Gas Hydrate Resource Potential in the Gulf of Mexico

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It is generally assumed that oceanic gas hydrates contain a huge volume of natural gases, mainly methane. Recent direct measurements of gas hydrate concentration at the Blake Ridge and Hydrate Ridge are suggestive that the global submarine gas hydrate reservoir contains (1-5)×10^{15} m^3 of methane (500-2500 Gt of methane carbon) (Milkov, 2004). Because so much methane may be concentrated in gas hydrate, this mineral is considered locally as a potential energy resource.

The northwestern Gulf of Mexico (NW GOM) continental slope is one of the best-studied gas hydrate provinces. The volume of hydrate-bound gas in this area has been estimated based on the relationship between geologic setting, water depth and the gas hydrate stability zone (Milkov and Sassen, 2001). A conceptual model of gas hydrate occurrence defines two types of gas hydrate accumulations in the NW GOM: (1) structurally-focused thermogenic and bacterial gas hydrate on the rims of minibasins, and (2) disseminated bacterial methane hydrate that resides within stratigraphic accumulations in minibasins. Structurally-focused gas hydrate is estimated to contain ~8-11×10^{12} m^3 of C_1-C_5 hydrocarbon gas at standard temperature and pressure (STP), representing an important target for future economic exploitation. The estimated volume of bacterial methane hydrate in minibasins is ~2-3×10^{12} m^3 of methane at STP, but appears to be too widely disseminated to represent a viable exploration target.

The resource potential of individual gas hydrate accumulations has been estimated at GC (Green Canyon) blocks 184/185, GC 234/235, GB (Garden Banks) 388, MC (Mississippi Canyon) 798/842, GC 204, MC 852/853, and AT (Atwater Valley) 425/426 sites in the Gulf of Mexico at water depths ~500-2000 m (Milkov and Sassen, 2003). These structural accumulations may contain from 4.7×10^{8} m^3 to 1.3×10^{11} m^3 of gas at STP conditions. The in-place resources in individual gas hydrate accumulations are comparable (by volume) with the reserves in very small to major conventional gas fields. Various geologic, technologic, and economic factors affect the economic potential of studied accumulations. The MC 852/853 appears to be characterized by the most favorable combination of these factors, and thus is suggested to have the highest economic potential. The economic potential of gas hydrate accumulations at GC 204, GB 388, and AT 425/426 sites is ranked as “average”. Gas hydrate accumulations at GC 234/235, GC 184/185, and MC 798/842 sites contain only small volumes of hydrate-bound gas, and likely have no economic potential. Future gas hydrate research should focus on the detailed study of large structural gas hydrate accumulations from which gas may be profitably recovered (e.g., the MC 852/853 site). However, the production of hydrate-bound gases faces major technological challenges and remains uncertain.