

Low Carbon Renewable Natural Gas from Depleted Fossil Fuel Reservoirs

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Abstract: Carbon sequestration in geological formations has long been viewed as one of the most practical options for reducing carbon dioxide in the atmosphere. Depleted fossil fuel reservoirs may also benefit from existing oil and gas infrastructure and a better understanding of reservoir functions. Moreover, pumping carbon dioxide into these reservoir has been shown to enhance oil and gas production. The potential for value added returns through the production of low carbon renewable natural gas, however, has not been fully considered. For example, simple and complex carbohydrates could be delivered to the indigenous microorganisms living in these reservoirs as an alternative substrate or food source, leading to the production of biogenic methane (i.e., low carbon renewable natural gas). Carbon dioxide could also serve as an electron acceptor for enhancing hydrogenotrophic methanogenesis. In addition, much of the injected carbon would likely remain in the subsurface as microbial biomass and carbonate species, further lowering the carbon intensity of the gas through carbon capture and storage. As a result, any remaining fossil-based natural gas would be effectively decarbonized in the process. In fact, it's conceivable that low carbon renewable natural gas recovered from depleted fossil fuel reservoirs could someday be classified as "carbon negative", resulting in a net reduction in global carbon dioxide emissions.