

Bioeconomy & Low Carbon Technology Overview for October 2023

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The following summary of the global bioeconomy and low carbon technology developments for October 2023 is based on the data and information collated by Gifford Consulting and presented on our website: [Gifford Consulting](#)

Highlights: October 2023

More information on these articles can be found on our website dashboards.

Ammonia Production

- KBR's K-Green technology is chosen by Madoqua Power2X for a green ammonia project at Sines Industrial Zone in Portugal.

Biobased Chemicals and Biomaterials

1. Dow launches a new propylene glycol (PG) solution in Europe using sustainable feedstocks, offering a range of applications with validated sustainability benefits via a mass balance approach.
2. In Illinois, LanzaTech Global collaborates with Dow to introduce EcoSense™ 2470, a biodegradable surfactant for the home care market, made using LanzaTech's CarbonSmart™ technology.
3. Under the France 2030 plan, the French government will fund the construction of a plant to produce 10,000 metric tons of isobutene and its derivatives annually, set to operate by 2027.
4. Braskem and WEAV3D Inc. introduced a novel demonstration of Braskem's polypropylene (PP) using WEAV3D's thermoplastic composite lattice technology.
5. In Finland, UPM Biochemicals selects Brenntag SE as the sole distributor for its sustainable BioMEG, UPM BioPura, in Europe.
6. TotalEnergies and Borealis announce the start of their Baystar joint venture's new Borstar® polyethylene (PE) unit in Bayport, Texas, which doubles the current production capacity.
7. In South Korea, LG Chem and GS Caltex collaborated on the development of 3-hydroxypropionic acid (3HP), a substance for eco-friendly materials, including a 3HP demonstration plant in Yeosu, aiming for prototype production in Q1 2024.
8. In Japan, Sumitomo Chemical began building a pilot facility for producing propylene from ethanol, backed by the NEDO Green Innovation (GI) Fund, with construction completion expected by the first half of 2025.
9. In Washington, the Engine Technology Forum released a white paper on the benefits of renewable bio-based diesel fuels. It covers production, consumption, growth, and more, emphasizing the immediate emissions reduction potential.

10. In Germany, DKV Mobility offered CO₂-reduced diesel fuel HVO at approximately 650 European service stations, available for all diesel vehicles with manufacturer approval.
11. Comstock Inc. in Nevada achieved scale-up milestones for its biomass refining process and signed a license agreement with RenFuel.
12. SQ Group in China launched the world's first one-million-metric-ton straw refinery.

Bioeconomy

13. SGP BioEnergy received a US\$250 million investment from Global Emerging Markets for its Golden City Biorefinery in Panama. This facility aims to be a major advanced biorefinery, producing significant volumes of biofuel and green hydrogen.

Biofuels

14. In Texas, Arkema invested €130 million to increase the global production capacity of DMDS, an additive essential for converting vegetable oils into renewable fuels, at its Beaumont site.
15. In Austria, Spar Austria used bio-based fuel in five regions, with almost half of its 300 trucks being refueled with HVO since mid-September.
16. In New York, SGP BioEnergy secured a \$250 million equity commitment from Global Emerging Markets for the development of the Golden City Biorefinery in Panama, which has a significant production capacity and accessibility.
17. In Brazil, a new industrial complex by Inpasa Brazil for ethanol, bran, crude oil, and electrical energy production was being set up in Balsas, Maranhão, following the government's biofuel encouragement policies.
18. In India, Numaligarh Refinery Ltd plans to start ethanol production at its biorefinery in Assam by March 2024.
19. In the UK, Colas Rail UK partners with G-Volution Ltd to introduce solid oxide fuel cells using near net-zero carbon emission Bio-LPG for locomotive operations, aiming to reduce dependency on diesel.

