ASSESSMENT OF CO$_2$-EOR AND STORAGE CAPACITY IN SOUTH SUMATERA AND WEST JAVA BASINS

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Abstract

A study of CO$_2$-EOR and Storage Capacity in South Sumatera and West Java Basins, Indonesia has been conducted in conjunctions with the project plans of Indonesia National Electric Company to build Carbon Capture and Storage Ready Coal Power Plant in Bojonegara of West Java and Muara Enim of South Sumatera. The Bojonegara power plant comprises 2x1000 MWe Ultra Super Critical Units, while Muara Enim consists of 2x300 MWe subcritical units. Those two power plants will produce CO$_2$ approximately 11 and 4 million tons per year. The geology of South Sumatera and West Java Basins are proven to keep oil and gas in place safely for very long time period and there are many oil and gas companies production still active in those basins. Those basins are confirmed to be used as storage of CO$_2$, where capacity, injectivity, and confinement will be suitable to keep CO$_2$ in place for period of time. CO$_2$ production from power plants in South Sumatera and West Java may be offered to the nearby oil companies and transported to oil fields for CO$_2$-EOR flooding to get additional revenue. A preliminary CO$_2$-EOR screening has been done for the oil fields surrounded the power plants. There are two types of mechanisms for CO$_2$-EOR, which depend on the nature of the oil field: immiscible EOR and miscible EOR. Immiscible EOR occurs where the injected CO$_2$ does not mix with the oil, but instead displaces the oil from the area where the CO$_2$ is injected and increases the pressure of the oil at the production wells so that it can be pumped out. Miscible EOR occurs where the supercritical CO$_2$ mixes with the residual oil to make it less viscous and facilitating its flow to the production wells. Total of 127 oil fields in South Sumatera have been analyzed to select which of those fields fulfill CO$_2$-EOR injection criteria. EOR reservoir screenings were performed on those oil fields on which detailed information was available using the screening criteria proposed by Taber et al. The criteria include a set of parameters such as API gravity, oil viscosity, current pressure, temperature, oil saturation, remaining oil, formation depth, thickness, porosity, permeability, and rock type which help to determine whether or not a reservoir is suitable for CO$_2$-EOR injection. 96 fields are classified as miscible displacement while the rest of 31 fields categorized as immiscible. The result shows that the potency of additional recovery from those fields is around 661 million stock tank barrels with CO$_2$ requirement is approximately 243 million tones. In addition to EOR, pure CCS to inject the CO$_2$ emission is also considered into depleted gas fields in West Java and South Sumatera regions. The maximum storage capacity of West Java gas fields is approximately 395 million tones, while the storage capacity of South Sumatera is around 537 million tones. The potential for storing CO$_2$ in saline aquifer was also calculated theoretically. The depleted gas fields and aquifers are considered enough to store the CO$_2$ emission from the power plants as long as 25 years.

Keywords: CO$_2$-EOR, Storage Capacity, immiscible EOR, miscible EOR