

The Global Market for Biofuels to 2033

<https://marketpublishers.com/r/GFBE2673C121EN.html>

Date: February 2023

Pages: 322

Price: US\$ 1,250.00 (Single User License)

ID: GFBE2673C121EN

Abstracts

Renewable energy sources can be converted directly into biofuels. There has been a huge growth in the production and usage of biofuels as substitutes for fossil fuels. Due to the declining reserve of fossil resources as well as environmental concerns, and essential energy security, it is important to develop renewable and sustainable energy and chemicals.

The use of biofuels manufactured from plant-based biomass as feedstock would reduce fossil fuel consumption and consequently the negative impact on the environment. Renewable energy sources cover a broad raw material base, including cellulosic biomass (fibrous and inedible parts of plants), waste materials, algae, and biogas.

The Global Market for Biofuels covers bio-based fuels, bio-diesel, renewable diesel, sustainable aviation fuels (SAFs), biogas, electrofuels (e-fuels), green ammonia based on utilization of:

First-Generation Feedstocks (food-based) e.g. Waste oils including used cooking oil, animal fats, and other fatty acids.

Second-Generation Feedstocks (non-food based) e.g. Lignocellulosic wastes and residues, Energy crops, Agricultural residues, Forestry residues, Biogenic fraction of municipal and industrial waste.

Third-Generation Feedstocks e.g. algal biomass

Fourth-Generation Feedstocks e.g. genetically modified (GM) algae and cyanobacteria.

Report contents include:

Market trends and drivers.

Market challenges.

Biofuels costs, now and estimated to 2033.

Biofuel consumption to 2033.

Market analysis including key players, end use markets, production processes, costs, production capacities, market demand for biofuels, bio-jet fuels, biodiesel, bio-naphtha, bio-based alcohol fuels, biofuel from plastic waste & used tires, biofuels from carbon capture, renewable diesel, biogas, chemical recycling based biofuels, electrofuels, green ammonia and other relevant technologies.

Production and synthesis methods.

Biofuel industry developments and investments 2020-2023.

171 company profiles including BTG Bioliquids, Byogy Renewables, Caphenia, Enkern, Infinium. Eni S.p.A., Ensyn, FORGE Hydrocarbons Corporation, Fulcrum Bioenergy, Genecis Bioindustries, Gevo, Haldor Topsoe, Infinium Electrofuels, Opera Bioscience, Steeper Energy, SunFire GmbH, Vertus Energy and Viridos, Inc.

