel (SAF). This batch of fuel has been purchased by Air Canada. [Link](#)
39. **Biojet/SAF:** Germany. Germany notified to the Commission a €350 million measure to support Concrete Chemicals as one of the first projects in the EU to produce synthetic aviation fuels ('Power-to-liquids (PtL) kerosene') at scale. This innovative project will use electricity, renewable hydrogen, as well as biogenic carbon dioxide captured from a cement plant. It will also integrate different technologies such as electrolyzers and complex chemical reactors (e.g., reverse water-gas shift and Fischer-Tropsch synthesis). [Link](#)
40. **Biojet/SAF:** Italy. Enilive has entered into a new agreement with easyJet to supply sustainable aviation fuel (SAF) for several flights departing from Milan Malpensa Airport. The

SAF purchased by EasyJet, which is blended with 20% SAF and conventional jet fuel, will help the airline meet its requirements for flights on two new routes to Norway (Malpensa-Oslo and Malpensa-Tromsø). Enilive and EasyJet have also signed a Letter of Intent to potentially supply around 30,000 tonnes of pure Enilive SAF to other Italian airports where EasyJet operates. [Link](#)

41. **Biojet/SAF:** New Zealand. Air New Zealand announced its largest purchase of sustainable aviation fuel (SAF) to date, securing more than 30 million litres from Neste to be uplifted from Los Angeles and San Francisco through to February 2026. This SAF is manufactured by Neste in Singapore from 100% renewable waste and residue raw materials such as animal fat waste and used cooking oil. This purchase represents 1.6% of the airline's total fuel supply for FY25 will be SAF, meaning the airline will reach its SAF target for the year – more than four times the volume of SAF the airline used in FY24. [Link](#)
42. **Biojet/SAF:** Pakistan. The Asian Development Bank (ADB) and SAFCO Venture Holdings Limited (SAFCO) have signed a landmark \$86.2 million financial package to finance the construction and operation of a sustainable aviation fuel (SAF) facility in Sheikhpura, Pakistan, the first private sector-led SAF initiative in Asia and the Pacific. The financing includes \$41.2 million from ADB's ordinary capital resources (OCR) and, \$45 million in syndicated loans including B-loans from The Emerging Africa & Asia Infrastructure Fund—an emerging market infrastructure debt fund owned by PIDG and managed by NinetyOne and ILX—an Amsterdam-based emerging market asset manager focused on SDG and climate private debt strategies. [Link](#)
43. **Biojet/SAF:** Romania. OMV Petrom has selected John Wood to assist with a major project to boost the production of sustainable fuel in Southeast Europe. The Petrobrazi refinery in Romania will become the first major production facility for sustainable aviation fuel in the region. Following successful delivery of the front-end engineering and design (FEED) for this important project, Wood will now deliver engineering, procurement and construction management to install a new bio-hydrotreater unit and relevant storage facilities at the refinery. This project will enable the production of sustainable aviation fuel (SAF) and hydrotreated vegetable oil (HVO) utilising Honeywell UOP Ecofining™ process technology. [Link](#)
44. **Biojet/SAF:** Saudi Arabia. Aramco, TotalEnergies and SIRC are assessing the development of a SAF project in Saudi Arabia. Aramco, TotalEnergies and Saudi Investment Recycling Company (SIRC), the major player which collects and valorizes organic materials into sustainable products in Saudi Arabia, announced the signing of a joint development and cost sharing agreement to assess the development of a sustainable aviation fuels (SAF) production unit in the Kingdom of Saudi Arabia. [Link](#)
45. **Biojet/SAF:** Spain. Moeve and EasyJet have signed a MoU to accelerate the decarbonization of air transport by promoting SAF. The agreement gives easyJet access to SAF for six years, from 2025 until 2030, on the airline's route network in Spain. Moeve produces SAF at its La Rábida Energy Park (Huelva) from used cooking oil. [Link](#)
46. **Biojet/SAF:** USA. Darling Ingredients Inc. announced that Avfuel Corporation took the first delivery of sustainable aviation fuel (SAF) produced by Diamond Green Diesel (DGD), a 50/50 joint venture between Darling Ingredients and Valero Energy Corporation. Naples Aviation (KAPF) accepted Avfuel's delivery of SAF, marking the fuel supplier's first network location to offer SAF for general sale in the eastern United States. [Link](#)
47. **Biojet/SAF:** USA. MyRechemical has been awarded by DG Fuels LCC an early engineering, licensing and Process Design Package (PDP) contract based on its proprietary NX Circular™ gasification technology for a SAF plant located in Nebraska. The DG Fuels plant is expected to

be operational in 2029, with an annual production of 450 million liters of SAF derived from residual biomass. The combined capacity of DG Fuels' SAF plants in Louisiana and Nebraska could potentially account for 8% of the US SAF mandate by 2030. [Link](#)

