Bioeconomy & Low Carbon Technology Overview for July 2024

Our summary of low carbon technology developments for July 2024 is based on data and information collated by Gifford Consulting and provided on our website: Gifford Consulting

Highlights by Topic: July 2024

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Ammonia production

1. **Ammonia production**: Achema will get the financial support in the form of a direct grant (EUR 122 million), made available to it through the Just Transition Fund. The company will use the funding to install a 171-MW alkaline electrolyser at its production site in the Kaunas region and thus replace the natural gas-based hydrogen it uses to make ammonia for fertiliser production. The electrolyser is expected to begin operation in 2026 and its hydrogen output is estimated to replace 30% of the hydrogen currently produced from natural gas.
2. **Ammonia production**: Aslan Energy Capital announced the signing of an MoU to acquire 35,000 hectares (approximately 135 square miles) of land in Sonora, Mexico, for the ANEM (Aslan Net-zero Energy Mexico) Project. Front-end engineering design is set to begin in Q3 2024, with the first green ammonia shipment planned for 2028. This solar-based green hydrogen and ammonia project will be developed in four phases over ten years.
3. **Ammonia production**: CF Industries Holdings, Inc. and POET LLC announced a collaboration to pilot the use of low-carbon ammonia fertilizer to reduce the carbon intensity of corn production and ethanol. Demand for ethanol with a lower carbon intensity is expected to increase significantly to meet low-carbon fuel standards. Ammonia is commonly used as a direct application fertilizer for U.S. corn production, but the conventional ammonia production process is emissions intensive. As a result, ammonia production is a significant contributor to the lifecycle carbon intensity of corn production and thus ethanol production. Producing ethanol with corn grown using low-carbon ammonia can reduce the carbon intensity of ethanol up to 10 percent.
4. **Ammonia production**: European companies signed four agreements with the Sovereign Fund of Egypt (TSFE) for green ammonia projects in Egypt requiring a combined investment of almost USD 33 billion (EUR 30.7bn). A USD-11-billion investment is associated with a green ammonia project at the East Port , while a further USD 14 billion will be invested by BP, Masdar, Hassan Allam Utilities and Infinity Power as part of a green ammonia project at the port of Sokhna.
5. **Ammonia production**: German electric utility EnBW Energie Baden-Wuerttemberg AG has initiated a process to market green ammonia from a new plant to be built in western Norway, with deliveries starting from 2027. The Skipavika Green Ammonia facility is expected to produce 100,000 tonnes of ammonia per year and is scheduled to start operation in the second half of 2027. The SkiGA project involves the construction of a 130 MW electrolyser powered by local green electricity. The facility is expected to lower carbon emissions by around 240,000 metric tonnes annually compared to the conventional ammonia production process.
6. **Ammonia production**: Hygenco Green Energies Pvt Ltd and Swiss agriproducts merchant Ameropa will collaborate on green ammonia supply from India to Europe and Asian markets. The project is for the supply of green ammonia from Hygenco's project at the Gopalpur port in Odisha, India. The project's first phase is planned to become operational by 2027and set to produce 600 tonnes per day. The site will have the potential to double this output by early 2028 and reach its full green ammonia production capacity of 1.1 million tonnes per year by 2030.
7. **Ammonia production**: KBR announced its blue ammonia technology has been selected by Shell for its Blue Horizons low-carbon hydrogen and ammonia project in Duqm, Oman. The facility will utilize KBR's leading ammonia synthesis loop technology to deliver cost-competitive and low-carbon intensity ammonia. Under the terms of the contract,

KBR will provide licensed proprietary engineering design for the 3,000 metric tons per day ammonia plant utilizing hydrogen produced by Shell's Blue Hydrogen technology.

8. **Ammonia production**: Phelan Green Energy, a renewables developer owned by an Irish family but based in South Africa, has announced plans for a USD-2.4-billion (EUR 2.21bn) green ammonia investment in Peru in parallel with the discontinuation of hydrogen projects in Chile, Egypt, and Spain.

Biobased chemicals

9. **Biobased chemicals**: ADM and LG Chem have cancelled the planned lactic acid and polylactic acid joint venture projects they planned for Decatur, IL. First announced in 2022, ADM announced that construction costs have since "skyrocketed. The project was expected to produce 150,000 metric tons per year of high-purity corn-based lactic acid and 75,000 metric tons per year of PLA.
10. **Biobased chemicals**: After seven years runtime, the 12 partners of the Horizon 2020 project PEFerence announced the completion of the first commercial flagship plant for furandicarboxylic acid (FDCA) at Chemie Park Delfzijl in the Netherlands. The new FDCA plant is a 5-kiloton facility that produces plant-based FDCA – a key building block for a wide range of chemicals and polymers such as polyamides, coatings plasticisers and, most importantly, PEF (Polyethylene furanoate). PEF is a 100% plant-based polyester that can be used in many applications such as bottles, (flexible) films and textile fibres. PEF is a polyester like PET, but 100% plant-based and with exceptional barrier and mechanical properties.
11. **Biobased chemicals**: Changhua Chemical is beginning the construction of China's first manufacturing site for sustainable polyols made from renewable carbon. Located in Lianyungang, the state-of-the-art, world scale facility will produce Carnol™, a new line of polycarbonate ether (PCE) polyols with 20-30% fewer greenhouse gases compared to standard chemistries. The technology for Carnol™ is based on a proprietary process and catalyst from Econic Technologies, which replaces fossil feedstocks with captured CO2. Changhua's new site is expected to produce annual commercial volumes of about 80,000 tons in early 2025 and will scale to over 1 million tons in subsequent years. Carnol™ polyols can be used to manufacture polyurethane foams, coatings, and elastomers with improved environmental and performance claims.
12. **Biobased chemicals**: Dow is to launch NORDEL™ REN Ethylene Propylene Diene Terpolymers (EPDM), a bio-based version of Dow's EPDM rubber material that goes into automotive, infrastructure and consumer applications. A key component of automotive weather seals and hoses. NORDEL™ REN EPDM, is also used for building profiles, roofing membranes, wire and cable among other applications.
13. **Biobased chemicals**: Encina Development Group, LLC (Encina), a manufacturer of ISCC PLUS certified circular chemicals, and BASF announced a long-term supply agreement for chemically recycled circular benzene derived from post-consumer end-of-life plastics. BASF will use the chemically recycled benzene for its broad Cycled® product portfolio.
14. **Biobased chemicals**: Neste and Mitsubishi Corporation agreed to establish a strategic partnership focusing on developing value chains for renewable chemicals and plastics for and with Japanese brands. The partners are targeting brands in industries such as food and beverage, apparel, and consumer electronics. Through the partnership, Neste and MC aim to accelerate their efforts to build defossilized supply chains for brand owners in Japan. Neste will provide its expertise in sustainability and more sustainable materials, also in the form of renewable Neste RE™, a bio-based raw material for plastics

production. MC will provide its strong experience in business development and supply chain management of petrochemical products and derivatives in Japan.

