ABSTRACT

Carbon dioxide (CO₂) capture and storage (CCS) is a process consisting of the separation of CO₂ from industrial and energy-related sources, transport to a storage location and long-term isolation from the atmosphere. Capture of CO₂ can be applied to large point sources. The CO₂ would then be compressed and transported for storage in geological formations, in the ocean, in mineral carbonates, or for use in industrial processes. The net reduction of emissions to the atmosphere through CCS depends on the fraction of CO₂ captured, the increased CO₂ production resulting from loss in overall efficiency of power plants or industrial processes due to the additional energy required for capture, transport and storage, any leakage from transport and the fraction of CO₂ retained in storage over the long term. There are different types of CO₂ capture systems: post combustion, pre-combustion and oxyfuel combustion. The concentration of CO₂ in the gas stream, the pressure of the gas stream and the fuel type (solid or gas) are important factors in selecting the capture system. Storage of CO₂ in deep, onshore or offshore geological formations uses many of the same technologies that have been developed by the oil and gas industry and has been proven to be economically feasible under specific conditions for oil and gas fields and saline formations. The reaction of CO₂ with metal oxides, which are abundant in silicate minerals and available in small quantities in waste streams, produces stable carbonates. With appropriate site selection based on available subsurface information, a monitoring program to detect problems, a regulatory system and the appropriate use of remediation methods to stop or control CO₂ releases if they arise, the local health, safety and environment risks of geological storage would be comparable to the risks of current activities such as natural gas storage and deep underground disposal of acid gas. Environmental impacts of large-scale mineral carbonation would be a consequence of the required mining and disposal of resulting products that have no practical use.

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