Biogas:

20. bp's Archaea Energy started its AMD renewable natural gas plant in Medora, Indiana.
21. Finnish shipping firm Wasaline will operate its vessel with certified biogas.
22. Cepsa in Spain aims to produce biomethane from agricultural and livestock waste, with a target of managing a project portfolio of 4 TWh per year by 2030.
23. Frontline BioEnergy in Iowa concluded a test campaign for its Biomass-Into-Natural-Gas technology.

Biojet/Sustainable Aviation Fuels:

24. Emirates and Shell Aviation agreed on the supply of over 300,000 gallons of SAF in Dubai.
25. Neste in Finland expanded its capability to supply renewable fuels in the U.S. West Coast.
26. Honeywell and GranBio Technologies collaborate to produce carbon-neutral SAF from biomass residues.

27. Lighthouse Green Fuels seeks approval for a sustainable aviation fuel facility in the UK.
28. Ensyn's RTP technology and other processes can produce various green fuels, including SAF.
29. Ryanair in Ireland bought 500 metric tons of SAF from OMV.
30. DHL Express and World Energy signed a long-term agreement for approx. 668 million litres of Sustainable Aviation Fuel.
31. Johnson Matthey and bp announced a technology for EDL's HyKero plant in Germany aimed at producing SAF.

Biomaterials

38. Comstock Inc. (Nevada): Completed milestones for scaling up its lignocellulosic biomass refining process. Its subsidiary, Comstock Fuels Corporation, signed an exclusive license agreement with RenFuel K2B to use RenFuel's patented catalytic esterification process to refine its proprietary Bioleum™ biointermediates in North America, Central America, and South America.
39. SQ Group (China): Launched the world's first one-million-metric-ton straw refinery, which is the first phase of a project that will annually process 500,000 tons of straw. This project will produce eco-friendly, bio-based products including biomass resin carbon, furfural, pulp, bio-methanol, and various biodegradable materials.

CO2 Removal

40. Public Opinion on CCS: Studies show varied awareness about Carbon Capture and Storage (CCS). About 36% of respondents are unaware of CCS, while 50% have heard of it. Acceptance of the technology varies, especially if respondents live near a CCS project.
41. GEA's Focus: GEA, a provider of emissions control solutions, offers a comprehensive carbon capture portfolio. This includes waste-heat-recovery, gas pre-treatment, four sizes of amine-based carbon capture plants, and CO2 utilization & sequestration solutions.
42. Cement Industry: To achieve net zero emissions, the cement industry must undergo significant changes and adopt innovative technologies and business models.
43. G20 Economies (Analysis on September 22, 2023): For G20 economies to reach net-zero greenhouse-gas emissions by 2050, they must boost their low-emission investments. These economies currently emit 31 gigatons of CO2 annually, necessitating the highest-income countries to significantly reduce their emissions.
44. CCUS Policies in Europe: Different CO2 capture technologies have varying environmental implications that need consideration. There are trade-offs concerning the performance, energy consumption, and resource requirements of CO2 capture units.

E-fuels:

45. The German Aerospace Centre (DLR) is developing a unique research and demonstration facility in Leuna, Saxony-Anhalt, with the Technology Platform Power-to-Liquid Fuels (TPP). Funded by the German Federal Ministry for Digital and Transport (BMDV), the facility aims to produce electricity-based Power-to-Liquid fuels on an industrial scale. The technology platform in Leuna is set to be constructed from 2024 on a site of just under five hectares at the Leuna Chemical Complex.

Electric vehicles:

46. Europe's automotive industry is adapting to a growing demand for electric vehicles. As consumers shift away from internal combustion engines, European automakers are dealing with a battery value chain predominantly controlled by Chinese companies. In response, some European automakers are forming strategic partnerships to enhance their battery and semiconductor supplies.

Ethanol:

47. In Japan, Sumitomo Corporation and KC&A, affiliated with the Korea Alcohol Group, have agreed to work together to develop the Japanese market for bioethanol, aiming to use it as a raw material for plastics and fuels.
48. In the UK, Ingenza and Phibro Ethanol are collaborating to develop a new yeast strain to enhance bioethanol yield in various conditions. This innovation stems from a longstanding partnership between the two companies.