15. **Biobased chemicals**: Novonesis, a leading supplier of enzymes for the detergent industry, is introducing Luminous, a biological alternative to petroleum-based technologies for maintaining whiteness and brightness of fabrics. This innovation addresses the growing demand for eco-friendly solutions for the laundry industry
16. **Biobased chemicals**: Södra has announced that it is investing over SEK 2 billion (≈ EUR 177.7 million) to build the country's first, and the world's largest commercial kraft lignin extraction and refining plant at its Mönsterås pulp mill complex. The plant is expected to be operational in 2027. Kraft lignin can replace fossil-derived components in, among other things, asphalt, adhesives, batteries, rubber, and composites and form the basis for new biofuels and biostimulators.
17. **Biobased chemicals**: Technip Energies and Shell Catalysts & Technologies developed a technology transfer agreement which accelerates the commercialization of Technip Energies' Bio-2-GlycolsTM technology for bio-based Mono Ethylene Glycol (MEG) production from glucose. MEG is traditionally produced using fossil-based feedstock to make various types of polyesters for packaging materials, such as plastic bottles, and for apparel.
18. **Biobased chemicals**: Trinseo, a specialty material solutions provider is opening its polymethyl methacrylate (PMMA) depolymerization facility in Rho, Italy, on. The pilot facility represents a significant step forward in the Company's commitment to sustainability, as the next-generation recycling technology helps advance a circular infrastructure for acrylic solutions. Depolymerization is a chemical recycling process that returns acrylic solutions to the constituent monomer, methyl methacrylate (MMA). Complementary to other recycling technologies, depolymerization helps close the loop for acrylic recycling with several advantages over traditional processes.
19. **Biobased chemicals**: Swedish forest industry group Södra has selected international technology group ANDRITZ to supply a complete solution for kraft lignin production at its Mönsterås pulp mill in Sweden. ANDRITZ will supply a system to recover the lignin contained in the black liquor from the pulping process, making it available to Södra as a saleable product. The scope of supply will also include supporting systems that improve the mill's environmental performance and ensure full integration of lignin recovery into the existing operations.

Biodiesel

20. **Biodiesel**: Flint Hills Resources has announced its decision to halt production at its Duonix biodiesel plant in Beatrice, Nebraska. The decision to idle the 50 million gallon per year biodiesel plant was made due to tough economics driven by low soybean prices. The Duonix biodiesel plant began operations in 2016 and is a joint venture between Flint Hills Resources and Benefuel.

Biofuels

21. **Biofuels**: bp has agreed to acquire Bunge's 50% holding interest in its bp Bunge Bioenergia S.A. joint venture, one of Brazil's leading biofuels-producing companies. Upon completion, bp said it will become sole owner of the industrial scale sugarcane and ethanol business. The cost of the *acquisition is around $1.4 billion.*

22. **Biofuels**: Evonik has announced the expansion of its sodium methylate production capacity at its Rosario plant, located in the Sante Fé Province in Argentina. With this

expansion, the company will strengthen its position as a leader in the biofuels industry. The move is in response to growing demand for biofuels in the region and will see the annual capacity increase by 50%, from 60,000 tons to 90,000 tons. Expanded production of high-performance sodium methylate catalysts aims to significantly increase biodiesel productivity and reduce production costs in South America.

23. **Biofuels**: A new report from bp has highlighted that the demand for biofuels will expands rapidly over the first half of the 2030s. This growth is driven by increasing use in transport in China and emerging economies as well as in the EU and US, supported by government policies to boost biofuel use. This expansion is achieved without any increase in land use, with most of the modern bioenergy sourced regionally from residues and wastes.
24. **Biofuels**: Cemvita has unlocked new efficient technologies that allow for the production of up to 500 barrels per day of sustainable oil from its first commercial plant—a goal originally projected for 2029. Cemvita's technological advances in lipid productivity have enabled the company to quadruple its expected production. This achievement is due in part to adaptive evolutionary enhancements in its leading-edge microbes. Additionally, reactor optimization has significantly increased oil extraction efficiency by at least 330%.
25. **Biofuels**: Petroliam Nasional Berhad (Petronas), Enilive, and Euglena have announced their FID to develop a biorefinery in Malaysia. The new facility will be situated within Petronas' Pengerang Integrated Complex (PIC) in Johor. Enilive, a subsidiary of the Italian energy firm Eni, and Euglena, a Japanese biotechnology company, will join Petronas in establishing a joint venture to construct and operate the biorefinery. Petronas Mobility Lestari (PMLSB), a Petronas subsidiary, and Enilive will be the largest shareholders in the venture. Upon completion, the biorefinery will process approximately 650,000 tonnes of raw materials annually to produce SAF, HVO, and bio-naphtha. The feedstocks for the biorefinery will include used vegetable oils, animal fats, waste from vegetable oil processing, and potentially microalgae oils.
26. **Biofuels**: Saudi Aramco is currently investing heavily in companies that produce gasoline and diesel engines. The oil giant predicts that it will be years before electric cars have completely taken over the market from cars with combustion engines. As recently as June, Saudi Aramco acquired a ten percent stake in Horse Powertrain, whose main business is the manufacture of internal combustion engines, which it resells to car companies.
27. **Biofuels**: The European Commission approved the acquisition of the European business of UK-based biofuels producer Greenergy by commodities trading giant Trafigura. The acquisition of Greenergy presents a unique opportunity for Trafigura to strengthen its fuel supply operations in Europe and to add production and distribution of renewable fuels to its growing biofuels portfolio.
28. **Biofuels**: Vale and Komatsu signed an agreement to develop and test, in partnership with Cummins, Dual Fuel haul trucks, powered by a mixture of ethanol and diesel. They will be the world's first trucks of their size, with payloads of 230 to 290 tons, to run on ethanol. This initiative is to advance sustainability for the mining industry.
29. **Biogas:** SUEZ is acquiring a 51% controlling stake in ARA Cursus (ARA), a developer and operator of biogas plants based in Poland. This action will make SUEZ as a major player in the European market for anaerobic digestion of waste and production of renewable energy from waste. ARA is a Polish developer and operator of anaerobic digestion plants and has developed a portfolio of 9 agricultural biogas projects in the country, with the

support of key technology and project partners. Each project is designed to produce around 1 MW electrical renewable energy.

Biogas

30. **Biogas**: BASF and ENGIE signed a 7-year Biomethane Purchase Agreement (BPA). Under the BPA, ENGIE will supply BASF with 2.7 to 3.0 terawatt hours of biomethane throughout the term of the agreement. BASF uses certified biomethane at its Ludwigshafen/Germany and Antwerp/Belgium sites as a sustainable alternative to fossil raw materials in its manufacturing process. The biomethane amount is allocated to the end product using a third-party, globally recognized certification scheme, known as the Biomass Balance approach.
31. **Biogas:** EverGen Infrastructure Corp. has developed a 20-year offtake agreement with FortisBC Energy Inc. through its wholly owned subsidiary Fraser Valley Biogas Ltd. The deal is subject to the acceptance by the British Columbia Utilities Commission. Under the terms of the agreement, FortisBC will purchase Renewable Natural Gas ("RNG") from FVB for injection into its natural gas system. This agreement ensures a stable and predictable supply of RNG for FortisBC, while providing EverGen with a dependable customer and long-term revenue stream. EverGen has also secured a long-term feedstock supply agreement with a waste disposal consolidator in the region. The feedstock secured represents greater than 50% of the off-farm waste required to achieve full capacity.
32. **Biogas**: Aemetis Biogas completed constructing and operating dairy digesters with a capacity to produce more than 300,000 MMBtu of renewable natural gas (RNG) per year. Additionally, the planned construction of new digesters is expected to increase the annual RNG production rate to over 800,000 MMBtu by the third quarter of 2025, more than a 150% increase from the current production rate.
33. **Biogas**: ANGI Energy Systems, a Vontier business, and leading provider of sustainable biogas and biomethane compression and decompression solutions, is expanding into Europe. This expansion builds off ANGI's extensive North American experience to bring its industry-leading technology to a new market. It is expected that the resulting clean, pipeline-quality biomethane can be used to serve a wide range of applications, from home energy to commercial transportation.
34. **Biogas**: Bright Renewables, a company focused on biogas upgrading and valorization technology, and BerQ RNG, a pioneer in transforming biogas into carbon-neutral, pipeline quality Renewable Natural Gas (RNG), have joined forces to develop four renewable natural gas projects in the USA. The series of projects include four initiatives across Michigan and New York, where Bright's proprietary deoxygenation system will be integrated with the Bright Renewables 3-stage membrane upgrader. Beyond these projects, Bright will also provide service and maintenance at three existing sites in Michigan and New York.
35. **Biogas**: Cepsa and PreZero Spain have signed a strategic partnership agreement that will enable both companies to advance in their decarbonization objectives. Under the agreement, PreZero Spain will supply biomethane from some of its projects to Cepsa, and the two companies will jointly develop biomethane plants. Furthermore, Cepsa and PreZero Spain will work on the recovery of waste to produce second-generation biofuels and circular chemical products and to decarbonize the land fleet operated by PreZero in Spain and Portugal.

