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Risk Assessment Study of Bio-CCS (2)

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Among in-situ geo-microbes within depleted oil/gas reservoir, there are some species those generate methane gas from residual oil. Mayumi et.al (2013) identified some methanogens in depleted oil reservoir, those generate more methane gas when they are cultivated in higher CO2 partial pressure environment than in CO2 poor environment. CO2 acts as a catalyst in the reaction. If we maintain preferable conditions for methanogenesis archaea during geological CCS, we will be able to abate greenhouse gas emission and produce natural gas as natural energy resource at the same time. We named the technology concept as 'Bio-CCS'. Assuming Bio-CCS site, CO2 is injected from a well for to abate greenhouse gas emission and cultivate methanogenic geo-microbes, and CH4 is produced from another well. The procedure is similar to the Enhanced Oil/Gas Recovery (EOR/EGR) operation, but in Bio-CCS, the target is generation and production of methane out of depleted oil/gas reservoir during CO2 abatement. We are evaluating the basic practicability of Bio-CCS. In our project, while biologists are identifying the most effective cultivating conditions for methanogenic archaea, geologists, environmental scientists and system scientists are evaluating feasibilities of the technology concept. To evaluate total feasibility of Bio-CCS concept, we are estimating: CH4 generation volume, environmental impact along with life cycle of injection well, and risk-benefit balance of the Bio-CCS. For that purpose, we assumed two conceptual sites of Bio-CCS: One is depleted oil field and the other one is depleted gas field. In our presentation, we will introduce methodologies and interim results of our feasibility study on Bio-CCS.

Keywords: CO2 Geological Storage, CCS, Methanogenesis, Feasibility study, Risk assessment, Methane gas