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Petroleum Potential of the Arctic National Wildlife Refuge (ANWR) Coastal Plain, Northeast Alaska

A 1998 U.S. Geological Survey assessment of undiscovered petroleum resources of the ANWR coastal plain and adjacent State offshore (3 mile limit) concluded that the area contains between 5.7 and 16.0 billion barrels of technically recoverable oil at the 95% and 5% probability levels, respectively, with a mean of 10.4 billion barrels. These resources were assessed in ten geologically defined plays using deposit simulation methodology.

Three petroleum systems documented in or adjacent to the ANWR coastal plain provide potential for charging the ten assessed plays. In the western part of the area where the bulk of assessed oil resources occur, most pre-Cretaceous strata, including those that are reservoirs at Prudhoe Bay, are absent due to erosion beneath a lower Cretaceous unconformity (LCU). Nevertheless, overlying Cretaceous-Tertiary strata are estimated to contain significant oil potential in mostly stratigraphic traps that include shoreface sands resting on the LCU, lowstand wedges, incised turbidite channels, lenticular sands in marine-shelf to fluvial depositional systems, and shelf-margin growth fault-systems. Intensely deformed rocks in the eastern part of the ANWR coastal plain reflect two main phases of Brookian deformation. Earlier, thin-skinned folding and thrusting of ductile Cretaceous-Tertiary strata formed relatively shallow structures inferred to have good oil potential, although traps are likely to be complex and compartmentalized. Later, basement-rooted thrusting deformed the entire section. Basement-rooted uplifts include some of the largest untested structures in North America, but the probable absence of pre-Cretaceous strata and the inferred late timing of uplift pose significant reservoir and charge risks.