36. **Biogas**: Copersucar and Geo bio gas&carbon signed a MoU to develop technology for converting biogas into Sustainable Aviation Fuel (SAF). Combining Copersucar's scale in the sugarcane-energy sector with Geo's expertise in biogas/biomethane production technology, the agreement intends to enable large-scale SAF production in Brazil. The SAF production project from biogas/biomethane will employ the gas-to-liquid (GTL) route using Fischer-Tropsch technology, a chemical process for producing green liquid hydrocarbons from synthesis gas.
37. **Biogas**: Ecogas and Nova Energy (New Zealand) have joined forces to bring the first renewable gas to the New Zealand gas market.
38. **Biogas**: Gevo, Inc. announced this week that its renewable natural gas business has achieved record production levels. Gevo's RNG is produced by capturing methane biogas from manure digestors across three dairy farms in northwest Iowa. The biogas is then delivered by pipeline to a centrally located gas upgrading unit where it is brought to pipeline-quality RNG and injected into the local gas pipeline.
39. **Biogas:** Large olive oil producers in Spain are to enter the biomethane business in the province of Jaén. There are four projects underway to produce biogas from alpeorujo that require a joint investment of 137 million euros in the municipalities of Martos, Guarromán, Castellar and Mancha Real, financed through public-private collaboration.
40. **Biogas**: Naturgy and the Lecta Group have signed a renewable gas supply agreement that will facilitate the efficient decarbonization of the industrial group's activity. Biomethane, will be used by Lecta's production centres located in Leitza (Navarra) and Zaragoza. The renewable gas supplied by Naturgy will be certified so that the paper group can offset the emissions derived from its activity and comply with its sustainability commitments.
41. **Biogas:** Sustainable Fuel Plant Group has secured $131.2 million to build two 20MW biomethane plants in the Netherlands, bringing the company's total production capacity to 800 MWh annually. ABN Amro Bank and ING together with Zencap Asset Management SWEN Capital Partners provided the green loan for the project development. SFP is owned by SWEN. The company currently operates SFP Zeeland but hopes to scale up to as many as 10 biomethane plants in several European countries by 2030.
42. **Biogas:** Vårgårda-Herrljunga Biogas AB opted for, EnviTec's technology which is allowing expansion its biogas plant with another gas upgrading plant, which will meet the prescribed DIN standard for vehicle fuel. While the rated capacity of the new gas upgrading plant amounts to 402 Nm^3 per hour of biomethane (600 Nm^3/h of raw biogas, 65 Vol. % Methane), it is already prepared for a capacity expansion of up to 566 Nm^3 per hour of biomethane (840 Nm^3/h of raw biogas, 65 Vol. % Methane).
43. **Biogas**: Vertus Energy, a company focused on decentralized bio-energy hubs, has announced the successful closure of an €8.75 million seed funding round. The investment, led by Energy Capital Ventures and supported by other investors, will be used to scale and commercially deploy the company's flagship product, BRIO. BRIO is a technology that enables advanced control of anaerobic bacteria, which accelerates biomethane generation and increases energy output. The technology has several key advantages, including the ability to generate biomethane up to three times faster than existing technologies and increase energy production by up to 60% from the same amount of waste.
44. **Biogas**: Waga Energy and local partner Zone-Éco have launched a biomethane production unit in Cowansville, Québec, which will generate 30 GWh of renewable gas annually, powering roughly 1,750 households and reducing CO2 emissions by 5,542 tons each year.

Biojet/SAF

45. **Biojet /SAF**: Air New Zealand received a shipment of Sustainable Aviation Fuel (SAF) into Wellington, its first delivery to the nation's capital city and another step towards its target of net zero carbon emissions by 2050. Manufactured by EcoCeres in China from 100 percent used cooking oil and supplied and blended by Exxon Mobil, the 500,000-liter delivery is equivalent to 165 flights on an A320 aircraft between Auckland and Wellington.
46. **Biojet/SAF**: A new IIASA-led report looks at the production of SAF based on six different types of crops: soybeans, maize (corn), switchgrass, miscanthus, jatropha, and reed canary grass. The authors used spatial data with global coverage from IIASA sources to calculate the Direct Land Use Chage (DLUC) emissions for each of these crops. The results showed that soybeans have the highest DLUC emissions on average, meaning they might not be the best choice to meet CORSIA emission reduction criteria. Jatropha and miscanthus had the lowest DLUC emissions, making them a more environmentally friendly option, although their performance varied depending on where they were grown.
47. **Biojet/SAF**: A summary of the current state of technology for SAF production is: i)HEFA: Proven – feedstock creates a ceiling to growth. Ii)Sugar fuels. Proven – high opex, low yields. Iii) ATJ. Proven, high capex. Carbon intensity concerns with corn. iv) eSAF. Emerging, elevated technology risk, high opex. v)Therm – High technology risk, high capex.
48. **Biojet/SAF**: Advances are being made in the science and industry of SAF production—but not quickly enough for the aviation industry to meet its ambitious decarbonization goals. As more aviation players start to develop the ecosystem through investments in the SAF supply chain, even more capital is needed to meet global demand in the next decades. Beyond the first seed investments to accelerate start-ups and immature projects, trillions of dollars for post-FID capital will be required to build enough capacity to meet global demand by 2050. In short, beyond fuel and energy suppliers, a wide range of industry stakeholders will need to play much larger roles in expanding and strengthening the SAF ecosystem to help the world reach its climate targets. An airline's SAF fund can drive innovation, but other investors will need to step up to fund the infrastructure that will decarbonize the industry.
49. **Biojet/SAF**: Airbus is investing in LanzaJet in line with its ambition to act as a catalyst for the global development of sustainable aviation fuels (SAF). This investment will support the development of the Alcohol-to-Jet (ATJ) pathway, an important step required to produce SAF at scale by enabling LanzaJet to expand its capability and capacity to further develop its proprietary Ethanol to Sustainable Aviation Fuel (SAF) process technology.
50. **Biojet/SAF**: bp is investing $48.5 million in renewable diesel and sustainable aviation fuel producer Lianyungang Jiaao New Energy, securing it 15% of the company, ahead of the expected SAF mandates that are likely to be announced soon in China. Currently the company's parent, Jiaao Enprotech, has 100,000 metric tons of SAF production capacity installed. bp has been pulling back on SAF investments in Europe due to supply issues there but will continue to invest in Brazil and Asia.
51. **Biojet/SAF**: BP will invest $48.54 million to acquire a 15% stake in Lianyungang Jiaao New Energy, a producer of renewable diesel and sustainable aviation fuels. The Chinese firm is owned by Zhejiang-based Jiaao Enprotech. Lianyungang Jiaao New Energy has a SAF production capacity of 100,000 tons per year. In 2023, annual global SAF production will be around 2.24 million tons, with China contributing 298,000 tons.