Contents

1 RESEARCH METHODOLOGY

2 EXECUTIVE SUMMARY

2.1 Market drivers

2.2 Market challenges

2.3 Liquid biofuels market 2020-2033, by type and production

3 INDUSTRY DEVELOPMENTS 2020-2023

4 BIOFUELS

4.1 The global biofuels market

4.1.1 Diesel substitutes and alternatives

4.1.2 Gasoline substitutes and alternatives

4.2 Comparison of biofuel costs 2022, by type

4.3 Types

4.3.1 Solid Biofuels

4.3.2 Liquid Biofuels

4.3.3 Gaseous Biofuels

4.3.4 Conventional Biofuels

4.3.5 Advanced Biofuels

4.4 Feedstocks

4.4.1 First-generation (1-G)

4.4.2 Second-generation (2-G)

4.4.2.1 Lignocellulosic wastes and residues

4.4.2.2 Biorefinery lignin

4.4.3 Third-generation (3-G)

4.4.3.1 Algal biofuels

4.4.4 Fourth-generation (4-G)

4.4.5 Advantages and disadvantages, by generation

5 HYDROCARBON BIOFUELS

5.1 Biodiesel

5.1.1 Biodiesel by generation

5.1.2 Production of biodiesel and other biofuels

- 5.1.2.1 Pyrolysis of biomass
- 5.1.2.2 Vegetable oil transesterification
- 5.1.2.3 Vegetable oil hydrogenation (HVO)
- 5.1.2.4 Biodiesel from tall oil
- 5.1.2.5 Fischer-Tropsch BioDiesel
- 5.1.2.6 Hydrothermal liquefaction of biomass
- 5.1.2.7 CO₂ capture and Fischer-Tropsch (FT)
- 5.1.2.8 Dimethyl ether (DME)
- 5.1.3 Global production and consumption
- 5.2 Renewable diesel
 - 5.2.1 Production
 - 5.2.2 Global consumption
- 5.3 Bio-jet (bio-aviation) fuels
 - 5.3.1 Description
 - 5.3.2 Global market
 - 5.3.3 Production pathways
 - 5.3.4 Costs
 - 5.3.5 Biojet fuel production capacities
 - 5.3.6 Challenges
 - 5.3.7 Global consumption
- 5.4 Syngas
- 5.5 Biogas and biomethane
 - 5.5.1 Feedstocks
- 5.6 Bio-naphtha
 - 5.6.1 Overview
 - 5.6.2 Markets and applications
 - 5.6.3 Production capacities, by producer, current and planned
 - 5.6.4 Production capacities, total (tonnes), historical, current and planned

6 ALCOHOL FUELS

- 6.1 Biomethanol
 - 6.1.1 Methanol-to gasoline technology
 - 6.1.1.1 Production processes
- 6.2 Bioethanol
 - 6.2.1 Technology description
 - 6.2.2 1G Bio-Ethanol
 - 6.2.3 Ethanol to jet fuel technology
 - 6.2.4 Methanol from pulp & paper production

- 6.2.5 Sulfite spent liquor fermentation
- 6.2.6 Gasification
 - 6.2.6.1 Biomass gasification and syngas fermentation
 - 6.2.6.2 Biomass gasification and syngas thermochemical conversion
- 6.2.7 CO₂ capture and alcohol synthesis
- 6.2.8 Biomass hydrolysis and fermentation
 - 6.2.8.1 Separate hydrolysis and fermentation
 - 6.2.8.2 Simultaneous saccharification and fermentation (SSF)
 - 6.2.8.3 Pre-hydrolysis and simultaneous saccharification and fermentation (PSSF)
 - 6.2.8.4 Simultaneous saccharification and co-fermentation (SSCF)
 - 6.2.8.5 Direct conversion (consolidated bioprocessing) (CBP)
- 6.2.9 Global ethanol consumption
- 6.3 Biobutanol
 - 6.3.1 Production

7 CHEMICAL RECYCLING FOR BIOFUELS

- 7.1 Plastic pyrolysis
- 7.2 Used tires pyrolysis
 - 7.2.1 Conversion to biofuel
- 7.3 Co-pyrolysis of biomass and plastic wastes
- 7.4 Gasification
 - 7.4.1 Syngas conversion to methanol
 - 7.4.2 Biomass gasification and syngas fermentation
 - 7.4.3 Biomass gasification and syngas thermochemical conversion
- 7.5 Hydrothermal cracking

8 ELECTROFUELS (E-FUELS)

- 8.1 Introduction
 - 8.1.1 Benefits of e-fuels
- 8.2 Feedstocks
 - 8.2.1 Hydrogen electrolysis
 - 8.2.2 CO₂ capture
- 8.3 Production
- 8.4 Electrolysers
 - 8.4.1 Commercial alkaline electrolyser cells (AECs)
 - 8.4.2 PEM electrolysers (PEMEC)
 - 8.4.3 High-temperature solid oxide electrolyser cells (SOECs)

