

EVALUATING OPPORTUNITIES FOR LONG-TERM DEPLOYMENT OF CARBON CAPTURE AND SEQUESTRATION TECHNOLOGIES IN THE U.S. ENERGY MARKET

Authors: Vatsal Bhatt¹, Diptiranjana Mahapatra, Hefei Li – Brookhaven National Laboratory

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The potential for fossil energy technologies to remain viable and significant part of our energy technology mix depends on the development of technically feasible, environmentally safe, and cost-effective carbon capture and sequestration technologies (CCS). A successful CCS approach would require carbon sequestration (CS) to demonstrate low probability of CO₂ leakage, minimal likely impact on health and safety, and the ability to compete in the energy marketplace.

This paper outlines economic risk of various CCS and CS approaches in a competitive U.S. energy market (with competing energy production and use technologies) with the help of an integrated energy systems analysis model MARKAL. The paper also outlines the necessary interactions with certain parameters of the geological storage formation and associated CCS technology and with the policy decisions of government related to carbon caps and/or carbon taxes. The end result is a tool to assess the required cost in the marketplace to be competitive, and the combination of technical and policy conditions that lessen the risk of failing to reach the desired objectives.

Alternative carbon capture and sequestration pathways are modeled for the US energy market. This model takes information from the both the geological and policy analyses to describe the technical parameters and regulatory environment that a CS approach would encounter in the energy market. The technical parameters are represented in the model by technology costs, arising from the equipment required to capture, transport, and sequester the CO₂, and by the nature of the formation, including the potential of CO₂ leakage. This information is generated in useable form by a newly-constructed Economic and Policy Drivers Module. The regulatory and policy information are incorporated as drivers of certain scenarios in the energy market.

MARKAL analysis and results examine the competitiveness of selected CCS approaches under alternative CO₂ policies and geological formation classifications in a series of scenario analyses. They outline the most promising CCS pathways where the cost and CO₂ leakage uncertainties are constraining market competitiveness of CS alternatives. They also study changes in CO₂ policies and/or regulations and alternative energy prices that could encourage competitiveness of CS approaches under review.

¹ Corresponding Author: Vatsal Bhatt, Brookhaven National Laboratory, vbhatt@bnl.gov, Phone: 631-344-5453