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## **Recent Advances in Carbon Dioxide Capture and Separation Techniques at the National Energy Technology Laboratory**

The recent interest in global warming has created a flurry of research activity. One of the greenhouse gases causing concern is carbon dioxide due to its abundant formation from various processes. Specifically, large quantities of carbon dioxide emanate from power generation systems that utilize/combust fossil fuels. These point sources are likely targets for removal of carbon dioxide if regulation of carbon dioxide is deemed necessary in the future. Although the overall carbon dioxide sequestration scheme is important, the capture (and separation) of the carbon dioxide from the large-point source is a critical step with respect to the cost and technical feasibility of the overall sequestration process. Within the Carbon Sequestration Program of the Department of Energy, an in-house focus area at the National Energy Technology Laboratory has initiated research in this fledgling area. As related to power generation, capture and separation processes can be viewed as near-term and far-term, with the former dealing with conventional fossil fuel combustion, such as pulverized-coal combustion, and with the latter pertaining to advanced power systems, such as integrated gasification combined cycle. For the near-term capture processes, an evolutionary research project has addressed improvements in conventional amine scrubbing to remove carbon dioxide from flue gas. In the far-term research effort, novel dry-scrubbing techniques are being developed to remove carbon dioxide from the fuel gas or flue gas from advanced power/energy conversion systems. Chemical absorption, physical adsorption, and electrochemistry are fundamental methods used in the separation step. An overview of the various novel techniques will be given along with overall technical performance and cost implications.