52. **Biojet/SAF**: Chinese biofuel producers plan to invest more than $1 billion (€0.9 billion) in the country's first plants to turn waste cooking oil into sustainable aviation fuel (SAF). China is the world's second largest aviation market and the announcement of its policy on SAF use for 2030 could lead to billions of dollars of investment in the sector. Chinese biofuel firms in China are planning to start up plants over the next 18 months to produce a total of more than 1 million tonnes/year of SAF. The companies included Junheng Industry Group Biotech, Zhejiang Jiaao Enprotech and Tianzhou New Energy.
53. **Biojet/SAF**: Firefly Green Fuels and Synagro Technologies have partnered to bring Firefly's novel fuel-production techniques to the American market. Firefly has developed a unique process to turn biosolids into high performance renewable fuels, including sustainable aviation fuel (SAF).
54. **Biojet/SAF**: International Airlines Group (IAG) reached an agreement with the multi-energy company Repsol for the purchase and supply during the next six months of more than 28,000 tons of sustainable aviation fuel (SAF). The SAF provided by Repsol will be used by the IAG airlines flying from Spanish airports, including Aer Lingus, British Airways, Iberia, Iberia Express and Vueling. This agreement represents the largest voluntary purchase of SAF made to date in Spain. This purchase brings the Group closer to the use of 2% of SAF in 2025 as established by the ReFuel EU regulation.
55. **Biojet/SAF**: Neste has commissioned terminal capacity at ONEOK's terminal in Houston, Texas for blending and storing Neste MY Sustainable Aviation Fuel™. This is a major step in further expanding the availability of Neste's SAF to airlines operating from airports east of the Rocky Mountains all the way to the East Coast. The new capacity at ONEOK's terminal in Houston provides Neste with storage capacity of up to 100,000 tons (around 33.5 million gallons) and is directly connected to the energy pipeline infrastructure in the eastern part of the U.S.
56. **Biojet/SAF**: OMV Petrom, will invest approximately EUR 750 mn at Petrobrazi to transform the refinery into the first major producer of sustainable fuels in the region. The company has made the final investment decision to build a SAF/HVO facility along with two facilities for green hydrogen which will be used in the production of biofuels. The plant will have a production capacity of 250 kt/year, of SAF and HVO as well as by-products like bio-naphtha and bio-LPG, which are used in the chemical industry. The high flexibility of the installation allows adjusting the products mix according to market demand and the available feedstock mix. The plant will have an annual consumption of ~11 kt of hydrogen, most of which will be provided by the two new green hydrogen production units.

Biomaterials

57. **Biomaterials** ZymoChem announced the launch of BAYSE™, the world's first scalable, 100% bio-based, and biodegradable Super Absorbent Polymer (SAP). This innovation is set to revolutionize the $145 billion global hygiene industry. BAYSE™ is a drop-in replacement for traditional, fossil fuel-based SAPs, which are a key component in disposable, absorbent hygiene products such as diapers. Unlike petroleum-derived, polyacrylate counterparts, BAYSE™ is made from renewable resources, has a lower carbon footprint, and is readily biodegradable.
58. **Biomaterials**: Avantium N.V. announced a strategic collaboration with leading textile innovators Auping, Monosuisse and Antex. This partnership will develop PEF (polyethylene furanoate)-based yarns, to be used in mattresses for Auping. This collaboration demonstrates the broad potential of fibers and yarns made from

Avantium's PEF across different application areas, supporting the introduction of PEF to the everyday life of consumers. Avantium will develop, produce, supply and make available recycled PEF. The textile innovators Monosuisse and Antex will focus on creating PEF-based yarns. Monosuisse will specialize in monofilament PEF yarns, while Antex will supply multifilament PEF yarns.

59. **Biomaterials**: Celanese Corporation has introduced a new biobased foam polymer for athletic footwear applications. The company's Hytrel TPC RS40F2 is ideal for athletic footwear applications and incorporates a minimum of 20% segregated biobased content that is verifiable via the C14 method.
60. **Biomaterials**: CREO Group, a specialist in sustainable packaging solutions, announced the introduction of Asili and AgaveGrow, two new bio-based products. Asili contains more than 70% biobased material without compromising performance, strength, or flexibility. Fully colourable and printable, these thermoformed containers resist mould and discoloration, and break down naturally over time. AgaveGrow is engineered from a blend of biobased resin and recycled resins. Agave is a byproduct of the tequila-making process and is used to displace a portion of a container's plastics with a biobased alternative. These containers are strong, automation-ready, and will seamlessly integrate into existing commercial plant nursery operations.
61. **Biomaterials**: UPM Biochemicals and Nokian Tyres, a leading developer and manufacturer of premium tires, are set for an industry first with its concept tire partly based on UPM BioMotion™ Renewable Functional Fillers (RFF). Functional fillers represent approximately 30% of a tire and consist of materials such as primarily carbon black and precipitated silica. According to an initial test series by Nokian Tyres, replacing functional fillers with UPM BioMotion™ RFF offers great potential for more sustainable tires.

CO2 Removal

62. **CO2 removal**: D-CRBN, an Antwerp-based company, has developed a technology that uses plasma to convert carbon dioxide into carbon monoxide. Using renewable electricity, the plasma is used to break the carbon-oxygen bond, thereby converting CO2 into carbon monoxide. The carbon monoxide can be used as a reductant in the steelmaking process – replacing part of the coke or metallurgical coal used in the blast furnace – or as a basic ingredient in Gent's Steelanol plant, for chemicals or alternative fuel production.
63. **CO2 removal**: ESG Clean Energy says its carbon capture system has achieved capturing 100% of the CO2 from a combustion exhaust stream, making it possible for any internal combustion engine – big or small – to have no carbon dioxide emissions. ESG's patented water removal and carbon capture system is designed for both large and small systems and can be retrofitted onto current operating power plants plus applied to mobile applications. ESG's water removal system consists of an advanced ceramic membrane incorporated into a unique mechanical cooling system. The carbon capture system utilizes readily available low-cost solid adsorbers that are nontoxic and easy to handle making the entire system very versatile and energy efficient.
64. **CO2 removal**: ESG Clean Energy, LLC ("ESG"), developers of power generation/carbon capture systems, announced that ongoing testing results at its facility in Holyoke indicate the company's patented water removal technology enables at least twice as much carbon to be captured per pound of adsorbent, which is an industry-changing outcome. ESG Clean Energy's enabling technology is its patented water removal system which

consists of an advanced ceramic membrane incorporated into a unique mechanical cooling system. It is designed to be used on large and small systems and can be retrofitted onto current operating power plants.