Feedstock:

49. In Switzerland, ADM and Syngenta Group have entered a memorandum of understanding to scale up research and commercialization of low carbon-intensity next-generation oilseeds.
50. Massachusetts-based Yield10 Bioscience has reported harvesting the majority of its *Camelina sativa* grain from the 2022/2023 season. The camelina grain is being transformed into biofuel, creating a new revenue stream for Yield10.
51. Global Clean Energy Holdings Inc. has contracted a record 65,000 acres of camelina crop in 2023, sourced globally.
52. Rising oil prices due to Middle East instability could increase biodiesel demand, supporting palm oil prices.
53. Sustainable farming practices are projected to make corn ethanol a primary feedstock for sustainable aviation fuel. With continued advancements, ethanol's GHG intensity could become negative by 2040.

Gasification:

54. Frontline BioEnergy in Iowa has made significant progress in syngas quality for biomass gasification at its new pilot facility.

Hydrogen Developments:

55. New Zealand: Fabrum, a leader in zero-emission technologies, will supply a 1MW electrolyser Hydrogen Refuelling Station package in Auckland, marking a first for New Zealand. They have several international green hydrogen projects.
56. India: Essar Energy Transition Hydrogen (previously Vertex Hydrogen) has begun the construction of a second hydrogen plant in the U.K. with a capacity of 1,000 megawatts.
57. Global Market Forecast: The worldwide hydrogen market is anticipated to grow from \$242.7 billion in 2023 to \$410.6 billion by 2030, with a CAGR of 7.8%.
58. Japan: Mitsui O.S.K. Lines and EDF Renewables have signed an MoU to promote offshore wind and green hydrogen businesses.
59. Finland: thyssenkrupp nucera and Neste collaborate to integrate a 120 MW water electrolyzer at Neste's Porvoo refinery.
60. Italy: Ballard Power Systems receives orders for 177 hydrogen fuel cell engines from Solaris Bus & Coach to be delivered between 2023 and 2026.

61. USA: The Department of Energy announces \$7 billion for seven Regional Clean Hydrogen Hubs to promote clean hydrogen production.
62. Denmark: Topsoe and Aramco will demonstrate eREACT technology for low-carbon hydrogen production.
63. Spain: Repsol begins producing renewable hydrogen at its Petronor center, with plans for additional electrolyzers in the coming years.
64. Research: A new device uses sunlight to produce hydrogen and hydrogenate biomass-derived feedstock.
65. France: Lhyfe to build the largest commercial green hydrogen plant in Germany by the second half of 2024. Lhyfe and Thevenin & Ducrot (AVIA) also plan a hydrogen production site in Greater Paris.
66. South Africa: Phelan Green Energy plans to invest \$2.5 billion in a green hydrogen and ammonia plant in the Western Cape.
67. California: ANGI Energy Systems will supply its first full Hydrogen Refuelling Station for Santa Clarita Transit, collaborating with Trillium.
68. JCB: Over 70 hydrogen internal combustion engines have been manufactured by JCB, now powering prototype machinery.
69. UK: Doosan Enerbility begins operation of the 3.3 MW Jeju green hydrogen plant, the largest in Korea, powered by wind energy.

Marine Fuels:

70. Japan: TSUNEISHI SHIPBUILDING will create two methanol-fuelled KAMSARMAX bulk carriers, chartered by Cargill, with the first vessel completed by 2025.
71. Denmark: Unifeeder Group signs an agreement for two methanol-capable container feeder vessels with an option for two more.
72. South Korea: GS Caltex, POSCO, and H-Line Shipping will introduce biofuel-powered ships using GS Galtex's B30 Bio Marine Fuel.
73. New York: Raizen and Wartsila are collaborating to test ethanol as a fuel for vessels.
74. Singapore: Vitol will provide biofuel blends like B24, B30, and up to B100 in Singapore from next year.
75. Louisiana: Proman Stena Bulk has christened its methanol-fuelled 49,900 DWT tanker Stena Pro Marine.

