

Availability of Coal for Efficient, Low-Cost Underground Mining in Illinois

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ABSTRACT

Geologic and technical factors such as coal seam thickness, stripping ratios, roof conditions, partings, faults, and size and geometry of the reserve block greatly impact the availability of Illinois coal for mining. Residential and commercial developments also restrict access to coal reserves in some areas. Despite the collective effects of these factors, large blocks of bituminous coal reserves suitable for efficient, low-cost underground mining remain available in Illinois.

INTRODUCTION

Whether Illinois' huge reserves of bituminous coal play a role in future U.S. coal production depends, to a significant degree, on their availability and mining cost. In recent years, Illinois coal mines have lost customers and closed as users shifted their purchases to mines producing lower sulfur products, particularly from mines in the Powder River Basin. Some industry experts believe, however, that a market for high-sulfur coal will continue to exist and perhaps grow, if the resource can be produced at a competitive price (Lilly 1996). The capability of Illinois coal producers to capture and hold these markets will depend on the availability of ample resources that can be mined at a low cost.

Recent studies in the eastern Kentucky coal fields indicate that much of the lowest-cost coal has been depleted. Future mining will be in thinner, deeper seams that will be more costly to mine (Cobb 1990). Examination of production trends versus remaining recoverable resources suggests that production from both surface and underground operations is in a permanent downtrend in several eastern coal-producing states. The decline is attributed to the depletion of low-cost recoverable resources (Milici 1997).

The Illinois and U.S. Geological Surveys are assessing the availability and estimated mining cost of the remaining coal resources in the state. Although these studies are only partially complete, some preliminary observations can be made regarding the availability of resources for efficient, low-cost mining.

COAL AVAILABILITY STUDIES IN ILLINOIS

The state was divided into seven regions, each comprising an area of similar geologic and physiographic characteristics (fig. 1). Twenty-six quadrangles, two to six in each region, were

selected for study. The quadrangle-scale studies permit comprehensive identification and assessment of the factors that limit the availability of coal. Findings from the individual quadrangle studies will be extrapolated to the entire coal field. Eight quadrangle studies have been completed to date, and seven more studies are in progress (Treworgy et al. 1994, Treworgy et al. 1995, Jacobson et al. 1996, Treworgy et al. 1996a, Treworgy et al. 1996b).

Criteria for the availability of coal are based on findings from interviews with experts from mining companies, consulting firms, and government agencies active in the Illinois mining industry. Interviews conducted for the first eight quadrangles involved 11 mining companies (table 1); these companies account for 81% of the current production in Illinois. We also interviewed consultants from an internationally recognized firm that provides services to the Illinois mining industry and representatives of the Illinois Office of Mines and Minerals.

Table 1. Companies interviewed for each quadrangle studied.

	Atwater	Collinsville	Galatia	Middletown	Mt. Carmel	Newton	Nokomis	Princeville
Amax			X	X	X			
Black Beauty								X
Consolidation						X		
Freeman United				X		X		X
Kerr McGee			X		X			
Midstate								X
Monterey Coal	X	X						
Old Ben/Zeigler						X	X	X
Peabody	X	X	X		X			
Sahara			X				X	
Turris				X				
Weir International	X	X					X	
IL Office of Mines and Minerals			X	X	X	X	X	X

The amount of available coal resources in the eight completed quadrangles ranges from as little as 18% to as much as 76% of the original resources (fig. 2). Technical factors such as thickness of the coal and overlying bedrock, roof and floor conditions, faults, and size of the mining block account for most of the restrictions on coal availability. Land use features such as towns, cemeteries, and interstate highways restrict from about 1% to almost 22% of the resources in the eight quadrangles. Technical factors restrict 40% and land use, 6%. Another 3% of the original coal has either been mined or left as or left as pillars. Cumulative availability of coal resources in the eight quadrangles is 45% of the original resources.