E-Fuels

65. **e-fuels**: Carbonaxion has a new project focused on producing 3rd generation renewable natural gas (3G RNG). The 3G RNG will be obtained by combining biogenic CO2 from a landfill site with green hydrogen (H2), using innovative biocatalytic methanation technology developed by Electrochaea GmbH.
66. **e-fuels**: in 2021 Vattenfall took the initiative to develop the HySkies project together with Shell, to speed up the transition towards electrofuels for aviation. Now Vattenfall and Shell have agreed to pause their collaboration and invite other potential partners to join Vattenfall. While Shell sees a future in the HySkies project, including opportunities for future potential collaborations, currently there is a different belief in the appropriateness of the project.
67. **e-fuels**: Swiss Life Asset Managers has acquired Norwegian green energy transition platform Vergia, which, as its flagship project, is developing a green ammonia plant at the Eydehavn port in Arendal. The asset manager has bought Vergia for and on behalf of several investment funds from previous owner Arendals Fossekompani. Established in 2022, Vergia is active in the development of energy infrastructure projects with a specific focus on Power-to-X and offshore wind.
68. **e-fuels**: The world's first industrial plant for the production of electricity-based CO_2-neutral kerosene for aviation has achieved a significant milestone towards full-scale operation, producing its first five tonnes of synthetic crude kerosene. This makes the atmosfair plant the first to successfully produce this new type of aviation fuel. The plant was built and financed by the climate organisation atmosfair and its operating company Solarbelt. The plant is intended to demonstrate that the industrial production of electricity-based synthetic kerosene is technically possible, using only renewable energies and other fully renewable resources. The process is considered the most significant method for decarbonizing a substantial portion of air traffic in the long term.
69. **e-fuels**: Shell has exited a planned renewable hydrogen based sustainable aviation fuel (e-SAF) project in Sweden, and it and utility Vattenfall will not take up a €80.2mn ($87mn) EU Innovation Fund. the HySkies project was selected for the grant in January 2023. The project in Sweden's eastern Forsmark region was envisaged to produce around 82,000 t/yr of e-SAF and 9,000 t/yr of renewable diesel, using hydrogen from a 200MW electrolysis plant, biogenic CO2 captured from a waste-to-energy plant and sustainable ethanol. It was supposed to start operations in March 2027 and required capital costs were estimated at close to €780mn.

Ethanol

70. **Ethanol**: Green Plains Inc. and joint venture partner Tharaldson Ethanol are to install the MSC system at Tharaldson's 175 million-gallon biorefinery in Casselton, North Dakota. Using MSC™ technology from Fluid Quip Technologies, the plant will increase the production of Ultra-High Protein, a high-quality protein ingredient which provide superior nutrition solutions for pet, aquaculture and other animal feed markets with up to a 40% lower carbon intensity.
71. **Ethanol**: Following a recent policy change by the Japanese Government, the country has received its first shipment of ethyl tert-butyl ether (ETBE) made from US corn-based

ethanol. The policy change recognises the greenhouse gas (GHG) benefits of ETBE, which is a component of gasoline, furthermore it means that US corn-based ethanol is now able to be used in the production of ETBE to be imported into Japan. Japan will allow US ethanol to meet up to 44% of a total estimated annual demand of 217 million gallons of ethanol used in the production of ETBE, which equates to around 95.5 million gallons of ethanol.

72. **Ethanol**: In the USA 14.2 million conventional vehicles were sold in 2023 and there are 270 million or more on the road - today these vehicles should be viewed as a bank vault waiting to be opened in that substantial energy security and environmental benefits are there to be had by using a bioethanol blend. More than 95% of the vehicles comprising the current fleet are spark ignition, internal combustion engines running on gasoline. With the addition of high-octane bioethanol, the gasoline fueling those vehicles can provide significant greenhouse gas (GHG) reductions.

Feedstock

73. **Feedstock**: Yield10 Bioscience signed a MoU and License Agreement with Nuseed Nutritional US Inc., granting Nufarm a commercial license to certain Omega-3 intellectual property assets, materials and know-how for producing oil in Camelina. Nufarm and Yield10 have additionally agreed to immediately negotiate exclusively with each other for the sale of Yield10's remaining assets to Nufarm.
74. **Feedstock**: Delta Biofuels has nearly completed its $100 million sugarcane bagasse-based pellet plant in Iberia Parish, Louisiana, USA. The facility will produce 340,000 metric tons of pellets annually from leftover bagasse from the state's sugarcane mills. Pellet production should kick off this fall while energy production is set to start in the next 30-45 days. The plant is the first of its kind in North America.
75. **Feedstock**: OMV Petrom concluded a contract with Expur S.A. for the supply of fully refined vegetable oil. It will be used as feedstock in the Petrobrazi refinery's sustainable aviation fuel (SAF) and renewable diesel (HVO) production facility. Expur will supply a maximum total quantity of 0.7 million tons, with an estimated value of over EUR 750 million, depending on the ordered quantity. The price is based on a formula that is indexed to an international quotation.
76. **Feedstock**: The soybean output within the European Union more than tripled over the past 10 years. The EU Commission expects the soybean harvest this year to amount to just less than 3 million tonnes, which translates to a full 6% increase on 2023. In other words, the European Union is set to achieve the biggest soybean harvest on record. Italy remains the largest EU producer with 1 million tonnes currently forecast. However, this is 0.9% short of the previous year's volume. France, the second largest EU supplier, is also expected to experience a marginal decline of 0.5% to 384.000 tonnes. Romania is forecast to harvest 371,000 tonnes, just under 24% more than in 2023. Production in Croatia and Hungary is forecast to reach 258,000 tonnes and 182,000 tonnes respectively, which translates to increases of 26.5% and 2.8% respectively.

Gasification

77. **Gasification:** Research and Markets reported that the global biomass gasification market is forecast to have a projected CAGR of 8.58% from 2019 to 2029, with market valuation of $143 billion by 2029, up from $85.49 billion last year. The report highlights that technological enhancements in biomass gasification processes are pivotal to increased market presence, with efficiency improvements and advanced syngas purification

technologies sparking significant interest. The introduction of automation and digital monitoring systems further will maximize efficiency and operational safety. Innovative efforts continue to diversify feedstock options, making biomass gasification an adaptable energy alternative.