8.5 Costs

8.6 Market challenges

8.7 Companies

9 ALGAE-DERIVED BIOFUELS

9.1 Technology description

9.2 Production

10 GREEN AMMONIA

10.1 Production

10.1.1 Decarbonisation of ammonia production

10.1.2 Green ammonia projects

10.2 Green ammonia synthesis methods

10.2.1 Haber-Bosch process

10.2.2 Biological nitrogen fixation

10.2.3 Electrochemical production

10.2.4 Chemical looping processes

10.3 Blue ammonia

10.3.1 Blue ammonia projects

10.4 Markets and applications

10.4.1 Chemical energy storage

10.4.1.1 Ammonia fuel cells

10.4.2 Marine fuel

10.5 Costs

10.6 Estimated market demand

10.7 Companies and projects

11 BIOFUELS FROM CARBON CAPTURE

11.1 Overview

11.2 CO₂ capture from point sources

11.3 Production routes

11.4 Direct air capture (DAC)

11.4.1 Description

11.4.2 Deployment

11.4.3 Point source carbon capture versus Direct Air Capture

11.4.4 Technologies

- 11.4.4.1 Solid sorbents
- 11.4.4.2 Liquid sorbents
- 11.4.4.3 Liquid solvents
- 11.4.4.4 Airflow equipment integration
- 11.4.4.5 Passive Direct Air Capture (PDAC)
- 11.4.4.6 Direct conversion
- 11.4.4.7 Co-product generation
- 11.4.4.8 Low Temperature DAC
- 11.4.4.9 Regeneration methods
- 11.4.5 Commercialization and plants
- 11.4.6 Metal-organic frameworks (MOFs) in DAC
- 11.4.7 DAC plants and projects-current and planned
- 11.4.8 Markets for DAC
- 11.4.9 Costs
- 11.4.10 Challenges
- 11.4.11 Players and production
- 11.5 Methanol
- 11.6 Algae based biofuels
- 11.7 CO₂-fuels from solar
- 11.8 Companies
- 11.9 Challenges

12 COMPANY PROFILES 173 (171 COMPANY PROFILES)

13 REFERENCES

List Of Tables

LIST OF TABLES

- Table 1. Market drivers for biofuels.
- Table 2. Market challenges for biofuels.
- Table 3. Liquid biofuels market 2020-2033, by type and production.
- Table 4. Industry developments in biofuels 2020-2023.
- Table 5. Comparison of biofuel costs (USD/liter) 2022, by type.
- Table 6. Categories and examples of solid biofuel.
- Table 7. Comparison of biofuels and e-fuels to fossil and electricity.
- Table 8. Classification of biomass feedstock.
- Table 9. Biorefinery feedstocks.
- Table 10. Feedstock conversion pathways.
- Table 11. First-Generation Feedstocks.
- Table 12. Lignocellulosic ethanol plants and capacities.
- Table 13. Comparison of pulping and biorefinery lignins.
- Table 14. Commercial and pre-commercial biorefinery lignin production facilities and processes
- Table 15. Operating and planned lignocellulosic biorefineries and industrial flue gas-to-ethanol.
- Table 16. Properties of microalgae and macroalgae.
- Table 17. Yield of algae and other biodiesel crops.
- Table 18. Advantages and disadvantages of biofuels, by generation.
- Table 19. Biodiesel by generation.
- Table 20. Biodiesel production techniques.
- Table 21. Summary of pyrolysis technique under different operating conditions.
- Table 22. Biomass materials and their bio-oil yield.
- Table 23. Biofuel production cost from the biomass pyrolysis process.
- Table 24. Properties of vegetable oils in comparison to diesel.
- Table 25. Main producers of HVO and capacities.
- Table 26. Example commercial Development of BtL processes.
- Table 27. Pilot or demo projects for biomass to liquid (BtL) processes.
- Table 28. Global biodiesel consumption, 2010-2033 (M litres/year).
- Table 29. Global renewable diesel consumption, to 2033 (M litres/year).
- Table 30. Advantages and disadvantages of biojet fuel
- Table 31. Production pathways for bio-jet fuel.
- Table 32. Current and announced biojet fuel facilities and capacities.
- Table 33. Global bio-jet fuel consumption to 2033 (Million litres/year).

