

# Kentucky's Coal Industry: Historical Trends and Future Opportunities

*Kentucky contains sufficient coal resources to support mining well into the future, but whether these resources can be economically mined at competitive coal prices will depend on many factors. Some of these factors include: the size and quality of the reserve base; transportation costs; market demand and competition; mining and processing technology advances; and government regulation. In order to ensure the long-term economic viability of Kentucky's coal industry, a careful assessment of these factors should be undertaken.*

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Coal has been produced in Kentucky's two coal fields (Figure 15.1) since the beginning of the 19th century and has been the state's most important mineral resource since that time. In 1994, the coal industry employed more than 24,000 miners, and tax revenues generated from all economic activity related to the industry provided more than 11 percent of General Fund receipts in Kentucky.<sup>1</sup> Today, more than 50 percent of the nation's electricity is generated in coal-fired power plants, and 95 percent of the electricity generated in Kentucky comes from coal. Clearly, demand for coal is strong and will remain so well into the future. Many factors affect Kentucky coal production: the size and quality of the reserve base, market demand and competition, transportation infrastructure, mining and processing technology, and government regulation. Understanding the complex relationships among these factors will help identify future opportunities for continued development of coal resources and realization of the associated economic benefits for coal-producing counties and the state.

Contrasts in eastern and western Kentucky coal resources present different challenges and opportunities for future development. Western Kentucky's coal is generally of greater thickness than that of eastern Kentucky, but has higher sulfur content. Surface access to western Kentucky coal is more limited, and more costly underground mines will be the primary method of extraction. Eastern Kentucky coals are typically thinner and more variable in thickness than those of western Kentucky, but are of higher quality. Greater physiographic relief in the east has provided greater accessibility for near-surface mining. Decisions regarding regulation of emissions from power plants and taxation levels are likely to affect Kentucky's coal fields in different ways, but as of this writing the outcomes of these issues are not known.

Increasing competition from the western United States in the steam coal market will present a significant challenge for Kentucky coal mines. Innovations in mining, processing, marketing, and transportation can position companies for future success. One such opportunity will be identification of specialty steel and chemical markets, which attract significantly higher prices for coal with desirable quality characteristics. In order to better prepare for future needs, an understanding of factors affecting past coal production is essential.

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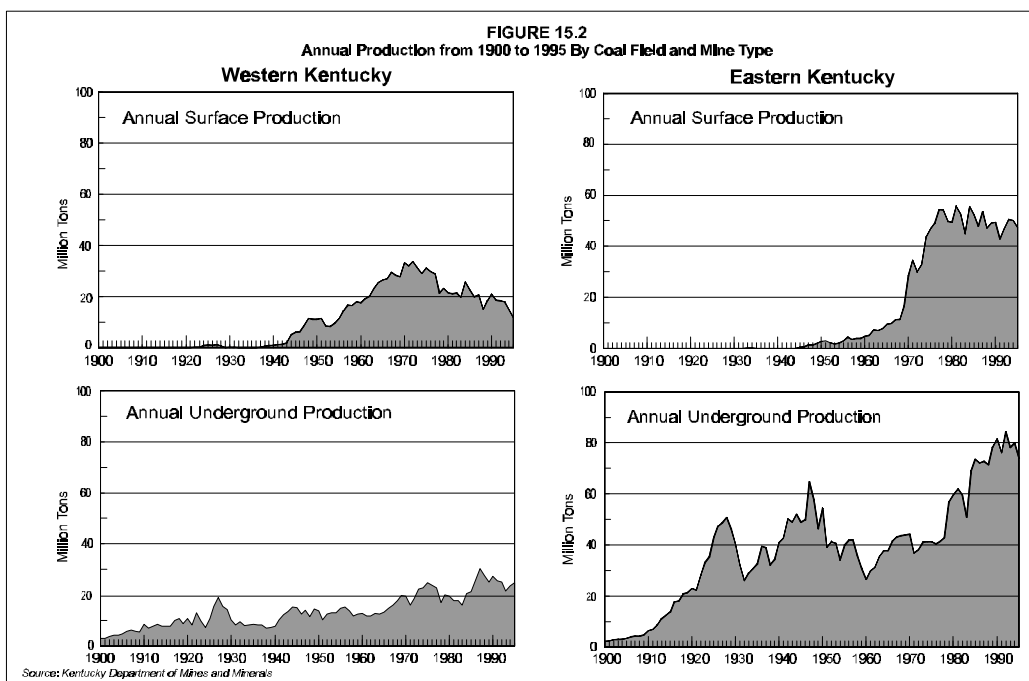
<sup>1</sup> Oral communication, Kentucky Department of Employment Services.

Figure 1 on this page (map of coal fields)

## Historic Trends in Coal Production

Coal was first produced in eastern Kentucky in 1790 and by 1820 in western Kentucky. Early mining resulted in only small tonnages, mainly for local use. Low production levels were primarily a function of modest demand and lack of efficient transportation routes. Regional usage of coal was primarily for steam locomotives, manufacturing, and domestic fuel. One of the earliest commercial markets was for cannel coal, a high-Btu product used for domestic heating. Cannel mines were developed in western Kentucky and in the outlying counties of the Eastern Kentucky Coal Field, but there were no efficient transportation routes to outside markets from the main part of this field.