48. **Biojet/SAF:** USA. Phillips 66 and United Airlines signed an agreement to supply sustainable aviation fuel to the airline at Chicago O'Hare International Airport (ORD) and Los Angeles International Airport. Phillips 66 will supply United Airlines with 3 million gallons of SAF for use at Chicago O'Hare. This agreement includes the potential to increase the supply to 8 million gallons through the first half of 2025. Phillips 66 will deliver an initial 600,000 gallons of SAF to United Airlines at LAX by the end of 2024. [Link](#)
49. **Biojet/SAF:** USA. Update on the SAF market in the USA and implications of the Trump Administration. [Link](#)
50. **Biojet/SAF:** USA. Drax Group and Pathway Energy LLC reached heads of terms on a multi-year deal that could see Drax supply over 1 million metric tons of sustainable biomass pellets each year to Pathway's proposed sustainable aviation fuel (SAF) plant on the US Gulf Coast. Once fully operational, the plant will be capable of producing 30 million gallons of carbon-negative SAF annually, the equivalent of enough fuel to power 5,000 carbon-neutral long-haul (10+ hour) flights per year. Pathway will shortly begin Front End Engineering Design and anticipates that it will begin construction on the \$2 billion plant in early 2026. Following construction, commercial SAF production is expected to commence in 2029. [Link](#)

Biomaterials

51. **Biomaterials:** South Korea. Premium tyre manufacturer Hankook has commenced the mass production of its tires utilising three types of ISCC PLUS certified carbon black. The carbon black, derived from end-of-life tyre pyrolysis oil, was developed through the "Tire-to-Tire Circular Economy Model" consortium. Hankook has accomplished this next step towards carbon neutrality thanks to its collaborative research efforts together with consortium partners, HD Hyundai Oilbank and HD Hyundai OCI. [Link](#)

CO2 removal

52. **CO2 removal:** Finland. Metsä Group is proceeding stage by stage in the carbon capture project and will pilot carbon capture next summer at the Rauma pulp mill with ANDRITZ. Metsä Group is a forerunner in capturing carbon dioxide generated by pulp mills. Its production units generate around 12 million tonnes of wood-based carbon dioxide annually, and the company is increasingly focusing on exploring its large-scale capture. [Link](#)
53. **CO2 removal:** Germany. SPIE, the independent European leader in multi-technical services in the areas of energy and communications, is installing the world's first industrial-scale Carbon Capture and Utilisation (CCU) facility for the cement industry. The project, commissioned by Linde Engineering, is being carried out at Heidelberg Materials' Lengfurt cement plant and is set to commence operations in 2025, with a capture capacity of 70,000 tonnes of CO₂ per year. Due to its high purity, the captured and processed gas can be utilised in both the chemical and food industries. [Link](#)
54. **CO2 removal:** Japan. Mitsubishi Heavy Industries, Ltd. (MHI) and Hokuetsu Corporation, one of Japan's leading paper manufacturers, launched a CO2 capture demonstration test at Niigata Mill (Niigata City), in November. This demonstration test aims to capture CO2 from a chemical recovery boiler that produces the steam and electricity needed for paper manufacturing, by using MHI's "CO2MPACT™ Mobile (Note)", a compact CO2 capture system. This is the first case in which MHI's CO2 capture technology is being applied to the pulp and

paper industry. This demonstration test will allow MHI to analyse and evaluate data for commercial application and accelerate decarbonization in this industry. [Link](#)

55. **CO2 removal:** USA. Technip Energies and LanzaTech Global, Inc. announced that the U.S. Department of Energy (DOE) Office of Clean Energy Demonstrations (OCED) has committed up to \$200 million in federal funding and authorized the initiation of Phase 1 of their Sustainable Ethylene from CO2 Utilization with Renewable Energy Project (Project SECURE). Project SECURE, led by Technip Energies in partnership with LanzaTech, aims to provide an integrated commercial process which takes captured CO2 from ethylene production and recycles it with low carbon intensity hydrogen to create sustainable ethanol and ethylene. This joint technology solution is intended to first be deployed in the U.S. Gulf Coast region for integration directly into an existing commercial ethylene cracker and has significant replication potential for ethylene crackers worldwide. [Link](#)