Market Development:

76. USA: The Federal Aviation Administration has started a grant program that can support sustainable aviation fuel (SAF) production capacity.
77. Global renewable energy stocks have dropped 20.2% over the past two months, marking the worst performance since 2013.

Methanol:

78. The Jiangsu Sailboat Methanol plant uses CRI's Emissions-to-Liquids (ETL) technology to convert waste carbon dioxide into methanol, recycling 150,000 tonnes of carbon dioxide from waste streams.

Plastic Recycling:

79. OMV collaborates with Wood for the global licensing of OMV's ReOil® technology, an agreement signed at ADIPEC in Abu Dhabi.

Policy:

80. Fraunhofer-Gesellschaft presents a roadmap titled “Circular bioeconomy for Germany” emphasizing the potential of bioeconomy and suggesting political actions.
81. Local councils will gain more control over the placement of new commercial forests, including carbon forests, as announced by Environment Minister David Parker.
82. Boston Consulting Group releases 'The Energy Transition Blueprint' advocating that investing in low-carbon energy enhances sustainability, affordability, and security.
83. KPMG’s report, 30 Voices on 2030, interviews energy leaders to forecast the energy sector's outlook in Aotearoa New Zealand by 2030.

Pyrolysis:

84. In Australia, Patriot Hydrogen Limited progresses with its biomass clean energy project near Sydney, set to be the first of its kind in the country by 2024.

Renewable Diesel:

85. In Spain, Repsol licenses Honeywell Ecofining technology to produce renewable fuels from used cooking oil and animal fat in Puertollano.
86. In California, Shell starts selling renewable diesel in Los Angeles, joining Chevron and Phillips 66.
87. In Nevada, Comstock Inc. achieves over 100 gallons per dry ton of biofuel production and reports low carbon intensity scores.
88. In France, Technip Energies gets EPsCm contracts from Galp for an advanced biofuels unit and a green hydrogen unit in Portugal.
89. Galp confirms investments in two projects aimed at carbon reduction at the Sines refinery, including an advanced biofuels unit and green hydrogen production.
90. In Italy, Enilive and Lannutti Group collaborate for the utilization of HVOlution, a 100% renewable diesel fuel.

Technology Development:

91. The significance of molecules in energy storage and distribution is highlighted, emphasizing their potential over electricity.

Overview –October 2023 (based on the above bullet points):

Maritime Fuels & The Evolution of Shipping: The maritime industry, historically a significant contributor to global emissions, is undergoing a transformational shift. A clear example of this transition is the collaboration between TSUNEISHI SHIPBUILDING, Mitsui & Co., and Cargill, which aims to produce methanol-fuelled bulk carriers. This initiative highlights an industry-wide trend moving away from traditional fuel sources. From Denmark's investment in methanol-capable vessels to South Korea's exploration of biofuel-powered ships, nations are realizing the value and necessity of reducing ships' carbon footprints. This concerted effort across countries not only underscores the international commitment to sustainability but also points to the maritime sector's potential as a pioneer in the green transition and the introduction of low sulphur fuels.

Revolutionizing Plastic Recycling: The global challenge of plastic waste management has necessitated innovative recycling solutions. OMV's strategic partnership with Wood on the ReOil®

technology is an example. By offering state-of-the-art recycling solutions, such partnerships highlight the global momentum towards a circular economy. As plastic pollution continues to threaten ecosystems, advancements in recycling technology are not just welcomed but are vital for our planet's future.

Navigating The Policy Landscape: A sustainable transition isn't merely about technological advancements; it requires a robust policy framework. The roadmap from Germany's Fraunhofer-Gesellschaft is an example of this, advocating for a faster market introduction of bio-based products. Simultaneously, insights from institutions like the Boston Consulting Group and KPMG offer invaluable perspectives on energy's future. These strategies emphasize the multifaceted benefits of low-carbon energy solutions, spanning sustainability, affordability, and security.

