

Sequestering CO₂ in Houston

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EXECUTIVE SUMMARY

The goal of this project is to propose an economically feasible plan to separate and sequester some fraction of the carbon dioxide that is emitted from power plants in Harris County, Texas. This project is conducted from the viewpoint of a governmental agency planning for legislation that will improve the air quality of Harris County without overburdening its electricity consumers.

This study focuses on seven utility power plants in Harris County that cumulatively emit 5.3 million tons of carbon dioxide per year. To reduce compression costs, it is necessary to separate carbon dioxide from the other components of flue gas emissions. This can be achieved by using one of two proposed methods: MEA packed tower and reaction with calcium hydroxide. Combustion of natural gas in oxygen-enriched air is considered as an alternative to separating flue gas that is combusted in ambient air.

Once the CO₂ from the power plants has been captured, a transportation network is designed to move the CO₂ from the power plants to a collection point, where it is mixed and compressed prior to sequestration. Then, it is sequestered to prevent it from entering the atmosphere. The methods that are considered for this purpose are: ocean sequestration, geological sequestration in brine aquifers, and sequestration by enhanced oil recovery.

In order to determine the best course of action, a mathematical model is developed. This tool allows for the consideration of many scenarios that might occur in the future of this project. The results of the model show that the government should proceed by enforcing a 15% overall reduction in CO₂ emissions over a ten year period. The most economical separation method for this purpose is separation with calcium hydroxide treatment and the most economical sequestration method is in brine aquifers.