Resource Characterization and Quantification of Natural Gas-Hydrate and Associated Free-Gas Accumulations in the Prudhoe Bay – Kuparuk River Area on the North Slope of Alaska

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The objectives of this project are to characterize, quantify, and determine the commerciality of in-place and recoverable gas-hydrate and associated free-gas resources in the Prudhoe Bay Unit (PBU) – Kuparuk River Unit (KRU) – Milne Point Unit (MPU) areas on the Alaska North Slope (ANS). The project team will accomplish these goals through integrated academic, industry, and government collaborative research designed to assess the potential for safe, cost competitive, and environmentally responsible production of these possible abundant, strategic, and secure unconventional energy resources.

The large magnitude of potential gas hydrate reserves and the interest in future ANS gas commercialization make this an opportune time to assess the energy resource potential of ANS gas hydrates. The PBU-KRU-MPU area is the premier area in the world for a project of this type. This area combines the presence of both gas hydrate and associated free gas within high-quality reservoirs beneath existing oil and gas facility infrastructure. This infrastructure enables access to sites, support equipment, and production facilities needed for a project of this magnitude.

Gas hydrate resource assessments of northern Alaska range from 6.7 to 66.8 trillion cubic meters (TCM) (236 to 2,357 trillion cubic feet (TCF)) of gas in-place (Collett, 1997). Collett (1997) calculates the mean ANS basin gas in-place resources are 16.7 TCM (590 TCF). Alaska sites where gas hydrates are inferred or identified include the Eileen trend within the PBU – KRU – MPU areas, which may contain as much as 1.24 TCM (44 TCF) of gas in-place.

Only limited, systematic gas hydrate reservoir characterization studies have been accomplished. ANS gas hydrates have not been characterized by detailed reservoir analyses to determine reservoir extent, stratigraphy, structure, continuity, compartmentalization, quality, variability, and geophysical and petrophysical property distributions. This project will study these reservoir characteristics to provide practical input to reservoir and economic models. The project will also determine the technical feasibility of gas hydrate production on the ANS.

Accomplishing project goals will require a multi-phased, multi-year, collaborative project with specific deliverables to determine the technical and economic feasibility of gas hydrate and associated free gas resource development. Three phases will occur over 4 years. Each phase will build on prior phases, with clear project continuation/commerciality decisions between phases. The first phase focuses on reservoir characterization using existing seismic and well data, leading to a scoping evaluation of recoverable reserves and commercial potential. This phase will also design drilling system, data acquisition, completions, and production testing technologies. Phase 2 will apply developed technologies and integrate well, core, log, and production test data from an additional well if justified by results from Phase 1. This phase will also extend the geologic and reservoir models, include detailed analyses of structural control on geothermal gradient and hydrate stability, and refine the evaluation of reserves and commerciality. Phase 3 will further verify the resource, extend the models to full field, and include additional drilling and long-term production testing if justified by Phase 2 results. This phase could lead to a future ANS gas hydrate pilot development.

Significant technical, economical, environmental and safety issues require resolution before gas hydrates become a viable energy resource. The energy resource potential of gas hydrates has been studied for nearly three decades. However, the developed knowledge has not been adequately tested or applied to practical gas hydrate resource development and economic recovery in the United States. Production from gas hydrates will likely require innovations in drilling, completion, and reservoir technology. Development of this technology could require significant capital investment. The PBU – KRU – MPU region of the ANS provides the best area for timely gas hydrate and associated free gas resource delineation studies, economic evaluations, and pilot development program plans due to the coincidence of resource presence beneath existing or planned facility infrastructure.