

## PROSPECTS FOR DEVELOPMENT OF ALASKA NATURAL GAS: A REVIEW

Kirk W. Sherwood (*kirk.sherwood@mms.gov*, 907 271 6085)  
Minerals Mangement Service  
949 E. 36<sup>th</sup> Ave., Veco Bldg., Suite 300  
Anchorage, AK 99508-4362

Alaska contains approximately 27 trillion cubic feet (Tcf) of known natural gas reserves—equal to 16% of U.S. reserves. Gas reserves in southern Alaska (Cook Inlet) have been exported in limited quantities for over 30 years. The much larger gas reserves in northern Alaska are stranded by the lack of a means of transportation to market.

Four percent (1 Tcf) of Alaska's remaining exportable gas reserves occur within fields in the Cook Inlet basin of southern Alaska. Ninety-six percent of Alaska's gas reserves (26 Tcf) occur within fields in or near the Prudhoe Bay field in northern Alaska and these stranded reserves are presently attracting many proposals for development. In addition to the Prudhoe Bay-area reserves, the Mackenzie delta area in Canada (300 miles east of Prudhoe Bay) contains 9 - 12 Tcf of stranded gas reserves in fields mostly under 1 Tcf in size that are also a focus of emerging proposals for development.

The known gas reserves are dwarfed by the potential for undiscovered gas in Arctic Alaska and nearby areas of the Mackenzie delta of northwest Canada. If the undiscovered gas resources in the Mackenzie delta (53 Tcf) are added to those of the North Slope (64 Tcf) and Federal submerged lands on the Beaufort (32 Tcf) and Chukchi shelves (60 Tcf), the Arctic regional gas resource potential totals 209 Tcf—a quantity equal to 33% of the total U.S. undiscovered conventional gas resource base (626 Tcf). Arctic Alaska and the Mackenzie delta seem destined to someday become major producing areas for natural gas. For the long-term outlook, the undiscovered gas resources may be overshadowed by the immense potential for gas extracted from methane hydrates in the northern regions. For northern Alaska, 590 Tcf of gas (in place) are estimated to be sequestered in methane hydrates associated with permafrost.

The Prudhoe Bay-area reserves and the discovered reserves in the Mackenzie delta are the key assets that will drive near-term strategic decisions about how to transport and market stranded natural gas from the Arctic. To date, the natural gas in the oil fields of the Prudhoe Bay area has been re-injected to increase oil recovery and used to fuel production facilities. Therefore, there has been no urgency for any decision about the ultimate disposition of the gas—an energy asset equivalent to 4.6 billion barrels of oil or \$130 billion U.S. Now, Prudhoe Bay oil production is falling rapidly (10% per year) while annual gas production at Prudhoe Bay has risen to 3 Tcf—a remarkable quantity equal to the domestic gas consumption of either Germany, the U.K., or Canada, and equal to 14% of current U.S. gas consumption. Limited gas sales could begin at any time from the Prudhoe Bay-area fields without affecting long-term oil recovery and gas sales may help avoid capital outlays for new gas-handling equipment.

At present, three concepts are in the forefront for commercializing the stranded gas resources in northern Alaska and Mackenzie delta:

- ***New gas pipelines that link to existing pipelines in Canada.*** Build new gas pipelines to carry the gas from Prudhoe Bay and Mackenzie delta to northern Alberta or British Columbia, where the new pipeline would join the Canadian pipeline network and supplement ongoing transmission gas exports to the U.S.

- ***Liquefied natural gas (LNG) to Asian Pacific Rim or U.S. West Coast.*** Build a conventional or high-pressure gas pipeline that carries the gas from Prudhoe Bay-area fields to a port in southern Alaska, where the gas is chilled to liquefied natural gas (LNG) and loaded on special LNG tankers for transport to the Asian Pacific Rim or U.S. West Coast.
- ***Gas to liquids (GTL) and tankers to U.S. West Coast.*** Build a new facility in the Prudhoe Bay area and use GTL technology to convert natural gas to middle-distillate (diesel-like) liquids. The GTL product could be pumped in segregated batches through the Trans Alaska oil pipeline and then transported by tankers to the U.S. West Coast.

Publicly available economic studies from 1995 suggest that all three concepts would be economic in the recent high-price environment (U.S. Midwest gas >\$5.00/mcf; World Oil >\$30) but not today. Forecasts for rapidly expanding gas consumption in the U.S. domestic market provide some confidence in a future sustained high-price environment, support for continuing pipeline system engineering and viability studies, and some political momentum for a pipeline system carrying gas to the U.S. Lower 48.