

**U.S. Senate Budget Committee
Field Hearing
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North Dakota's Bakken Resource

The Bakken Formation is a large unconventional resource that underlies most of the western portion of the state of North Dakota. The USGS stated in their April 2008 report that it is the largest continuous resource they have assessed in the lower 48 states.

The upper and lower members of the Bakken are world class source rocks. Published estimates of Bakken oil generation potential range from 10 billion barrels (Dow 1974) to 300 billion barrels (Flannery and Krause 2006). The unpublished work of Price estimated the Bakken oil generation potential at up to 503 billion barrels. The geological models presented by Price (unpublished) and by Flannery and Kraus (2006) were based on considerable input from North Dakota Geological Survey geologists, samples from the North Dakota Core and Sample Library, and the well files from the North Dakota Oil and Gas Division.

An extensive oil sampling program conducted by the North Dakota Geological Survey has shown that the oil generated in the Bakken remains within the Bakken pool. The results of this study were published by Price and LeFever in 1994 and showed that the Bakken is "truly dysfunctional" with no evidence in the analysis that Bakken-generated oil had migrated into the overlying Madison beds, as previously thought.

The original oil in place in the Bakken Formation within the thermally mature portion of the State of North Dakota is estimated to be **149.2 billion barrels**. The attached study published by the Department of Mineral Resources presents the estimates by County and also separated into the total Bakken Formation, upper Bakken shale member, middle Bakken member, and lower Bakken shale member to make them more useful for resource evaluation and planning. This estimate validates the highest oil generation estimates of Price (unpublished) and Flannery and Kraus (2006).

The Bakken Formation estimated ultimate recovery using current drilling and completion practices within the thermally mature portion of the state of North Dakota has been estimated at approximately **1.4%** of original oil in place, which is equal to **2.1 billion barrels**. The Bakken play in North Dakota is still in the learning curve. North Dakota wells are still undergoing adjustments and modifications to the drilling and completion practices used for this formation. It is apparent that technology and the price of oil will dictate what is potentially recoverable from this formation. The current Bakken Formation horizontal drilling techniques involve much longer, deeper and more accurate placement of multiple horizontal well bores to exploit fractured rocks coupled with new hydraulic fracturing technologies to boost both production rates and recovery factors.

The Bakken formation has been an exploration target several times since oil was discovered in North Dakota. Recent success in the Bakken Formation has once again focused interest on this resource. The current play started in Montana in 2001, but recent activity has been in the North Dakota portion of the Williston Basin, where the majority of the formation exists. This activity has translated into record lease sales of mineral rights and increased drilling.

The thermally mature portion of the middle Bakken member occupies over 8.4 million acres in western North Dakota. The current North Dakota drilling rig fleet is capable of developing 300,000 to 650,000 acres per year meaning full development could require 13 to 26 years. Full resource development could move North Dakota from number 8 to number 5 among US states in daily production. To achieve those production levels will require significant increases in pipeline, natural gas processing, electric generation and transmission, and refining capacity. Workforce needs will approach 12,000 new workers or over 8 new hires per day. These new workers and their families will need housing, medical facilities, schools, recreation facilities, and all of the other services expected by our modern culture.