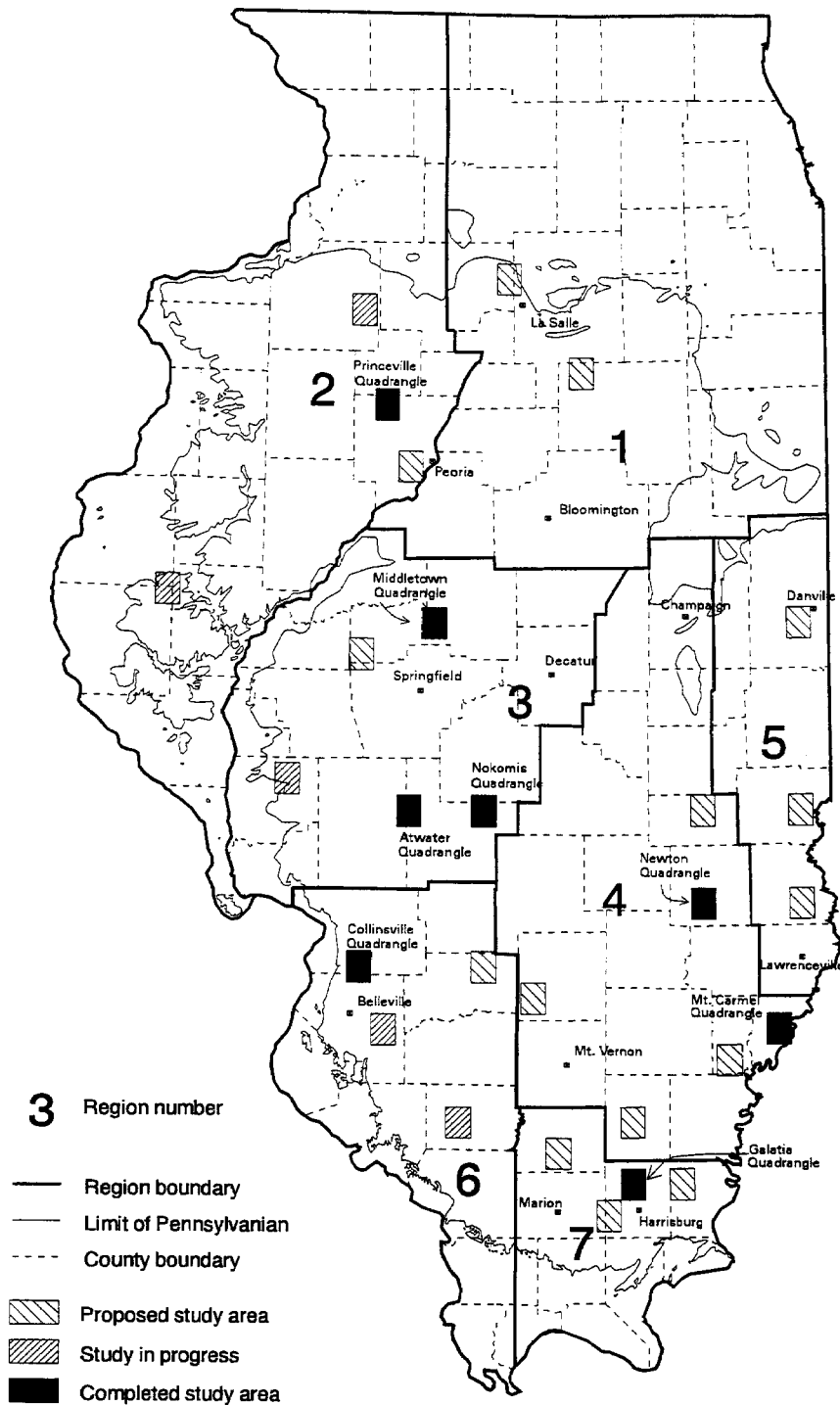


Figure 1. Coal resource regions and quadrangles for evaluation of available coal.

Slightly more than 4 billion tons of resources representing 16 coal seams have been assessed so far. Of all the seams, the Herrin Coal has the highest availability, more than 50% of original resources, compared with 36% of the Springfield and Seelyville Coals and less than 13% of the other coals (fig. 3). The high availability of the Herrin Coal reflects the relatively thick, uniform character of this seam and the excellent mining conditions associated with it.

To determine whether these conditions extend over large areas, we conducted a preliminary screening of Herrin Coal resources throughout the state to identify areas free from some of the major restrictions: thickness of bedrock, roof stability and mining conditions, block size, towns, and interstate highways. Coal less than 5.5 feet thick or more than 900 feet deep was also excluded. Coal escaping these restrictions should be minable by underground methods at a cost competitive with the costs of most surface and underground mining operations.

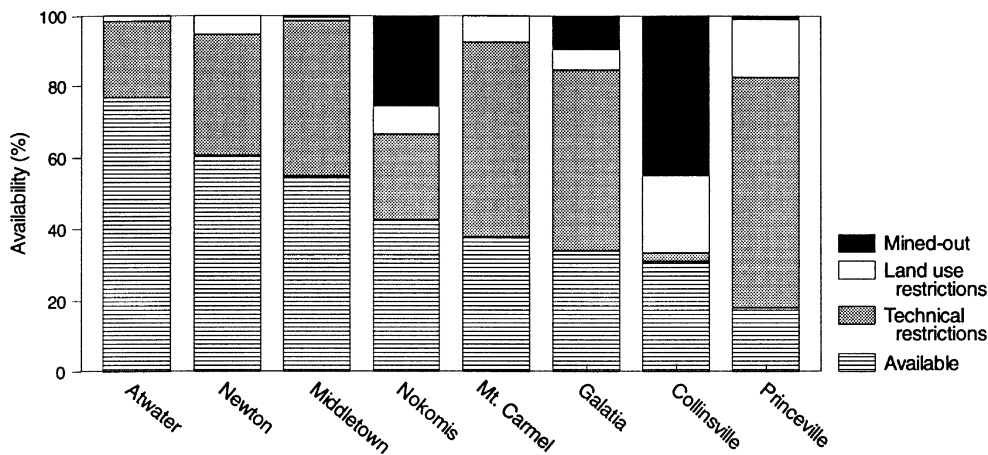


Figure 2. Availability of coal resources in eight quadrangles in Illinois.