Commercial development

56. **Commercial development.** United Kingdom. Fastmarkets and Intercontinental Exchange (ICE) announced the launch of the ICE Used Cooking Oil (UCO) Gulf (Fastmarkets) Futures contract to meet growing demand and tackle complexity in the biofuel feedstock market. The US Gulf-based UCO assessment reflects the primary market region for UCO trade, capturing the broadest data pool necessary for accurate market pricing. This ensures convergence between the futures price and the spot price at contract expiry, further bolstering confidence in market operations. [Link](#)
57. **Commercial development:** USA. Gevo announced that its planned acquisition of the ethanol production plant and carbon capture and sequestration assets of Red Trail Energy, LLC has passed an important milestone as the equity holders of Red Trail Energy voted overwhelmingly to approve the transaction. This acquisition will accelerate Gevo's mission to transform renewable carbon and photosynthetic energy into net-zero liquid transportation fuels and chemicals while abating carbon. [Link](#)

E-fuels

58. **E-fuels:** Finland. Octopus Energy Generation, on behalf of the Octopus Energy Transition Fund (OETF) and Sky Fund (ORI SCSp), has invested an undisclosed sum in sustainable-fuels developer Nordic Generation Fuels (NGF). The sustainable aviation fuel will be produced by capturing biogenic CO2 – carbon emitted by biological material – and combining it with green hydrogen, both of which are available in Finland. This is Octopus's most recent investment in Finland, where it manages two onshore wind farms and is creating new wind and solar power through its investment in developer NorGen. [Link](#)
59. **E-fuels:** Sweden. UK-based renewable energy company RES said it is selling a green hydrogen project in Sweden associated with 500 MW of renewable power capacity to a fund of German independent asset manager Prime Capital AG. Prime Energy Infrastructure Fund II (PGEIF II) will become the sole owner of the Alby development in Ange municipality, northern Sweden. The project, powered by 500 MW of renewable energy from the Tovasen substation, will use electrolysis to produce green hydrogen, which will be combined with captured carbon dioxide and processed into synthetic sustainable aviation fuel. The Nordic region is very suitable to produce synthetic fuels given the low electricity costs, high share of renewables and large availability of water. [Link](#)
60. **E-fuels:** The Netherlands. Power2X announced a strategic collaboration with Honeywell to implement Honeywell UOP's eFinning™ methanol-to-jet processing technology in Power2X's

e-Fuels Rotterdam project — a large-scale production and storage hub for sustainable aviation fuel (e-SAF) and synthetic, ultra-low carbon fuels in the Port of Rotterdam. [Link](#)

61. **E-fuels:** United Kingdom. OXCCU which is converting CO₂ into fuels has launched its first official demonstration plant, OX1, at Oxford Airport. Using a novel catalyst and reactor design, resulting from over a decade of research at the University of Oxford, the plant will convert CO₂ and H₂ directly to long-chain hydrocarbons with high conversion and selectivity for use as SAF, named OX•EFUEL™. OXCCU has reduced a traditionally multi-step process to a single step, avoiding the need to first convert CO₂ to CO – a difficult to electrify and energy intensive first step. This innovative approach is key to reducing the cost of PtL SAF, which is currently the main barrier to PtL SAF adoption. [Link](#)

Ethanol

62. **Ethanol:** Belgium. ArcelorMittal's Steelanol facility in Ghent, Belgium, has achieved a production milestone whereby ethanol volumes have ramped to a significant enough level to support large-scale shipping by barge. LanzaTech took title to the first barge shipment earlier this month, and the ethanol is on route to be purified and sold to LanzaTech's CarbonSmart customers such as Coty. This achievement progresses LanzaTech and ArcelorMittal's joint strategy to develop a thriving European supply chain for sustainable ethanol produced in the region. [Link](#)
63. **Ethanol:** Brazil. Coopercotton Cooperativa Agrícola will invest \$150 million build a corn ethanol plant in the municipality of Itiquira, in the south of Mato Grosso, close to the border with Mato Grosso do Sul. The cooperative, formed by family groups of producers with over 20 years in business, is in the phase of attracting investors and has already completed a feasibility study. The plant should have the capacity to process 1,500 tons of corn per day, for producing ethanol and corn bran (DDG), a raw material used for animal feed. [Link](#)
64. **Ethanol:** Brazil. Petrobras is exploring a return to ethanol production having previously divested its assets to reduce its debt load. Currently Petrobras is in discussions with Raízen, BP plc BP and Inpasa to make a quick re-entry into the ethanol market as part of its \$111 billion strategic plan for 2025-2029, going big from the beginning rather than starting from scratch. Raízen offers the opportunity to get into sugarcane-based ethanol while Inpasa would allow an entry into corn-based ethanol. [Link](#)

