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### **Timing of Hydrocarbon Generation in the Colville Basin of Northern Alaska from Burial and Thermal History Modeling**

Burial/thermal history modeling was performed to determine timing of hydrocarbon generation in the Colville Basin of northern Alaska. The model extent includes the National Petroleum Reserve-Alaska (NPRA) and state lands to the east. Sequence stratigraphic analysis of borehole and seismic reflection data provides the fundamental constraints on burial history. In addition, estimates of exhumation from log-derived compaction data provide key insight into depositional patterns. One-dimensional and two-dimensional models of thermal evolution were derived from the burial history and calibrated with vitrinite reflectance, thermal conductivity, and surface and bottom-hole temperature measurements, as well as with paleoclimate data. The resulting thermal history models were combined with geochemical data for potential hydrocarbon source rocks to determine the timing of hydrocarbon generation. The modeled source rocks include the Triassic Shublik Formation, shales in the lower portion of the Jurassic Kingak Shale, and the Cretaceous gamma ray zone/Hue Shale. Results were compiled in maps and cross-sections representing multiple stages of basin evolution.

Hydrocarbon generation in the Colville Basin generally correlates with deposition of the Cretaceous-Tertiary Brookian sequence and was driven by eastward progradation of the Brookian shelf margin along the basin axis. Accordingly, a hydrocarbon generation "front" was initiated in the southwest of the NPRA during the Albian, migrated across the NPRA during the Albian and Cenomanian, and progressed through the state lands from the Cenomanian to the Eocene. North-south asymmetry of Brookian deposition led to high maturation levels (gas window) in the south, decreasing northward toward the Barrow arch where hydrocarbon generation is incomplete.