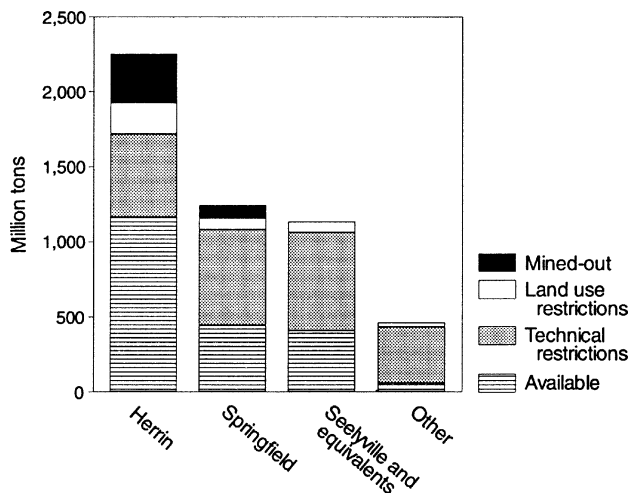


Figure 3. Tonnage of available resources by seam in eight quadrangles

The Herrin Coal is free from major restrictions, more than 5.5 feet thick, and less than 900 feet deep in large areas of southwestern and southern Illinois; some deposits also occur in east-central Illinois (fig. 4). The approximately 25 billion tons of resources can be considered minable at costs roughly comparable with those at currently active mines. Generally at shallow to moderate depths, these resources are suitable for longwall mining because they are in large contiguous blocks and relatively free from geologic anomalies such as faults. Surface development is also minimal. Although these are largely high-sulfur resources, some are low- and moderate-sulfur deposits.

CONCLUSIONS

This preliminary extrapolation suggests two conclusions. First, ample resources of Herrin Coal with characteristics comparable to those in currently active mines are available in Illinois. Second, because of these ample resources, the cost of mining in Illinois will not be driven up by lack of available resources with favorable geologic conditions. Although these findings will not help companies weather the current competitive market conditions, they do suggest that, over the long term, Illinois can continue to be a significant contributor to the nation's coal production.

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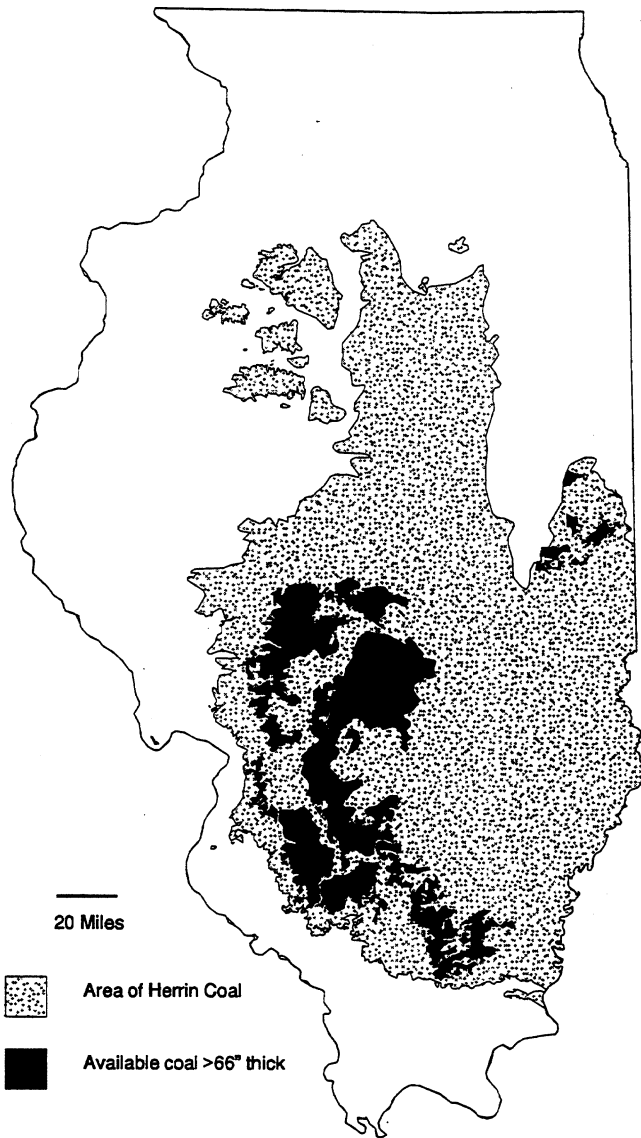


Figure 4. Available Herrin Coal >5.5 feet thick and <900 feet deep.