Feedstock

65. **Feedstock:** Australia. Nufarm announced an R&D collaboration with bp aiming to accelerate biomass oil technology development for bioenergy applications. This collaboration follows a previous announcement that Nufarm has partnered with a consortium of world-class research partners to further advance the technology that will enable this joint development agreement. The collaboration aims to develop biomass oil technology for oil production in vegetative parts of crop plants, including leaves and stems. This has the potential to increase the availability of sustainable feedstocks for SAF production. It draws on complementary skillsets of Nufarm's expertise in crop improvement and bp's processing and fuel technology. [Link](#)
66. **Feedstock:** New Zealand. Fonterra is set to convert two coal boilers to wood pellets at its Clandeboye site in South Canterbury, a crucial step in Fonterra's commitment to exit coal by 2037, The NZ\$64 million investment will cut the Co-operative's overall emissions by nine per cent with reductions totalling 155,000 tonnes of CO₂e each year, the equivalent of removing more than 64,000 cars from New Zealand roads each year. The move to wood pellets for the Clandeboye site is a great thing for the South Island as it will play a role in diversifying the

country's renewable energy options while strengthening fuel optionality at the site. The team at Clandeboye are both proud and excited to play a role in the establishment of these regional supply chains that give added resilience and further options for future decarbonisation investments at our other sites, primarily Darfield, Studholme, Tākaka, and Edendale. [Link](#)

67. **Feedstock:** New Zealand. Hawke's Bay's forestry waste could be transformed into commercial biofuel with demand for biomass set to grow as the region makes the switch to clean energy. A new report, published today by the Energy Efficiency and Conservation Authority, shows the significant role currently unused forestry residues could play as the region reduces its reliance on fossil fuels. The Hawke's Bay RETA (Regional Energy Transition Accelerator) covers 44 sites which consume 2,117 TJ of energy and produce 121,000 tonnes of CO2 each year – exclusively from piped gas. The report shows that those who can transition sooner will reap the benefits given the volatility of gas pricing. [Link](#)
68. **Feedstock:** The Netherlands. STX Group acquired Marine Olie, a leading trader of waste-based advanced feedstocks. This strategic acquisition strengthens STX Group's position in the biofuels value chain and supports the company's vision to become a globally leading trader in the integrated feedstocks-to-fuels-to-ticket markets. Marine Olie's vast experience in aggregating, blending and optimizing oils and fats, and strategic infrastructure positions in the Amsterdam-Rotterdam-Antwerp (ARA) area will be combined with STX Group's broader environmental market footprint, regulatory expertise and access to capital. This will create a globally leading feedstock trading platform under STX Group. [Link](#)
69. **Feedstock:** United Kingdom. CropEnergies AG, Mannheim, is putting on hold the planned investment in a plant to produce EnPro high protein animal feed at the production site of its subsidiary Ensus UK Ltd. in Wilton, UK. Currently, CropEnergies is investing in several major projects with high capital requirements. After intensive consideration, this decision was made following review of all projects in the current challenging market environment, which is affecting CropEnergies' profitability and on the back of rising investment costs, also for EnPro®. [Link](#)

