Bioenergy with carbon capture and storage (BECCS)

BECCS involves capturing carbon dioxide in plants, turning it into energy or fuel, and storing subsequent carbon emissions in geologic formations or carbontech products.

BECCS is projected to be able to remove 3.5 to 5.2 gigatons of CO₂ annually by 2050 at costs between $15 and $400 per ton of CO₂ removed — costlier than forestry and soil carbon sequestration but cheaper than direct air capture (DAC).

Benefits and opportunities

BECCS can convert otherwise wasted plant biomass into fuel, electricity, building materials, chemicals, and more while capturing and storing CO₂ from difficult-to-decarbonize biorefineries and industries that use bioenergy. It can create jobs in geologic sequestration and the bioenergy sector, and provide revenue streams for rural communities through agricultural biomass production and forestry waste management.

Challenges and risks

For economic reasons, deployment of BECCS has been limited and not prioritized carbon removal. By 2025, however, the number of BECCS facilities is expected to increase from a few to more than thirty, removing over 3 million tons of carbon removal per year. Large-scale production of bioenergy crops can lead to land use competition, higher food prices, biodiversity loss, soil carbon loss, and high water and fertilizer use. Increased governance for sustainable biomass production, strong emissions reductions policies, and RD&D funding are needed.
Current policy support

Policy support for BECCS has so far been piecemeal and indirect. The US Department of Agriculture and Department of Energy are currently involved in BECCS through biofuel and bioenergy industry financial assistance programs (such as the Renewable Energy Assistance Program) and R&D funding. Existing federal policies and programs (such as the Renewable Fuel Standard) are designed for the production of biofuels from biomass and offer no direct incentive for atmospheric CO₂ removal. Next-generation policies like the low-carbon fuel standard (LCFS) currently implemented in California and Oregon are growing in popularity across states. LCFS programs incentivize innovative fuel production processes like BECCS through a market-based, carbon emissions reduction credit system. Section 45Q of the US tax code also supports BECCS by providing a $35–$50 tax credit per ton of CO₂ stored geologically or in carbontech products.

The Clean Electricity Standard included in H.R. 1512, the CLEAN Future Act, sets a 100% clean electricity target by 2035 and creates a zero-emission electricity generation credit system which would allow BECCS to become more cost competitive with renewables. Introduced in the Senate, S. 622, the American Jobs in Energy Manufacturing Act of 2021, would provide a manufacturing tax credit that would cover carbon capture facility investments, an incentive for biorefineries to become BECCS plants.

Additional policy support is needed to develop innovative feedstock production pathways, increase demonstration and deployment projects, nationalize LCFS, and establish sustainability standards that safeguard from possible risks.

Explore today’s federal support for BECCS with the Carbon Removal Policy Tracker.