Hydrogen

78. **Hydrogen** Enagas Renovable and Verbund Green Hydrogen GmbH, a unit of Austrian utility Verbund AG , have signed a MoU, outlining their plan to develop green hydrogen projects in Spain. The companies will focus on large-scale green hydrogen projects in areas of Spain with high wind and solar power potential. This will allow them to produce large volumes of low-cost hydrogen, which will be exported to the European Union via the H2Med hydrogen pipeline and the European Hydrogen Backbone.
79. **Hydrogen**: Ohmium International has opened a 2-GW factory for the production of Proton Exchange Membrane (PEM) electrolysers in southwestern India. The new facility has close to 14,000 sq m (150,700 sq ft) of production space, where Ohmium will make hyper modular PEM electrolysers. The site's manufacturing capacity could be expanded to reach 4 GW.
80. **Hydrogen**: Although there are many hydrogen projects being announced the development confirmed orders for electrolysers has been low. Announcements involved Alkaline Water Electrolysis (AWE) and Proton Exchange Membrane (PEM) devices, with just a few Solid Oxide Electrolysis Cell (SOEC) and Anion Exchange Membrane (AEM) units.
81. **Hydrogen**: Belgian holding company Virya Energy NV and its partners HyoffGreen and Messer have taken the final investment decision for the construction of a 25-MW green hydrogen plant in Belgium, potentially scalable to up to 100 MW.
82. **Hydrogen**: CWP Global and Corner Brook Port Corporation (CPBC) have signed a MoU to consider the development of a green hydrogen hub at the industrial port in the eastern Canadian province of Newfoundland and Labrador. Project Gwinya is expected to use up to 5 GW of wind power capacity to produce green hydrogen. The contemplated complex will also include a green hydrogen-powered hot briquetted iron (HBI) plant for the production of green iron.
83. **Hydrogen**: DH2 Energy has obtained an environmental permit for a new development in Spain, as it announced the permitting milestone for its Hysencia solar-to-hydrogen scheme in the region of Aragon. The Hysencia project will build a 35-MW electrolysis system and a 49-MWp captive solar photovoltaic plant in the hamlet of Plasencia del Monte.
84. **Hydrogen**: Essar Energy Transition (EET), a business of Indian conglomerate Essar Group, has developed Europe's first hydrogen-ready combined heat and power plant (CHP) at its Stanlow oil refinery in North West England. The project is called EET Hydrogen Power and is targeted to be operating by 2027. The new plant will be built in two phases to reach a capacity of 125 MW of power with 6,000 tonnes per day of steam. It will replace Stanlow's existing 50 MW of boiler units, which generate power for the refinery operations, as part of the refinery's ambition to cut total emissions by 95% by 2030.
85. **Hydrogen**: FRV, part of the Jameel Energy group, announced a green hydrogen production project in the Pecém Industrial and Port Complex (CIPP), in Brazil, called H2 Cumbuco. The project focuses on producing green ammonia for export, targeting European and Asian markets. FRV's project involves an investment of approximately $5 billion dollars. The project will be developed in two phases with a total production

capacity of 2 GW. The first phase involves the installation of 500 MW of electrolyzers, aimed at producing 400,000 tons of ammonia annually. The second phase will expand the capacity by adding 1.5 GW of electrolyzers, increasing production by 1.2 million tons to a total of 1.6 million tons per year.

86. **Hydrogen**: German energy group RWE AG is to receive EUR 619 million (USD 674.09m) in funding to build a 300-MW electrolysis plant in Lingen, Lower Saxony, and a hydrogen storage facility in Gronau-Epe, North Rhine-Westphalia. An additional EUR 199 million has been allocated to a consortium, involving RWE, for the development of a 100-MW electrolyser plant at the port of Rostock, Mecklenburg-Western Pomerania, as part of the HyTechHafen Rostock project.
87. **Hydrogen**: Messer, the world's largest privately held specialist for industrial, medical, and specialty gases, is to build a plant for the production of green hydrogen in the Brainergy Park Jülich intermunicipal industrial estate. The hydrogen plant will be operated by HyDN GmbH, a joint venture between the district of Düren and Messer. With a nominal output of 10 megawatts and a production capacity of up to 180 kilograms of hydrogen per hour, the plant will be one of the largest of its kind in Germany. The green hydrogen produced will primarily be used to power fuel cell buses.
88. **Hydrogen**: Nikkiso Clean Energy & Industrial Gases Group announced a series of contracts to build and maintain approximately 24 liquid-based hydrogen (LH2) fueling stations in South Korea. Nikkiso has a fully vertically integrated offering for fueling station with in-house liquefaction systems and trailer loading systems, cryogenic pumps, vacuum insulated pipe, vacuum insulated vessels, cryogenic vaporizer, industrial controls, permitting, installation, and maintenance services. Several locations have already been commissioned across South Korea and have successfully fuelled buses. The remaining stations in South Korea will be commissioned over the next 12 months.
89. **Hydrogen**: Renewable energy and green hydrogen projects developer Climate Impact Corporation (CIC) has developed plans for two 10-GW green hydrogen projects in central Australia that would utilise modular technology. CIC's technology uses modular hydrogen production units that operate entirely off-grid, each containing solar panels, atmospheric water generators, electrolysers and supporting infrastructure. The company stresses that the use of atmospheric water helps deal with challenges like water scarcity which is common across Australia.
90. **Hydrogen**: Shell plc is to invest in a 100-MW Refhyne II electrolyser project in Germany which will be developed to produce renewable hydrogen for the decarbonisation of the oil and gas giant's chemicals park in Rheinland. The proposed electrolyser will use polymer electrolyte membrane technology (PEM) and will produce up to 44,000 kg of green hydrogen daily. The fuel will be used in the manufacturing of lower carbon intensity fuels, which will partly lower the chemicals park's carbon footprint. In the longer term, the output could be supplied directly to industrial customers in the region.
91. **Hydrogen**: Siemens AG said it has signed a Memorandum of Understanding (MoU) with Boson Energy to facilitate collaboration on technology that converts non-recyclable waste into clean energy. The collaboration aims to advance sustainable, local energy security, enabling hydrogen-powered electric vehicle charging infrastructure without compromising grid stability or impacting consumer prices. Siemens will provide consultancy and technology, including applications from its Siemens Xcelerator portfolio, spanning automation, digitalization, electrification, and instrumentation. Boson Energy is targeting more than 300 plants in order to produce 1 million tons of circular hydrogen from waste by 2030.

92. **Hydrogen**: Siemens Energy will build a 280-megawatt (MW) green hydrogen electrolysis system for Northern German utility EWE, which is expected to begin operating in 2027. This plant is expected to provide up to 26,000 metric tons of green hydrogen a year, replacing around 800,000 tons of carbon dioxide annually. EWE chose Siemens Energy after a 12-month selection process. The stacks will be produced at Siemens Energy's Berlin site.
93. **Hydrogen**: Since the beginning of 2024, the hydrogen fuelled truck has been delivering to Lidl supermarkets in the Nantes region, marking a first for the French haulage operation, and an important step in the energy transition of Lidl, which is set on drastically reducing its greenhouse gas emissions. This first new-generation 26-tonne truck is fitted with a 100 kW fuel cell and has a range of 400 kilometres.
94. **Hydrogen**: Spanish transmission system operator Enagas and French peers GRTgaz and Terega, in coordination with the associated partner OGE of Germany, signed an agreement to develop the BarMar project, a maritime hydrogen pipeline connection between Spain and France. BarMar is part of the H2med project that seeks to connect the hydrogen networks of the Iberian Peninsula to those of France, Germany and the whole of North-West Europe.
95. **Hydrogen**: The Spanish government has approved the disbursement of EUR 794 million (USD 859.5m) in state aid to support the development and construction of seven green hydrogen projects in Spain that were previously selected in the EU's IPCEI Hy2Use programme. Spain's seven proposals were among the 35 Projects of Common European Interest (IPCEI) selected by the European Commission in September 2022 in line with the two themes of the Hy2Use programme -- construction of new infrastructure and promoting the uptake of green hydrogen by the hard-to-decarbonise industry. The Spanish Hy2Use projects will add 652.2 MW of combined electrolysis capacity, mobilise EUR 1.141 billion immediately and more than EUR 6 billion in total investment over the lifetime of the project.
96. **Hydrogen**: Voltalia and its partner TAQA Arabia, signed a framework agreement. With its partner TAQA Arabia, Voltalia is continuing to develop a cluster combining renewable energy and green hydrogen production. The framework agreement is a continuation of a MoU signed in December 2022 to develop a cluster combining green hydrogen production with renewable power generation. The project will be implemented in two phases, each comprising a 500-megawatt electrolyzer powered by more than 1.3 gigawatt of solar and wind energy. The facility will have an annual production capacity exceeding 130,000 tons of hydrogen for each phase. It will be located at a greenfield site near Ain Sokhna port in the Suez Canal Economic Zone
97. **Hydrogen**: Wärtsilä launched a large-scale 100% hydrogen-ready engine power plant which has been converted to run on 100% hydrogen. The new engine power plant is a significant step beyond existing technology, which can run on natural gas and 25 vol% hydrogen blends. Such fuel flexible engines can use natural gas today to provide flexibility and balancing and facilitate the use of renewable power. However, these engines can then be converted to run on hydrogen once this fuel becomes readily available.
98. **Hydrogen**: EnBW will invest 1 billion euros ($1.09 billion) in Germany's planned national hydrogen transport network. The hydrogen, provided it is produced in an electrolysis process using renewable electricity, will help the transition to a lower carbon economy. The hydrogen core network is the entry point into the hydrogen economy of the future

