Bioenergy With CCS Market By Technology (Oxy-combustion, Pre-combustion, Post-combustion, Others), By Application (Biomass Conversion, Carbon Storage): Global Opportunity Analysis and Industry Forecast, 2024-2033

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Report description:

The global bioenergy with CCS market was valued at $212.4 million in 2023, and is projected to reach $676.6 million by 2033, growing at a CAGR of 12.3% from 2024 to 2033.

Introduction

Bioenergy with Carbon Capture and Storage (BECCS) is a climate mitigation technology that combines bioenergy production with carbon capture and storage (CCS) to achieve negative carbon emissions. Biomass, such as wood, agricultural residues, or algae, absorbs CO? during growth. When used for energy production, the resulting CO? emissions are captured instead of getting released into the atmosphere. This captured CO? is then stored underground in geological formations or used in industrial applications. BECCS helps reduce greenhouse gases, supports net-zero emission goals, and provides a sustainable energy source while actively removing CO? from the air, making it a key tool for decarbonization.

BECCS involves the use of biomass (organic material derived from plants and animals) for energy production, coupled with the capture and storage of the CO? emissions generated during the combustion or conversion of biomass into energy. Biomass includes a wide range of materials such as wood, agricultural residues, algae, and even waste from forests, agricultural fields, and urban environments. Biomass is processed in a variety of ways to produce bioenergy. This can be done through combustion, gasification, fermentation, or anaerobic digestion, depending on the type of biomass and the desired form of energy (electricity, heat, or biofuels). These processes release CO?, as well as other gases, into the atmosphere.??

Market Dynamics

Increase in use of biomass waste for energy production significantly drives the growth of the Bioenergy with Carbon Capture and Storage (BECCS) market. According to the International Energy Agency (IEA), modern bioenergy accounts for approximately 55% of global renewable energy consumption, highlighting its pivotal role in the energy mix. The U.S. Department of Energy's 2023 billion-Ton Report indicates that biomass resources could supply up to 1.2 billion dry short tons annually, underscoring the vast

potential for bioenergy expansion. Utilizing biomass waste provides a renewable energy source and when integrated with CCS, enables negative emissions, thereby bolstering efforts to mitigate climate change.

However, the limited availability of sustainable biomass restrains the growth of the Bioenergy with Carbon Capture and Storage (BECCS) market by creating supply chain challenges and increasing costs. Biomass sources such as forestry residues, agricultural waste, and energy crops must be sustainably sourced to prevent deforestation, soil degradation, and competition with food production. However, large-scale biomass production requires significant land, water, and resource inputs, which lead to environmental and economic constraints. In addition, inconsistent biomass supply and transportation challenges impact the feasibility and scalability of BECCS projects, slowing down adoption of BECCS despite its potential for negative carbon emissions. All these factors hamper the Bioenergy with CCS market growth.

Segments Overview

The Bioenergy with CCS market is segmented into technology, application, and region. On the basis of technology, the market is divided into oxy-combustion, pre-combustion, post-combustion, and others. On the basis of application, the market is bifurcated into biomass conversion and carbon storage. Region-wise, the market is analyzed across North America, Europe, Asia-Pacific, and LAMEA.

On the basis of technology, oxy-combustion dominated the bioenergy with CCS market in 2023. The use of bioenergy with CCS (BECCS) provides a unique advantage by not only reducing emissions but also achieving negative emissions. By burning biomass, which absorbs CO2 during its growth, and capturing the CO2 during combustion, BECCS can remove more carbon from the atmosphere than is emitted during the process. This makes it an essential tool in the effort to mitigate climate change, especially in industries and regions that are hard to decarbonize. Furthermore, oxy-combustion enhances the efficiency of the carbon capture process because it produces a concentrated CO2 stream, making it easier and more cost-effective to capture.

On the basis of application, biomass conversion dominated the market in 2023. Biomass conversion plays a significant role in the field of bioenergy, particularly when integrated with Carbon Capture and Storage (CCS) technologies. Biomass, a renewable energy source, is primarily derived from organic materials such as plants, wood, and agricultural residues. Through processes like combustion, gasification, or anaerobic digestion, biomass can be converted into biofuels such as biogas, bioethanol, or biodiesel, and utilized as a clean energy source. This conversion helps reduce the dependency on fossil fuels and mitigates environmental impact by tapping into the carbon neutrality of organic matter.

Region wise, North America dominated the market in 2023. Bioenergy with Carbon Capture and Storage (BECCS) is an emerging technology that plays a crucial role in mitigating climate change by reducing carbon dioxide (CO2) emissions. In North America, several countries are exploring the potential of BECCS as part of their broader decarbonization strategies. The U.S. is a leader in the development of BECCS technology, with significant research and investment directed towards its implementation in bioenergy and industrial sectors. The U.S. has an abundant supply of biomass resources, including agricultural residues, forestry waste, and dedicated energy crops, which are ideal for BECCS applications. Several pilot projects and large-scale facilities are being developed, particularly in states with strong agricultural industries. The U.S. government's support, through policies like the 45Q tax credit, incentivizes the capture of CO2 from bioenergy facilities. These initiatives aim to scale up BECCS and integrate it into the energy grid while reducing overall greenhouse gas emissions.

Competitive Analysis

The key players operating in the bioenergy with CCS market include Chevron Corporation, Drax Group, Orsted A/S, Saudi Arabian Oil Co., Sekab, Clean Energy Systems, Climeworks, LanzaTech, Aker Solutions, and Babcock & Wilcox Enterprises, Inc.

Key Benefits For Stakeholders

-This report provides a quantitative analysis of the market segments, current trends, estimations, and dynamics of the bioenergy with ccs market analysis from 2023 to 2033 to identify the prevailing bioenergy with ccs market opportunities.

-The market research is offered along with information related to key drivers, restraints, and opportunities.

-Porter's five forces analysis highlights the potency of buyers and suppliers to enable stakeholders make profit-oriented business decisions and strengthen their supplier-buyer network.

-In-depth analysis of the bioenergy with ccs market segmentation assists to determine the prevailing market opportunities.

-Major countries in each region are mapped according to their revenue contribution to the global market.

-Market player positioning facilitates benchmarking and provides a clear understanding of the present position of the market

players.
-The report includes the analysis of the regional as well as global bioenergy with ccs market trends, key players, market segments, application areas, and market growth strategies.

Additional benefits you will get with this purchase are:
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- Key player details (including location, contact details, supplier/vendor network etc. in excel format)
- SWOT Analysis
- Volume Market Size and Forecast
Key Market Segments
By Technology
- Oxy-combustion
- Pre-combustion
- Post-combustion
- Others
By Application
- Biomass Conversion
- Carbon Storage
By Region
- North America
? U.S.
? Canada
? Mexico
- Europe
? Germany

? UK
? France
? Spain
? Italy
? Rest of Europe
- Asia-Pacific
? China
? India
? Japan
? South Korea
? Australia
? Rest of Asia-Pacific
- LAMEA
? Brazil
? Saudi Arabia
? South Africa
? Rest of LAMEA
- Key Market Players
? Chevron Corporation
? Drax Group PLC
? Climeworks
? Aker Solutions
? LanzaTech
? SLB
? Orsted A/S
? Saudi Arabian Oil Co. (Saudi Aramco)
? Babcock & Wilcox Enterprises, Inc.
? C?lean Energy Systems

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