

Brazil's Energy Transition: Initiatives In Emissions Reduction And Control

28.10.2025 2 min read

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Since COP26 in 2022, Brazil has made significant progress in building a regulatory foundation for the energy transition and for controlling greenhouse gas (GHG) emissions. Over this period, the country has seen notable advances in its regulated carbon market, the expansion of renewable energy sources, and pioneering efforts in carbon capture and storage (CCS).

In October 2024, Brazil enacted the Future Fuel Law (Law 14.993), establishing a legal framework for carbon capture and storage. Two months later, Law 15.042/2024 created the Brazilian Greenhouse Gas Emissions Trading System (SBCE), a cap-and-trade model designed to provide organized economic incentives for decarbonizing the economy. At the same time, promising developments have emerged, such as authorization by the National Petroleum, Natural Gas and Biofuel Agency (ANP) for CCS research in biofuels in the Parecis Basin (scheduled to begin in 2026) and Brazil's participation in the Clean Energy Ministerial's CCS initiative, an international forum for advancing clean energy solutions.

In the oil and gas sector, CCS projects are beginning to take shape. Petrobras has launched a pilot project in saline aquifers in northern Rio de Janeiro state, estimating a national storage potential of 250 million tons per year in this type of formation.

Petrobras is also advancing its emissions reduction strategy through innovative technologies and investments. The company has acquired all-electric floating production storage and offloading units (FPSOs), which can cut GHG emissions by up to 30% per barrel of oil equivalent produced. Another highlight is Petrobras's proprietary "Hi-SEP" technology, which separates CO₂-rich gas from oil while still underwater and reinjects the CO₂ directly into the reservoir.

In the electricity sector, renewables continue to gain momentum. In 2024, Brazil added a record 10.9 GW to its power grid, with 91.13% of this new capacity coming from solar (51.87%) and wind (39.26%) sources. The rapid growth of these technologies—both centralized and distributed—poses challenges for system operation and reliability, particularly due to curtailment, or generation cuts. This situation highlights the urgent need to expand transmission infrastructure, secure capacity reserves, and deploy energy storage solutions such as batteries and pumped-storage hydropower. Addressing these challenges will require coordinated advances in Brazil's legal and regulatory framework, with active collaboration among sector institutions.

The period from 2022 to 2025 has been marked by major milestones: strengthening the transmission network, expanding renewable energy, launching a CCS pilot project, and enacting carbon market legislation. Looking ahead, Brazil faces several immediate challenges: regulating the

SBCE and the Future Fuel Law, addressing the impacts of curtailment, executing CCS projects, and improving the reliability and efficiency of natural gas use. Tackling these issues will be essential to ensure energy security and achieve lasting, structural reductions in greenhouse gas emissions.

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