CARBON CAPTURE AND STORAGE NETOWRK OPTIMIZATION UNDER UNCERTAINTY

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ABSTRACT

Carbon capture and storage (CCS) is likely to play an important role in achieving greenhouse emissions reductions. It provides a method for capturing carbon dioxide from multiple sources, such as power plants and industry, transporting it and then storing it in the subsurface. For widescale deployment, future CCS demand has to be considered during infrastructure planning. This study presents a two-stage stochastic model, that utilizes both geographic information systems (GIS) and Mixed Integer Programming (MIP), to generate an optimal near-term hedging strategy. One discrete uncertainty distribution is considered: the future demand for CO_2 storage. The model utilizes spatial information to generate a candidate network of pipeline and ship routes. An optimal set of transportation modes, capture locations, and storage sites is selected from this network. These represent the least cost system to build under current, certain conditions, that allows for flexibility in adapting to future unknown conditions. We run the model on the Texas Gulf Coast region, considering 12 separate industrial sources and 6 reservoirs. Two separate scenarios are considered: an increasing CCS demand and a mixed demand. The results demonstrate the cost benefits achieved by considering demand uncertainty compared to planning based on expected future values.

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