

*Session V-2*

## **Injecting Carbon Dioxide into Seabed Formations**

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Atmospheric carbon dioxide concentrations, the most important greenhouse gas (GHG), have been increasing since the pre-industrial era because of burning fossil fuels. Every year, about 7 G tons of anthropogenic carbon is released. Approximately 50% of the emissions stay in the atmosphere, and the remaining 50% is stored naturally by the ocean and the terrestrial vegetation. However, as the global climate change issues debate grows stronger, governments and companies are seeking new methods to reduce their GHGs emissions to meet the Kyoto protocol. Besides the natural ones, there is other important type of sequestration that merit discussion such as the injection of CO<sub>2</sub> into seabed formations. Carbon dioxide capture and sequestration in deep geologic formations can provide more than 90% reduction in CO<sub>2</sub> emissions. The technological and environmental feasibility of this latter sequestration options is the subject of this article. Before CO<sub>2</sub> gas can be sequestered, it must be captured as a relatively pure gas from power plants or industrial sources. CO<sub>2</sub> is routinely separated and captured as a by-product from industrial processes such as synthetic ammonia production, hydrogen production, and limestone calcination. The most likely options currently identifiable for CO<sub>2</sub> separation and capture include the following: absorption, adsorption, low-temperature distillation, gas separation membranes, and mineralization and biomineralization. After compression, captured CO<sub>2</sub> can be transported as liquid from shore and injected into seabed formations by land-based pipelines or by a tanker ship-towed pipeline. Carbon dioxide storage in geologic formations includes injection in sites such as depleted oil and gas reservoirs, shale formations with high organic content, coal seams, and underground saline formations. To find the adequate reservoirs or aquifers large seabed geologic survey is needed. Ocean Drilling Program, which revolutionized our view of earth history and global processes such as the deep biosphere and the sub-seafloor ocean, Environmental change, and Solid earth cycles through ocean basin exploration can greatly expands our knowledge of the seabed geologic structure as well as drilling sub-sea wells for CO<sub>2</sub> injection by using multiple drilling vessels. Besides CO<sub>2</sub> sequestration, production of oil or natural gas can be enhanced in some cases by pumping CO<sub>2</sub> into depleted oil and gas reservoirs to push out the product, a process called enhanced oil recovery (EOR). It represents an opportunity to sequester carbon at low net cost, due to the revenues from the recovered oil/gas. However the capacities of oil reservoirs are

small and cannot store considerable amount of CO<sub>2</sub>. Saline aquifers are bigger and widely distributed under the sea floor that is way this sequestration option is more appropriate. The first decision to store CO<sub>2</sub> captured from natural gas in the seabed (in the Sleipner Utsira Sand Formation, North Sea), as a climate change mitigation effort, was taken by Statoil in 1990, it is the only successful CO<sub>2</sub> sub-sea sequestration project.