- Table 34. Biogas feedstocks.
- Table 35. Bio-based naphtha markets and applications.
- Table 36. Bio-naphtha market value chain.
- Table 37. Bio-based Naphtha production capacities, by producer.
- Table 38. Comparison of biogas, biomethane and natural gas.
- Table 39. ?Processes in bioethanol production.
- Table 40. Microorganisms used in CBP for ethanol production from biomass lignocellulosic.
- Table 41. Ethanol consumption 2010-2033 (million litres).
- Table 42. Summary of gasification technologies.
- Table 43. Overview of hydrothermal cracking for advanced chemical recycling.
- Table 44. Applications of e-fuels, by type.
- Table 45. Overview of e-fuels.
- Table 46. Benefits of e-fuels.
- Table 47. Main characteristics of different electrolyzer technologies.
- Table 48. Market challenges for e-fuels.
- Table 49. E-fuels companies.
- Table 50. Green ammonia projects (current and planned).
- Table 51. Blue ammonia projects.
- Table 52. Ammonia fuel cell technologies.
- Table 53. Market overview of green ammonia in marine fuel.
- Table 54. Summary of marine alternative fuels.
- Table 55. Estimated costs for different types of ammonia.
- Table 56. Main players in green ammonia.
- Table 57. Market overview for CO₂ derived fuels.
- Table 58. Point source examples.
- Table 59. Advantages and disadvantages of DAC.
- Table 60. Companies developing airflow equipment integration with DAC.
- Table 61. Companies developing Passive Direct Air Capture (PDAC) technologies.
- Table 62. Companies developing regeneration methods for DAC technologies.
- Table 63. DAC companies and technologies.
- Table 64. DAC technology developers and production.
- Table 65. DAC projects in development.
- Table 66. Markets for DAC.
- Table 67. Costs summary for DAC.
- Table 68. Cost estimates of DAC.
- Table 69. Challenges for DAC technology.
- Table 70. DAC companies and technologies.
- Table 71. Microalgae products and prices.

Table 72. Main Solar-Driven CO₂ Conversion Approaches.

Table 73. Companies in CO₂-derived fuel products.

Table 74. Granbio Nanocellulose Processes.

List Of Figures

LIST OF FIGURES

- Figure 1. Liquid biofuel production and consumption (in thousands of m³), 2000-2021.
- Figure 2. Distribution of global liquid biofuel production in 2021.
- Figure 3. Diesel and gasoline alternatives and blends.
- Figure 4. Schematic of a biorefinery for production of carriers and chemicals.
- Figure 5. Hydrolytic lignin powder.
- Figure 6. Regional production of biodiesel (billion litres).
- Figure 7. Flow chart for biodiesel production.
- Figure 8. Global biodiesel consumption, 2010-2033 (M litres/year).
- Figure 9. Global renewable diesel consumption, to 2033 (M litres/year).
- Figure 10. Global bio-jet fuel consumption to 2033 (Million litres/year).
- Figure 11. Total syngas market by product in MM Nm³/h of Syngas, 2021.
- Figure 12. Overview of biogas utilization.
- Figure 13. Biogas and biomethane pathways.
- Figure 14. Bio-based naphtha production capacities, 2018-2033 (tonnes).
- Figure 15. Renewable Methanol Production Processes from Different Feedstocks.
- Figure 16. Production of biomethane through anaerobic digestion and upgrading.
- Figure 17. Production of biomethane through biomass gasification and methanation.
- Figure 18. Production of biomethane through the Power to methane process.
- Figure 19. Ethanol consumption 2010-2033 (million litres).
- Figure 20. Properties of petrol and biobutanol.
- Figure 21. Biobutanol production route.
- Figure 22. Waste plastic production pathways to (A) diesel and (B) gasoline
- Figure 23. Schematic for Pyrolysis of Scrap Tires.
- Figure 24. Used tires conversion process.
- Figure 25. Total syngas market by product in MM Nm³/h of Syngas, 2021.
- Figure 26. Overview of biogas utilization.
- Figure 27. Biogas and biomethane pathways.
- Figure 28. Process steps in the production of electrofuels.
- Figure 29. Mapping storage technologies according to performance characteristics.
- Figure 30. Production process for green hydrogen.
- Figure 31. E-liquids production routes.
- Figure 32. Fischer-Tropsch liquid e-fuel products.
- Figure 33. Resources required for liquid e-fuel production.
- Figure 34. Levelized cost and fuel-switching CO₂ prices of e-fuels.
- Figure 35. Cost breakdown for e-fuels.