The Surge in Pyrolysis & Renewable Diesel: The global drive for renewable diesel is considerable. Industry giants like Honeywell, Repsol, and Shell are championing developments, focusing on producing diesel from sustainable and renewable feedstocks. Parallely, developments in pyrolysis, such as a project like Patriot Hydrogen Limited's in Australia, offer promising avenues for clean energy.

Future of Energy Storage and Distribution: Beyond immediate solutions, the discussion brought to light the long-term vision for energy. While electricity is crucial, the potential of molecular solutions can't be overlooked. Molecules provide unmatched flexibility in storage and distribution, presenting a promising pathway for future energy solutions.

Companies: Significant Contributions – October - 2023

1. **TSUNEISHI SHIPBUILDING:** Pioneering the development of methanol-fuelled bulk carriers using green methanol, promoting zero emissions in maritime.
2. **Mitsui & Co.:** Collaborating with TSUNEISHI SHIPBUILDING for the order of two methanol-fuelled KAMSARMAX bulk carriers, supporting sustainable shipping.
3. **Cargill:** Chartering the methanol-fuelled carriers from TSUNEISHI SHIPBUILDING and Mitsui & Co., reinforcing the commitment to green shipping.
4. **Unifeeder Group:** Committing to long-term time-charter agreements for methanol-capable container feeder vessels in Denmark.
5. **GS Caltex:** Collaborating with other South Korean companies to introduce biofuel-powered ships and producing a blend of heavy fuel oil with reduced carbon emissions.
6. **OMV:** Developing the proprietary ReOil® technology, a potential game-changer in plastic recycling.
7. **Fraunhofer-Gesellschaft:** Presenting a roadmap titled "Circular bioeconomy for Germany", which recommends political actions for bio-based products.
8. **Boston Consulting Group:** Publishing 'The Energy Transition Blueprint', illustrating the benefits of investing in low-carbon energy.
9. **KPMG:** Providing insights on the future of energy in New Zealand through interviews with energy innovators and industry leaders.
10. **Patriot Hydrogen Limited:** Advancing the biomass clean energy project in Australia, aiming to commission the country's first-of-its-kind project by 2024.

11. **Honeywell:** Collaborating with Repsol in Spain to produce renewable fuels using the Honeywell Eco-finishing technology.
12. **Shell:** Selling renewable diesel at retail stations in California, furthering the adoption of sustainable fuels.
13. **Chevron and Phillips 66:** Retailing renewable diesel in California, emphasizing the industry's shift towards greener fuel options to consumers.
14. **Comstock Inc.:** Achieving significant biofuel production yields and establishing market-leading low carbon intensity scores for their biofuels.
15. **Technip Energies:** Being awarded contracts by Galp for an advanced biofuels unit and a green hydrogen unit, aiding in reducing carbon footprints.
16. **Lannutti Group:** Collaborating with Enilive for the adoption of renewable diesel in the logistics and road transport sector.

Company Ranking – October 2023

Company Name	Frequency
LanzaTech	3
Global Bioenergies	2
Arkema	2
Sumitomo	2
SGP BioEnergy	2
Frontline BioEnergy	2
Federal Aviation Authority (FAA)	2
Neste	2
Comstock	2
Yield 10 Bioscience	2
Repsol, Spain	2
Lhyfe	2
Madoqua Power2X	1
Dow	1
Braskem	1

Topic & Theme Ranking – October 2023

Topic Name	Frequency
Hydrogen	18
Biobased chemicals	11
Biojet	9
Biofuels	6
Feedstock	6
Marine fuels	6
CO2 Removal	5
Biogas	4
Policy	4
Renewable Diesel	4
Market Development	3
Biodiesel	2
Bioeconomy	2
Biomaterials	2
Ethanol	2

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