and therefore the prerequisite for the complete decarbonisation of the German economy and the achievement of climate goals.

Marine fuels

99. **Marine fuels**: China's COSCO Shipping Corporation has signed a preliminary agreement with Australia's Fortescue, which will develop a green fuel supply chain to help reduce pollution from the shipping industry. The memorandum of understanding includes exploring construction and deployment of green ammonia-fuelled vessels owned either by COSCO or jointly owned by both companies to transport iron ore and other minerals to reduce carbon emissions in the China-Australia iron ore green shipping corridor.
100. **Marine fuels**: Consort Bunkers Pte. Ltd., ClassNK, Yanmar Asia (Singapore) Corporation Pte Ltd, and Taiko Asia Pacific Pte. Ltd. have signed MOU to accelerate the introduction of more bunkering ships capable of handling alternative fuels. Singapore-based Consort Bunkers placed an order to COSCO SHIPPING Heavy Industry (Guandong) Co.,Ltd. to construct four 7,999 DWT IMO Type 2 tankers, ready for biofuel and methanol bunkering. Incorporating their previous orders, a total of 13 biofuel/methanol bunkering tankers totaling over 90,000 DWT will join Consort's fleet.
101. **Marine fuels**: Mölnlycke Health Care and Scan Global Logistics (SGL), have entered an agreement for the purchase and deployment of ocean biofuel covering trade lanes from Asia to Europe to further reduce carbon emissions. This decision supports the global MedTech company's commitment to reducing greenhouse gas (GHG) emissions.
102. **Marine fuels**: Norwegian roll-on/roll-off shipping line United European Car Carriers (UECC) and Dutch supplier of fuels Titan Clean Fuels have decided to collaborate on a series of major liquefied biomethane (LBM) bunkering operations in the Port of Zeebrugge. Titan plans to bunker ISCC-EU certified mass-balanced LBM, also known as bio-LNG, to all of UECC's liquefied natural gas (LNG) dual fuel car carriers.
103. **Marine fuels**: Sydrogen Energy Pte. Ltd. announced its entry into the maritime market with a 250 kW fuel cell power module. Developed in an exclusive collaboration signed today with Shanghai Hydrogen Propulsion Technology Co., Ltd., this system aims to accelerate the adoption of hydrogen technology for the shipping industry, and to support Singapore's ambitious maritime decarbonization programme.
104. **Marine fuels**: X-Press Feeders has started Europe's first scheduled feeder network serviced by green methanol-powered vessels. X-Press Feeders chose northern Europe for the first routes in the network because it found that customers in this part of Europe were most receptive to the company's plans for sustainable shipping.

Market development

105. **Market Development**: Eni has signed a temporary exclusivity agreement with KKR, a global investment firm, aimed at progressing the due diligence phase and completing the drafting of the documents related to the sale of a 20% to 25% stake in its biofuels unit Enilive, based on a valuation of the company between $12.5 billion and $13.5 billion. This step represents another example of the development of Eni's satellite model strategy, attracting strategically aligned capital from valuable new partners at attractive multiples, funding our growth and confirming the value we are creating in these new businesses.
106. **Market Development**: Tesco Ireland has taken delivery of 50 state-of-the-art biomethane fuelled trucks which will operate across the country-wide distribution network. The new biomethane trucks are coming on stream as part of Tesco's

comprehensive strategy to reduce its carbon footprint and enhance the environmental sustainability of its operations.

107. **Market Development**: The expected SAF mandate in the UK will phase in starting at 2% in 2025 and increase on a linear basis to 10% in 2030 and 22% in 2024. According to the Department of Transport UK, regulations implementing the SAF mandate will place a cap on feedstocks used in the hydro processed esters and fatty acids (HEFA) process, but not until other types of SAF are also commercially viable. HEFA supply will not be limited under the mandate for the first two years. The HEFA cap is expected to be set at 71% in 2030 and 35% in 2040.
108. **Market Development**: the Port of Gangavaram, India, is going to reduce fees for vessels propelled by environmentally friendly fuels such as LNG, ammonia, hydrogen, or electrical power effective from July 1, 2024. The initiative will apply to all vessels equipped with dual fuel engines that primarily use any of the mentioned green fuels. To receive the waiver, vessels must present valid certification—such as the International Air Pollution Prevention (IAPP) certificate—that verifies the engine specifications and the type of fuel used. This documentation is required both upon entering and departing the port limits.

Methanol

109. **Methanol**: Lhyfe announced a partnership with low-carbon molecule innovator Elyse Energy to produce e-methanol from green hydrogen for maritime transport within the Loire Estuary's industrial and logistics port ecosystem. Lhyfe was selected by the Nantes Saint-Nazaire port authority to develop green hydrogen production and distribution at the authority's 73 hectare Montoir-de-Bretagne site on the Atlantic coast. In the partnership, Lhyfe and Elyse's exclusive agreement is for the technical, economic, financial and regulatory feasibility study of a project to produce e-methanol from green hydrogen.

Plastic recycling

110. **Plastic recycling**: Renewi and Freepoint Eco-Systems International Ltd are entering into a long-term and strategic cooperation to produce feedstock for the advanced recycling of waste plastics. This collaboration aims to divert end-of-life plastics from incineration by developing the sorting and treatment infrastructure. The goal is to supply 80,000 tonnes of feedstock for Freepoint Eco-Systems' first European advanced recycling facility to be located at the Kluizendok site in Ghent, Belgium. By joining forces, these two companies are addressing both the growing demand for sustainable solutions for end-of-life plastics and the use of pyrolysis oil to create recycled products.

Policy

111. **Policy**: Air New Zealand has abandoned its carbon intensity reduction target for 2030. The national carrier announced during July that it would both drop the target and withdraw from the Science Based Targets Initiative (SBTi), a partnership between carbon disclosure charity CDP, the United Nations Global Compact, the World Resources Institute, and the World Wide Fund for Nature. Air NZ chief executive Greg Foran said the availability of new aircraft and the availability and affordability of more sustainable jet fuels were the main reasons. In addition, Air NZ expects there will be delays in sourcing more efficient planes due to supply chain issues.

