

Alaska Coal Resources and Coalbed Methane Potential

By Romeo M. Flores, Gary D. Stricker, and Scott A. Kinney

U.S. Geological Survey Bulletin 2198

U.S. Department of the Interior
U.S. Geological Survey

U.S. Department of the Interior
Gale A. Norton, Secretary

U.S. Geological Survey
Charles G. Groat, Director

Version 1.0, 2003

This publication is available only online at:
<http://pubs.usgs.gov/bul/b2198>

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Manuscript approved for publication February 6, 2003
Published in the Central Region, Denver, Colorado
Page layout by Gayle M. Dumonceaux
Edited by F. Craig Brunstein

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Introduction

The U.S. Geological Survey (USGS) is assessing coal resources in Alaska and the conterminous United States to determine the quantity, quality, and minability of coal likely to be used within the next 30 years. This assessment is critical because the utilization of clean (low sulfur content and low ash yield) coal has been rising in the United States and because coal is the least expensive fuel for generation of electrical power. Previous coal resource assessments attempted to assess the total coal in the ground in the United States and Alaska, but those estimates tended to be high and included coal deposits that are either not available (contain coal beds that are too thin and (or) too deep to be economically mined using present mining technology) or that are not of sufficient quality to serve as a fuel for electrical power generation. Thus, a new assessment was required that focused on coal resources likely to be utilized in the next 30 years, which are for the most part coal beds currently being developed in existing mines or in areas that are currently leased in Alaska.

This report is a summary of a more detailed report (Flores and others, work in progress) on the Alaska coal resources assessment performed during the past few years. Largely untapped, hypothetical coal resources of Alaska are estimated to be as much as 5,500 billion short tons (4,990 billion metric tons) (table 1). The previous coal resource assessment for the conterminous United States was done in 1974 (Averitt, 1975) and included coal remaining in the ground. That assessment estimated total coal resources of 3,968 billion short tons (3,600 billion metric tons). Thus, the Alaska coal resource estimate from our more recent assessment surpasses the Averitt total coal resources of the conterminous United States by almost 40 percent.

The recent assessment of Alaskan coal resources focused on the three major coal provinces—Northern Alaska-North Slope, Central Alaska-Nenana, and Southern Alaska-Cook Inlet (fig. 1). The coal resources of Alaska are in discrete areas (coal fields) and in isolated, unrelated outcrops (fig. 1). A coal field may contain coal beds of various ranks and of different ages and geologic settings. Coal resources and geological settings of minor coal fields are not reported here, but will be found in the more detailed report of Flores and others (work in progress). The detailed report will include data and interpretations on the origin, geologic setting, and depositional environments of the coal, as well as coal rank, quality, and petrology. In addition, the

report will summarize the coalbed methane potential and prioritize areas for exploration and development in these major coal provinces.

Coal Included in this Assessment

Nearly all the coal resources calculated for Alaska are in Cretaceous and Tertiary rocks distributed in the three major coal provinces. The Cretaceous coal resources, generally of bituminous and lignite rank, are found mainly in the Northern Alaska-North Slope coal province with 120 billion short tons (109 billion metric tons) of identified resources and 3,200 billion short tons (2,903 billion metric tons) of undiscovered or hypothetical resources (table 1). Minor Tertiary lignite and subbituminous coal resources are found in the Northern Alaska-North Slope coal province with 670 billion short tons (608 billion metric tons) of undiscovered or hypothetical resources.

Most of the Tertiary coal resources, mainly lignite to subbituminous with minor bituminous and semianthracite, are in the Central Alaska-Nenana and Southern Alaska-Cook Inlet coal provinces with as much as 1,600 billion short tons (1,451 billion metric tons) of identified and undiscovered or hypothetical resources (table 1). Identified Tertiary coal resources in these two provinces are as much as 19,300 million short tons (17,509 million metric tons).

These three Alaska coal provinces contain about 87 percent of the total coal resources and represent most of the minable coal beds in Alaska. Coal resources in the three coal provinces are as much as 5,500 billion short tons (4,990 billion metric tons). Of this total, 19.7 billion short tons (17.9 billion metric tons) are identified coal resources mainly from the Central Alaska-Nenana and Southern Alaska-Cook Inlet coal provinces. Thus, only a small fraction of the total coal resources of Alaska is known, and a large amount of coal is undiscovered.