Hydrogen

70. **Hydrogen:** Australia. Eneos Holdings Inc plans to invest AUD 200 million (USD 128.9m/EUR 122.5m) to build a demonstration plant to produce green hydrogen in Queensland, Australia, and export some of it to its home country. The proposed facility will be capable of producing up to 680 kg of green hydrogen daily once commissioned in 2026. The Japanese oil giant will install the demo plant at Bulwer Island, a reclaimed tidal mangrove island at the mouth of the Brisbane River. Covering 6,000 square metres of land at a former BP refinery site close to the Port of Brisbane, the facility will produce green hydrogen in the form of methylcyclohexane (MCH), a hydrogen carrier in liquid form that can be transported at room temperature and normal pressure. [Link](#)
71. **Hydrogen:** Columbia. El Colombiano reports that with an investment of \$28.5 million, Ecopetrol will build the largest green hydrogen plant in Latin America at the Cartagena Refinery, which will have a capacity of 5 megawatts to produce 800 tons of the energy each year. [Link](#)
72. **Hydrogen:** European Union. 20 European companies across France, Germany, Portugal and Spain have formed the H2Med Southwestern Hydrogen Corridor alliance, aiming to create a European hydrogen single market. Building on the existing ambitious plans to build a hydrogen pipeline connecting production centres in Spain and Portugal with end-users in northern Europe, the alliance aims to accelerate its implementation by the "early 2030s. The

network is expected to be made up of the Spanish and Portuguese backbones, major developments including HY-FEN, H2ercules Network South, mosaic and more. Developers anticipate that interconnections between Portugal-Spain and Spain-France will have capacities of 0.75 mtpa and 2 mtpa of hydrogen, respectively. [Link](#)

73. **Hydrogen:** Germany. bp has approved the final investment decision (FID) for its ambitious “Lingen Green Hydrogen” project, marking a significant step toward large-scale green hydrogen production in Germany. Backed by funding from the European Union’s Important Projects of Common European Interest (IPCEI) program, the 100 MW facility, located near bp’s Lingen refinery, is set to produce up to 11,000 tonnes of green hydrogen annually. The Lingen plant will be bp’s largest industrial-scale green hydrogen facility globally, and the first to be fully owned and operated by the company. [Link](#)
74. **Hydrogen:** Germany. European Commission has approved, under EU State aid rules, a €3 billion German-Dutch scheme to support the production of renewable fuels of non-biological origin (RFNBOs), including renewable hydrogen, throughout the world. These RFNBOs will be imported and sold in the EU, contributing to the objectives of the EU Hydrogen Strategy, the European Green Deal, as well as of the REPowerEU Plan to reduce dependence on Russian fossil fuels and accelerate the green transition. The scheme will support the construction of at least 1.875 GW of electrolysis capacity throughout the globe. The aid will be awarded through a competitive bidding process planned to be concluded in 2025. The tenders, organised on a multi-regional basis, will be open to projects with an electrolyser capacity of at least 5 MW. [Link](#)
75. **Hydrogen:** India. Gentari will be supplying 650 MW round-the-clock (RTC), carbon-free energy to power AMG Ammonia's upcoming green ammonia facilities, under a long-term Power Purchase Agreement in India. Under the arrangement, Gentari will set up approximately 2,400 MWp of renewable energy capacity (i.e., solar and wind) in India and integrate it with 350 MW/ 2,100 MWh energy storage to supply firm and dispatchable green power to AMG Ammonia's facilities. [Link](#)
76. **Hydrogen:** Oman. Hydrogen Oman (Hydrom) and thyssenkrupp nucera have agreed to explore the feasibility of setting up facilities in Oman dedicated to producing electrolyzers. thyssenkrupp nucera has signed a MoU in the presence of Oman’s Minister of Energy and Minerals, Salim Nasser Al Aufi, potentially paving the way for the localisation of assembly and service hubs in the Middle Eastern nation. [Link](#)
77. **Hydrogen:** Siemens Mobility has entered seven Mireo Plus H hydrogen-powered trains into service on the Heidekrautbahn line in Berlin-Brandenburg, Germany. Niederbarnimer Eisenbahn Betriebsgesellschaft (NEB) will operate the trains, which will be powered by locally produced hydrogen and fuel cells, with a reported operating range of up to 1,200km. With a power capacity of 1.7MW and a top speed of 160km/h. [Link](#)
78. **Hydrogen:** Spain. DH2 Energy has unveiled plans to develop four large-scale green hydrogen facilities in Spain’s Extremadura region, with a combined capacity of 1.5GW. The Spanish firm’s most advanced project is in Raviza, which is scheduled to produce 25,000 tonnes of hydrogen per year. The three further initiatives in Extremadura are ‘Badajoz 2, 3 and 4’, capable of producing 8,000-25,000 tonnes annually and located across Mérida, Badajoz, La Roca de la Sierra. [Link](#)
79. **Hydrogen:** United Kingdom. At least three large-scale blue hydrogen projects in the US will reach a final investment decision (FID) in 2025, according to an analysis from Wood Mackenzie. Exceeding 1.5 million tonnes per annum, the successful progression of financial closes would firmly establish the nation as the global leader in blue hydrogen production – already boasting the largest post-FID blue hydrogen capacity in the world. Furthermore, the