- Figure 36. Pathways for algal biomass conversion to biofuels.
- Figure 37. Algal biomass conversion process for biofuel production.
- Figure 38. Classification and process technology according to carbon emission in ammonia production.
- Figure 39. Green ammonia production and use.
- Figure 40. Schematic of the Haber Bosch ammonia synthesis reaction.
- Figure 41. Schematic of hydrogen production via steam methane reformation.
- Figure 42. Estimated production cost of green ammonia.
- Figure 43. Projected annual ammonia production, million tons.
- Figure 44. CO₂ capture and separation technology.
- Figure 45. Conversion route for CO₂-derived fuels and chemical intermediates.
- Figure 46. Conversion pathways for CO₂-derived methane, methanol and diesel.
- Figure 47. CO₂ captured from air using liquid and solid sorbent DAC plants, storage, and reuse.
- Figure 48. Global CO₂ capture from biomass and DAC in the Net Zero Scenario.
- Figure 49. DAC technologies.
- Figure 50. Schematic of Climeworks DAC system.
- Figure 51. Climeworks' first commercial direct air capture (DAC) plant, based in Hinwil, Switzerland.
- Figure 52. Flow diagram for solid sorbent DAC.
- Figure 53. Direct air capture based on high temperature liquid sorbent by Carbon Engineering.
- Figure 54. Global capacity of direct air capture facilities.
- Figure 55. Global map of DAC and CCS plants.
- Figure 56. Schematic of costs of DAC technologies.
- Figure 57. DAC cost breakdown and comparison.
- Figure 58. Operating costs of generic liquid and solid-based DAC systems.
- Figure 59. CO₂ feedstock for the production of e-methanol.
- Figure 60. Schematic illustration of (a) biophotosynthetic, (b) photothermal, (c) microbial-photoelectrochemical, (d) photosynthetic and photocatalytic (PS/PC), (e) photoelectrochemical (PEC), and (f) photovoltaic plus electrochemical (PV+EC) approaches for CO₂ c
- Figure 61. Audi synthetic fuels.
- Figure 62. ANDRITZ Lignin Recovery process.
- Figure 63. ChemCycling™ prototypes.
- Figure 64. ChemCycling circle by BASF.
- Figure 65. FBPO process
- Figure 66. Direct Air Capture Process.
- Figure 67. CRI process.

Figure 68. Cassandra Oil process.

Figure 69. Colyser process.

Figure 70. Domsj? process.

Figure 71. ECFORM electrolysis reactor schematic.

Figure 72. Dioxycle modular electrolyzer.

Figure 73. FuelPositive system.

Figure 74. INERATEC unit.

Figure 75. Infinitree swing method.

Figure 76. Enfinity cellulosic ethanol technology process.

Figure 77: Plantrose process.

Figure 78. Sunfire process for Blue Crude production.

Figure 79. O12 Reactor.

Figure 80. Sunglasses with lenses made from CO₂-derived materials.

Figure 81. CO₂ made car part.

Figure 82. The Velocys process.

Figure 83. Goldilocks process and applications.

Figure 84. The Proesa Process.

I would like to order

Product name: The Global Market for Biofuels to 2033

Product link: <https://marketpublishers.com/r/GFBE2673C121EN.html>

Price: US\$ 1,250.00 (Single User License / Electronic Delivery)

If you want to order Corporate License or Hard Copy, please, contact our Customer Service:

info@marketpublishers.com

Payment

To pay by Credit Card (Visa, MasterCard, American Express, PayPal), please, click button on product page <https://marketpublishers.com/r/GFBE2673C121EN.html>