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An assessment of some geological challenges in the implementation of a Carbon Capture, Utilization & Sequestration (CCS) and Carbon Dioxide Enhanced Oil Recovery (CO2 EOR) project in Trinidad

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This paper intends to review some geological aspects of the recently announced mega plan by the Government of Trinidad and Tobago to conduct a Carbon Dioxide (CO2) Enhanced Oil Recovery (EOR) project, utilizing emitted CO2 to inject into previously producing reservoirs of some of Heritage Petroleum Company's fields, with the dual purpose of decreasing the country's CO2 emissions, as part of the country's commitment to the Paris agreement and secondly to increase its oil production.

The importance of the geological aspects of this project can never be understated; both at the surface and sub-surface level. The review indicates that geology plays an important role in the design of the pipeline, its configuration to counter any stress brought about by earthquakes or slippages associated with swelling clay rocks and in areas of outcropping aquifers. It is evident that a detailed understanding of the surface geology of the area of the pipelines and the fields is necessary so that mitigation efforts can be developed prior to any large scale injection of CO2.

The stratigraphic framework of the reservoirs as a result of their being more of structural complex than a genuine formation, as was previously interpreted, has implications for the performance of the flood as well as management of break-outs and micro seismic activity, which can result from the sealing capacity of the discontinuities between reservoir rocks and seals breaking down with increasing pressure of the displacing gas in the reservoirs. The structural complex nature of the reservoirs would also explain several anomalies that were observed in the pilot CO2 EOR projects of the 1970s.

The critical importance of predicting the reservoir bodies, their orientation and discrete gross rock volumes, before any injection occurs cannot be overstated. Detailed simulation techniques in the discrete reservoir packages need to be employed so that the CO2 flood performance can be monitored and changes, where required, can be timely addressed.

Finally, this project is driven by environmental concerns and leakages/blowouts as well as any release of anthropogenic CO2 into the atmosphere are to be avoided. Remapping surface geology and monitoring of seepages will assist in identifying potential surface zones of weakness,

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which could develop into breakout zones once the CO2 injection has reached certain pressure hurdles.