112. **Policy**: South Korea's refining industry is set to gain momentum with the enforcement of the "Petroleum and Petroleum Alternative Fuel Business Act". The enforcement of the Petroleum Business Act is expected to accelerate the SAF business of domestic refiners.
113. **Policy**: The French government's decision to approve the sales of transport fuels from 100% renewable raw materials, such as renewable diesel, at fuel stations has been supported by RD producers. So far, the sales have been limited to logistics companies with dedicated fuel supply networks. HVO100 has not previously been available to the general public. The decision by the government allows HVO100 fuels, such as Neste's renewable diesel to be sold and used unblended in all user segments in France.

Pyrolysis

114. **Pyrolysis**: AquaGreen secured a 60 million DKK investment from Japanese conglomerate Marubeni Corporation and current shareholders. AquaGreen is a technology leader in biomass treatment technology using high temperature slow pyrolysis technology. The other investors include Nordic Alpha Partners, Swedish FMG Circular Invest AB, and Impagt Invest Sjælland. The investment and partnership will enable the commercial acceleration of AquaGreen's patented factory technology platform.
115. **Pyrolysis**: Nexus Development Capital announced an investment of approximately $9 million in Castlerock Biofuels, a joint venture company led by Ensyn Corporation and Castlerock Green Energy LLC (CGE). Castlerock Biofuels is focused on developing renewable fuel oil production facilities, with its flagship project located in the Katahdin region of Maine. This project will produce 20 million gallons of RFO® renewable fuel oil annually, utilizing Ensyn's proprietary RTP® technology. At completion, this will be the largest project in the world to produce renewable fuel oil using pyrolysis of wood feedstock.

Recycling plastic

116. **Recycling plastic**: CARBIOS, a pioneer in the development and industrialization of biological technologies to reinvent the life cycle of plastic and textiles, and Zhink Group, which specialises in two global industries, PET and textiles, have confirmed a joint arrangement to build a biorecycling plant in China using CARBIOS' revolutionary enzymatic depolymerization technology.

Renewable diesel

117. **Renewable Diesel**: Chevron Renewable Energy Group will furlough employees at this facility in Oeding in northern Germany as of August 1having already been mothballed the facility for months due to imports of Chinese used cooking oil that has sent the European biodiesel industry into a flurry. The German government will cover part of the employees' salaries while on furlough. The facility recently was upgraded to expand the feedstocks it can handle, including UCO. Shell announced last week that it would temporarily halt construction at its renewable diesel facility under construction in Rotterdam as a result of the challenging European market.
118. **Renewable Diesel**: dnata and ExxonMobil have started a six-month trial to fuel 12 of its airside vehicles and generator sets with renewable diesel. The trial uses Esso Renewable Diesel R20 (R20), which is a high-quality fuel with an estimated 15.4% lower lifecycle greenhouse gas (GHG) emissions. dnata is the first ground handler at Changi Airport to use renewable diesel, with partial funding provided by the Civil Aviation Authority of Singapore (CAAS) as part of its Aviation Sustainability Programme.

119. **Renewable Diesel**: Oceania Biofuels has pulled its $500 million Queensland biofuels project out of the federal approval process, just two years after it was launched by the state government. The company withdrew the project from the Environment Protection and Biodiversity Conservation (EPBC) process on during July 2024. Construction was supposed to start in 2023 and the biorefinery was supposed to be running in 2025, using waste tallow, canola and used cooking oil to produce 350 million litres of renewable diesel and sustainable aviation fuel a year.
120. **Renewable Diesel**: Phillips 66 announced that its Rodeo Renewable Energy Complex in California is operating at full capacity, producing 50,000 barrels per day of renewable diesel and sustainable aviation fuel (SAF). In 2021, Phillips 66 completed a hydrotreater conversion project, enabling the production of 8,000 barrels per day of renewable diesel at the facility. The company in May 2022 expanded plans for renewables production at the Rodeo site, announcing a final investment decision to fully convert the facility to produce 50,000 barrels per day of renewable diesel and SAF. At that time, the company explained that the scope of the project includes the construction of pre-treatment units and the repurposing of existing hydrocracking units to enable production of renewable fuels.
121. **Renewable Diesel**: The European Investment Bank (EIB) and Cepsa signed a €285 million loan agreement for the construction of an advanced biofuels plant to be located next to the La Rábida Energy Park in Palos de la Frontera, Andalusia. The plant, which Cepsa is building together with Bio-Oils, will produce sustainable aviation fuel (SAF) and renewable diesel (HVO), from organic waste such as used cooking oil or from agricultural waste. The plant is expected to process as much as 600,000 tonnes of waste and produce up to 500,000 tonnes of second-generation biofuels annually.
122. **Renewable Diesel**: Valero Energy Corp. released second quarter financial results during July, reporting strong performance for both its ethanol and renewable diesel segments. The company's sustainable aviation fuel (SAF) project in Texas remains on track to begin operations later this year. Valero's ethanol segment produced an average of 4.5 million gallons per day during the second quarter of this year, up 31,000 gallons per day when compared to the same period of 2023. The segment reported $105 million in operating income for the second quarter, down from $127 million during the same quarter of last year. Valero's renewable diesel segment consisting of Diamond Green Diesel, a joint venture with Darling Ingredients. Segment sales volumes averaged 3.5 million gallons per day during the second quarter, down 908,000 gallons per day when compared to the same period of last year. The renewable diesel segment reported $112 million of operating income for the second quarter of the year, down from $440 million during the same period of 2023. Valero attributed the drop in operating income to lower sales volumes resulting from planned maintenance activities and lower renewable diesel margins.

Textiles

123. **Textiles**: Hyosung TNC, the world's largest manufacturer of spandex, has partnered with Geno, a leading sustainable materials company, to establish a plant in Vietnam that will produce biobased butanediol (BDO) derived from sugarcane. The new facility will use Geno's proven plant-based technology to ferment sugars from sugarcane, replacing fossil fuels as the primary source of raw materials. This innovation enables Hyosung to build upon its existing range of certified regen™ BIO Spandex products.

GIFFORD
CONSULTING

Company Summary – **July 2024**

Frequency of mention.

Company	Frequency
BP	4
Shell	3
Cespa	2
EnBW	2
ESG Clean Energy	2
Neste	2
Sodra	2
Achema	1
ADM	1
Air New Zeland	1
ANGI Energy Systems	1
AquaGreen	1
Aramco	1
Aslan Energy	1
Atmosfair	1
Avantium	1
BASF	1
Bright Renewables	1
Carbios	1
Carbonaxion	1
Castlerock Biofuels	1
Celanese	1
Cemvita	1
Changhua	1
Climate Impact Corporation	1
Consort Bunkers	1
Copersucar	1
CREO Group	1
Total	**108**

Topics & Themes Summary– **July 2024**

Frequency of mention

Category	Frequency
Hydrogen	20
Biogas	14
Biobased chemicals	11
Biojet	11
Biofuels	9
Ammonia production	7
Marine fuels	6
Renewable diesel	6
Biomaterials	5
e-fuels	5
Feedstock	4
Market Development	4
CO2 removal	3
Policy	3
Ethanol	2
Pyrolysis	2
Biodiesel	1
Gasification	1
Methanol	1
Plastic recycling	1
Recycling plastic	1
Textiles	1
Total	**118**