# Chapter 9
# Carbon Capture, Utilization, and Storage (CCUS) Technologies: Net-Zero Strategies

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## ABSTRACT

*Global climate change initiatives must include carbon capture, use, and storage (CCUS). It will significantly reduce unavoidable carbon emissions. The nations have effectively implemented carbon pricing, tax credits, and procurement programs for low carbon items to make CCUS economically feasible. Countries like India have submitted net-zero emission objectives. Hard-to-abate sectors like factories and irreplaceable coal power plants, which produce roughly 80% of CO2 emissions, can only reach net-zero with negative emission technologies like CCUS. Different CO2 collecting and separation methods are possible with CCUS technology. Pipelines, trains, trucks, and ships carry CO2. Captured CO2 can be turned into goods for*

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*storage and use. CCUS technologies with diverse CO2 separation and carbon capture processes are described. This chapter reviews the research on CCUS system problems, highlighting the need to expand low technological readiness level (TRL) technologies for commercial application. Finally, we want to help scale up and build global CO2 emission reduction programs.*

## INTRODUCTION

The goal of the carbon neutrality 2050 (CN2050) scenario is to achieve carbon neutrality by the year 2050. This will be accomplished by balancing greenhouse gas emissions with offsets, which will not result in any net increase of carbon dioxide emissions to the environment. CCUS, which stands for carbon capture, use, and storage, is an essential component of the worldwide decarbonization initiative. It provides a means to cut emissions while simultaneously fostering the expansion of industrial production. Using Carbon Capture, Utilization, and Storage (CCUS) technology, the carbon dioxide that is released by fossil fuel plants is collected, stored, and either used in applications that require $CO_2$ as a raw material or it can be permanently sequestered in $CO_2$ storage sites. This is done to achieve net carbon zero conditions all over the world. Because the collected carbon dioxide is put to use for enhanced oil recovery (EOR) and increased energy production, this carbon capture and utilization system (CCUS) technology is the energy source of the future. This is because it enhances the hydrogen economy. The technologies of CCUS, their incorporation into net-zero programs, and the problems that are related with them are discussed in this chapter.

Emissions of carbon dioxide have emerged as one of the most pressing issues confronting the world in the present day as a direct consequence of the growing activities of humans. The burning of fossil fuels, the release of chemicals into the atmosphere, the expansion of industrial activity, and the cutting down of forests are all examples of pollution. As a consequence of the production of greenhouse gases (GHG), the concentration of carbon dioxide (CO2) in the atmosphere is becoming higher. Because of emissions of greenhouse gases, which result in the formation of a blanket of gasses, heat is unable to escape from the atmosphere and is instead trapped there. The methods that are used to manufacture cement, steel, and chemicals are the ones that are responsible for industrial emissions. Secondary emissions come from a variety of sources, including the transportation industry, residential and commercial buildings, and architectural projects that are both residential and commercial. As the need for energy continues to rise all across the world, one factor that contributes to this demand is the utilization of fossil fuels. The research conducted by British Petroleum indicates that fossil fuels constitute the primary source of energy for the

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