Minability of Coal and Clean Air Act Requirements

Coal mining has been intermittently attempted in the Central Alaska-Nenana and Southern Alaska-Cook Inlet coal provinces. A dozen or more underground and strip mines in

Table 1. Coal resource estimates of various authors for Alaska using the classification of Wood and others (1983). Resource estimates are in millions of short tons [multiply by 0.9072 to convert to metric tons]; “na” means no estimate available.

Coal Province, Coal field, and Age		Resource Classifications			
		Identified			Undiscovered
		Demonstrated		Inferred	Hypothetical
		Measured	Indicated		
Northern Alaska-North Slope	Age				
	Tertiary		na		670,000 ^a
	Cretaceous		120,000 ^c		3,200,000 ^a
Total for North Slope			120,000		3,900,000
Central Alaska-Nenana	Coal field				
	Healy Creek		1,000 ^b -1,360 ^c		2,000 ^b
	Lignite Creek		4,100 ^c -4,900 ^b		7,000 ^b
	Jarvis Creek		13 ^e -77 ^c		175 ^b
	Wood River	15 ^c	45 ^c	241 ^c	na
	Wood River		275 ^b		350 ^b
	Rex Creek	na	9.5 ^c	113 ^c	na
	Rex Creek		70 ^b		130 ^b
	Tatlanika Creek	na	117 ^c	153 ^c	na
	Tatlanika Creek		290 ^b		400 ^b
Total for Central Alaska-Nenana			6,400-7,700		10,000
Southern Alaska-Cook Inlet	Coal field				
	Matanuska		137 ^c -200 ^g		2,400 ⁱ
	Susitna-Beluga		2,400 ^c -11,100 ^b		34,800 ^b
	Broad Pass		0.3 ^f -64 ^c		13 ^f -500 ^b
	Kenai (onshore)		318 ^c -400 ^h		34,000 ^e -35,000 ^b
	Kenai (offshore)		na		900,000 ^d -1,500,000 ^b
Total for Southern Alaska-Cook			2,900-12,000		970,000-1,600,000
Total Coal Resources for Provinces			129,000-140,000		4,900,000-5,500,000

Source of Estimate: (a) Stricker (1991); (b) Merritt and Hawley (1986); (c) Barnes (1967); (d) Affolter and Stricker (1987); (e) McGee and Emmel (1979); (f) Hopkins (1951); (g) Merritt and Belowich (1984); (h) Barnes and Cobb (1959); and (i) Renshaw (1983).

these two coal provinces have produced more than 40 million short tons (36 million metric tons) of coal. Only a small fraction of the identified resources have been mined of the more than 140 billion short tons (127 billion metric tons) that are estimated to be present in these coal provinces. Alaskan coal resources have low sulfur content (averaging 0.2–0.4 percent) compared to coal in the contiguous U.S. This low-sulfur coal is within or below the minimum value mandated by the 1990 Clean Air Act amendments. The extremely large quantity of identified coal resources is located near existing infrastructure, which should aid in the development, transportation, and marketing of this coal. Additionally, the short distance of these resources to countries in the western Pacific Rim would probably make them more marketable there than in the contiguous U.S.

The coal resources of Alaska have been only minimally developed. Mined coal is presently being utilized to fuel domestic electric power generating plants. Approximately one-half of the production from the Usibelli Coal mine is shipped to South Korea. The Alaska Railroad hauls the coal to Seward where the coal is loaded at the deep-water port for transport to South Korea. Although the Usibelli Coal mine is presently the only active coal mine in Alaska, coal mine leases and projects have been planned for the upper Cook Inlet region (for example, Beluga and Matanuska coal fields).

Coalbed Methane Potential

A potential untapped resource in Alaska is coalbed methane (CBM). With more than 5,500 billion short tons (4,990 billion metric tons) of combined coal resources of Alaska coal, the in-place gas resource could be exceedingly large. Smith (1995) estimated a total of 1,000 trillion cubic feet (28 trillion cubic meters) of in-place CBM resource. A large part of the gas resource may be contained in subbituminous coal. A large part of the coal resources, about 5,470 billion short tons (4,962 billion metric tons), is found in the Northern Alaska-North Slope and Southern Alaska-Cook Inlet coal provinces where in-place and planned infrastructure (pipelines, highways, and so forth) may potentially assist in the transportation and marketability of coalbed gas.

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