Carbon Dioxide Enhanced Oil Recovery Potential of the Central Devonian Michigan Basin

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This paper is a general overview of carbon dioxide enhanced oil recovery (CO2-EOR) potential in Devonian reservoirs of the Dundee Limestone and Detroit River Group in the central Michigan Basin. Given the recent national and international interest in reducing CO2 emissions, there is considerable new research on the assessment of CO2 storage targets in geological media. In central Lower Michigan, only oil and natural gas bearing formations and deep saline reservoirs appear to have significant CO2 storage potential. CO2-EOR is especially attractive because of the potential for revenue generated by incremental oil production.

Since the early 1920s, Michigan has produced more than 1.34 billion (B) barrels (bbl) of oil. Currently, approximately 4,673 operating oil wells in Michigan produce an average of 22,667 bbls oil per day. It is estimated that approximately 40 to 80 percent of the original oil-in-place (OOIP) has not been recovered, equating to approximately 1 B bbls of remaining oil in place (ROIP) in larger (> 1MM bbls OOIP) fields. CO2-EOR is currently used in northern Michigan Niagaran Reef Trend using CO2 from natural gas treatment facilities in that area. This source, along with CO2 captured at electric power generation or cement plants may provide additional sources for CO2-EOR in other areas of the Michigan Basin. This paper presents information on general CO2-EOR methodology, and an overview of prospective central Michigan Basin oilfields for CO2-EOR opportunities. This analysis was developed using CO2-EOR screening criteria including geologic conditions and available well field history, reservoir characteristics, and available CO2-EOR technological assessments and case histories.