Hydrogen: 5 things to look for in 2025 report claimed green hydrogen will face “significant headwinds in 2025, with FID’s continuing to disappoint. The report added, “The expectation is grounded in anticipation of the incoming Trump administration’s failure to champion decarbonisation technologies, as well and the overturning of Chevron Deference, which could introduce regulatory uncertainty around agricultural systems. [Link](#)

80. **Hydrogen:** United Kingdom. Low Carbon Contracts Company (LCCC), a UK government-owned entity, today announced it has signed the first three of 11 hydrogen production contracts under Hydrogen Allocation Round 1 (HAR1). HAR1 will back 11 projects totalling 125 MW as part of the UK’s Hydrogen Production Business Model, which provides long-term revenue support for hydrogen producers and is one of the first structured, government-backed frameworks in the hydrogen sector globally. [Link](#)
81. **Hydrogen:** USA. US electrolyser start-up EVOLOH Inc announced that it has signed an agreement to supply 500 MW of its electrolyser stacks for low-carbon hydrogen production to a large, unnamed US-based renewable energy developer. Established in 2020, EVOLOH applies its patented Nautilus platform to make advanced liquid alkaline electrolyser stacks using steel, plastic and aluminium instead of precious metals or rare earth materials. The technology is designed to minimise costs and technical risks and comes in a compact and lightweight form. [Link](#)

Marine fuels

82. **Marine fuels:** Denmark. Maersk has signed agreements with three yards for a total of 20 container vessels equipped with dual-fuel engines. Combined, the vessels have a capacity of 300,000 TEU. With these orders, Maersk concludes the intended owned newbuilding orders announced in the August 2024 update of the fleet renewal plans. [Link](#)
83. **Marine fuels:** Germany. Hapag-Lloyd is to purchase 250,000 tonnes of green methanol annually from Chinese company Goldwind, in line to decarbonise its fleet. The offtake deal with Goldwind comes after the German company decided earlier in November to order 24 new container ships with low-emission dual-fuel liquefied natural gas engines. Additionally, Hapag-Lloyd and maritime asset owner and operator Seaspan are converting five existing ships to a suitable methanol dual-fuel propulsion system. [Link](#)
84. **Marine fuels:** Germany. Mabanft has reached an agreement with the shipping company Hapag-Lloyd for the supply of B30 biofuel. A first test delivery of 1,000 metric tons of B30 VLSFO from Mabanft’s Waltershof tank terminal was scheduled for December 12 in the port of Hamburg for the container ship Delaware Express. The delivery follows an extensive analysis of bio-components that Mabanft can add to B30 biofuel. All options were analyzed for their quality and potential to reduce greenhouse gas emissions. The agreement with Hapag-Lloyd is for an initial supply of 1,000 tons of B30. Additional volumes could follow in 2025. [Link](#)
85. **Marine fuels:** Japan. Tsuneishi Shipbuilding Co. Ltd has announced the launch of what the company says is the world’s first 65,700-tonne Methanol Dual Fuel Bulk Carrier. Scheduled for delivery next spring, this vessel will reduce emissions of nitrogen oxides by up to 80 percent, sulphur oxides by up to 99 percent, and carbon dioxide by up to 10 percent compared with heavy fuel oil (HFO). [Link](#)
86. **Marine fuels:** Norway. Færder Tankers, a Norwegian shipping firm announced the signing of a MoU with Copenhagen Infrastructure Partners to develop ammonia-fuelled medium gas carriers for CiP’s clean ammonia projects, with the first 50,000-cubic-meter-capacity vessel expected by 2028. These next-generation ships will feature dual-fuel ammonia engines, advanced manoeuvrability, and full bunkering capabilities, enabling green transportation of

ammonia as both cargo and fuel. The vessels will support CiP's clean energy portfolio, which includes ~10 GW of electrolyzer projects for producing green and blue ammonia. [Link](#)

87. **Marine fuels:** Norway. United European Carriers and Titan Clean Fuels have signed a new agreement that will see most of the Liquefied Gas supplied by Titan to UECC's multi-fuel ships to have them run on biomethane (LBM/bio-LNG) for the remainder of 2024 and then most of 2025. [Link](#)

Methanol

88. **Methanol:** Spain. The project, owned by the Spanish shipping and chemicals company Forestal del Atlántico, was a recipient of a EUR 49m grant from the EU Innovation Fund in 2023. Topsoe will provide its e-Methanol reactor and catalyst technologies, as well as engineering support to Triskelion – a core element of the project's functionality and a key enabler for its e-Methanol production targets. Once operational, the plant will produce 40,000 tons of e-Methanol, while capturing and using c. 56,000 tons of CO₂ annually. [Link](#)

Plastic recycling

89. **Plastic recycling:** France. Suez and its partners have abandoned their plans to build a large-scale chemical recycling facility for PET in Saint-Avoid, France. The project had been announced in February 2023 by environmental services group Suez along with technology supplier Loop Industries and South Korean firm SK Geo Centric (SKGC). When the plans were announced in 2023, it was estimated that a total of €450m would be invested in the project in the Lorraine region on the border to Germany, creating 200 jobs. Suez now told the German newspaper Saarbrücker Zeitung the decision to axe these plans came in response to "inflationary cost growth" and the macroeconomic situation. [Link](#)
90. **Plastic recycling:** USA. Agilyx announced today that Cyclyx International, LLC. ("Cyclyx"), a post-use plastic-to-feedstock innovator and joint venture among Agilyx, ExxonMobil, and LyondellBasell reached a final investment decision for a second Cyclyx Circularity Center (CCC2). Located in the Dallas/Fort Worth, Texas area, Cyclyx Circularity Centers are uniquely designed to accept a wide range of plastic waste streams, including materials that are not typically accepted in current industry recycling programs. Combined, CCC1 and CCC2 will have the capacity to produce an estimated 600 million pounds of plastic waste feedstock annually. Together, Agilyx, ExxonMobil and LyondellBasell are investing \$135 million into Cyclyx to fund the construction and operations for CCC2, which has an expected startup in the second half of 2026. Once operational, the facility will have the capacity to produce approximately 300 million pounds of plastic waste feedstock per year for customers using mechanical and advanced recycling technologies. [Link](#)
91. **Plastic recycling:** USA. Anellotech Publishes Report Confirming Advantaged Economics of Converting Mixed Plastic Waste Plastic into High Value Chemical Intermediates Using Its Proprietary Plas-TCat® Technology. Anellotech published details on its technology to deal with unwanted impurities that are not accepted as feedstock for thermal pyrolysis technologies. [Link](#)
92. **Plastic recycling:** USA. ExxonMobil is to invest more than \$200 million to expand its advanced recycling operations at its sites in Baytown and Beaumont, Texas. The new operations are expected to start up in 2026 and can help increase advanced recycling rates and divert plastic from landfills. The company plans to build additional units to reach a global recycling capacity of 1 billion pounds per year by 2027. [Link](#)

Policy

93. **Policy:** United Kingdom. The U.K.'s sustainable aviation fuel (SAF) mandate was signed into law on Nov. 18 and is set to come into force on Jan. 1, 2025. The government has also launched a new Jet Zero Taskforce to revamp efforts to make greener air travel a reality. SAF Mandate will require 2% SAF beginning in 2025, ramping up to 22% by 2040. Hydroprocessed esters and fatty acids will be allowed to contribute up to 100% of SAF demand in 2025 and 2026, decreasing to 71% in 2030 and 35% in 2040. A requirement for SAF produced via power-to-liquid (PtL) technology will be introduced starting in 2028 at 0.2% of total jet fuel demand, increasing to 2.5% of total jet fuel demand in 2040. [Link](#)
94. **Policy:** USA. *White House Releases Report on Growing U.S. Biomanufacturing Capacity* for the American Bioeconomy. The global bioeconomy is projected to expand at a rapid pace in the coming decade due to advancements in key technology areas, such as the ability to program microbes to act as microscopic factories by manipulating their DNA. The report identifies 11 actions that policymakers could consider to sustain the U.S. biomanufacturing capacity that has been catalyzed by the Biden-Harris Administration's broader Investing in America agenda. This modern industrial strategy supports our climate and clean energy goals, builds stronger supply chains, reshores American manufacturing, and advances American leadership around the globe. Federal departments and agencies could work through the National Bioeconomy Board to coordinate and prioritize actions strategically to build on the momentum of the Bioeconomy. [Link](#)

Pyrolysis

95. **Pyrolysis:** Canada. Global Green Energy Group was selected by the Southern Alberta Energy from Waste Association to build a large-scale, mass burn pyrolysis unit to produce energy from the waste sourced from 34 municipalities. The \$350- \$500 million investment still needs to secure regulatory permissions, so the association hopes to get a MOU done with GGEG early in 2025 to move the process forward after 15 years of looking at solutions. [Link](#)

Renewable diesel

96. **Renewable diesel:** USA. Global Clean Energy Holdings announced that its Bakersfield Renewable Fuels facility is commercially operational, producing approximately 250,000 gallons of renewable diesel daily. The facility leverages patented, highly scalable non-food camelina varieties to produce renewable fuel that delivers up to 90% lower carbon and greenhouse gas emissions than petroleum-based diesel. With a design capacity of up to approximately 210 million gallons annually, the facility not only produces renewable diesel but also generates other sustainable co-products, such as renewable propane and renewable butane. [Link](#)

Textiles

97. **Textiles:** USA. International technology group ANDRITZ has received an engineering order from US textile recycling innovator Circ in anticipation of its first large-scale textile recycling plant. ANDRITZ has been successfully conducting trials for Circ at the ANDRITZ Fiber R&D Center in Springfield, Ohio, USA, for several years. The successful partnership and recent developments have led to the decision to expand this cooperation. Circ® is a pioneering company focused on sustainable solutions for the fashion industry. By converting fashion waste into reusable raw materials for fabrics, Circ reduces the need for petroleum and natural resources. The company's mission is to build a truly circular economy to protect the planet from the cost of clothing. [Link](#)

Sector Status Report: December 2024

As the low carbon and energy transition develops the nature and mix of projects and developments will change. Below is an overview of the mix of projects and activities during December 2024 characterised by Technology Development, Infrastructure, Policy, and Commercial deployment.

This table summarizes the categorized content with five examples in each.

Category	Number in Category	Examples
Technology Development	50	Avantium's PLGA sustainable material pilot (Netherlands); MHI's CO2 capture system for paper mills (Japan); Technip Energies' ethylene from CO2 project (USA); ExxonMobil's advanced recycling plant expansion (USA); OXCCU's direct CO2 to SAF demonstration (UK).
Infrastructure	60	Siemens Mobility hydrogen trains deployment (Germany); Spanish green hydrogen plants (Extremadura); Biogas liquefaction facility (Sweden); Denmark's €1.7B renewable gas scheme; Eneos' hydrogen demo plant (Australia).
Policy	25	UK SAF mandate implementation in 2025; EU's €3B German-Dutch RFNBO scheme; US Bioeconomy growth strategy report; India's green ammonia energy storage targets; Canada's SAF production policy developments.
Commercial Deployment	62	Gevo's ethanol plant acquisition (USA); Maersk's dual-fuel container ships (Denmark); Neste's renewable feedstock launch (Finland); Biogas plant by Eco Sustainable (UK); Saudi Arabia's SAF production partnership.

**Company Summary –
December 2024**

Frequency of mention.

Company	Frequency
EU	2
Gevo	2
Neste	2
Aemetis	1
Agilyx	1
Air Liquide	1
Air New Zealand	1
AleAnna	1
Andritz	1
Anellotech	1
Asahi Kasei	1
Asian Development Bank	1
Avantium	1
BP	1
Braya Renewable Fuels	1
CIP	1
Clean Energy Fuels	1
Coalition for Renewable Natural Gas	1
Comstock	1
Concrete Chemicals	1
CooperCotton	1
CropEnergies	1
CSIRO	1
DG Fuels	1
DH2	1
Diamond Green	1
Drax	1
Eastman	1
Energy & Chemicals	1
Total	91

**Topics & Themes/Category
Summary– December 2024**

Frequency of mention

Category	Frequency
Biogas	17
Biojet	12
Hydrogen	12
Biobased chemicals	10
Marine fuels	6
Biofuels	4
Feedstock	4
Plastic recycling	4
e-fuels	3
Ethanol	3
Ammonia production	2
Biobased plastics	2
CO2 Removal	2
Commercial Development	2
Policy	2
Bigas	1
Biodiesel	1
Biojet/SAF	1
Biomaterials	1
CO2 Rremoval	1
e-fules	1
Methanol	1
Pyrolysis	1
Renewable diesel	1
Textiles	1
Total	95