The first large production increase occurred in the early 1920s as a result of penetration of commercial rail lines into the eastern coal fields and increased demand for coal for steam locomotives. During the economic depression of the 1930s, demand for coal declined, and with diminished coal production there was little impetus for technological improvement. Until the beginning of World War II, almost all mining in Kentucky was by underground methods, as the technology for efficient surface mining had not yet been applied (Figure 15.2).



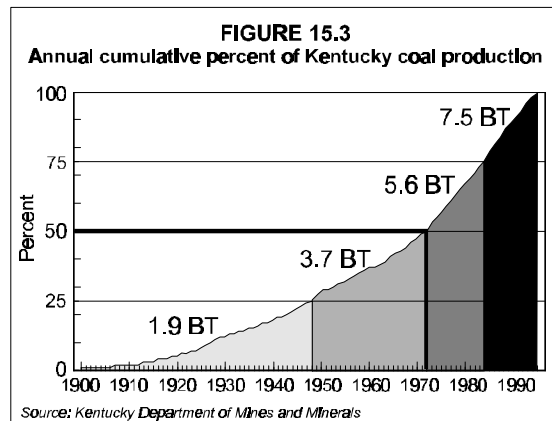
The next significant production increase occurred during the industrial expansion associated with World War II. Large-area surface-mine machines (draglines) were used to develop the relatively flat terrain of the Western Kentucky Coal Field, and this would be the dominant method of mining in this region until the mid-1980s. Surface mine production for western Kentucky has steadily decreased from 1970 to the present (Figure 15.2a). This trend may be due to diminished surface-mineable reserves, as surface access to mineable coals in western Kentucky is limited to the periphery of the coal field, much of which has been previously mined.

In eastern Kentucky, growing demand for coal in the 1940s resulted in increased underground mining (Figure 15.2d), but the steep slopes of this mountainous area prevented development by the early surface-mining equipment. A shift toward surface-mine production did not occur until the 1970s. This was a response to developments in contour surface mine technology, unusually high demand for coal as a result of the OPEC oil embargo, and increasing underground mine costs. However, the trend toward increasing surface-mine production

quickly reversed, as extensive production diminished high-quality surface reserves and the regulatory costs of surface mining increased in 1977 after passage of the Federal Surface Mine Control and Reclamation Act. Since that time, eastern Kentucky surface mine production has shown a slight decline, whereas underground mining has increased significantly (Figures 15.2b and 15.2d).

Changes in coal utilization within the last half of this century have had a significant impact on the production and marketing of coal from Kentucky. First, traditional fuel markets and coal for steam locomotives virtually disappeared, leaving electric power generation and coking coal for the steel industry as the principal markets. Eastern Kentucky underground mine production was especially influenced by large-scale replacement of steam by diesel locomotives in the period between 1950 and 1960 (Figure 15.2d). This was followed by a shift from northern fuel markets to southern utility markets. In addition, the market for coking coal was greatly diminished by downsizing in the steel industry in the 1970s. Existing and anticipated clean air legislation also affected the marketing of both high- and low-sulfur coal. Initially, demand for high-sulfur coal diminished, but as electric power-generating facilities with scrubbing technology became available, this demand returned. More recently, Kentucky coal has been faced with strong competition from inexpensive low-sulfur coal from the Powder River Basin in Wyoming and Montana. This coal is now capturing some traditional utility markets for Kentucky coal located in the midwestern and eastern United States.

As a result of major technological advances in mining techniques, more coal is being mined in Kentucky than ever before, and this is being accomplished with a smaller number of mines and fewer employees. Over half of all coal produced in the state has been extracted only within the last 25 years (Figure 15.3), and the question arises whether or not this level of production can be profitably sustained in the future. The answer will depend on a thorough understanding of the current reserve base; mining, transportation, processing technologies; the nature of future markets; and the impact of regulations. The socio-economic impact of these changes in Kentucky coal mining will also require careful assessment because of the economic impact that mining jobs have for the state.<sup>2</sup>



## Transportation and Marketing

Two modes of coal transportation dominate Kentucky's supply infrastructure and represent a substantial portion of the cost of delivered coal. More than three fourths of mined coal is transported by truck from the mine site to either preparation or loading facilities. This is true for both coal fields, but direct rail shipment is more practical in western Kentucky because there are fewer mines and the infrastructure is better developed. Coal transportation to the end user (principally utilities) is approximately two thirds by railroad and the balance by barge or truck. Rail access for specific areas is typically limited to a single carrier, and where multiple carriers serve a region, rates are reported to be somewhat different. Deregulation of rail rates, implemented by the Federal Staggers Rail Act of 1980, is generally believed to have been dis-

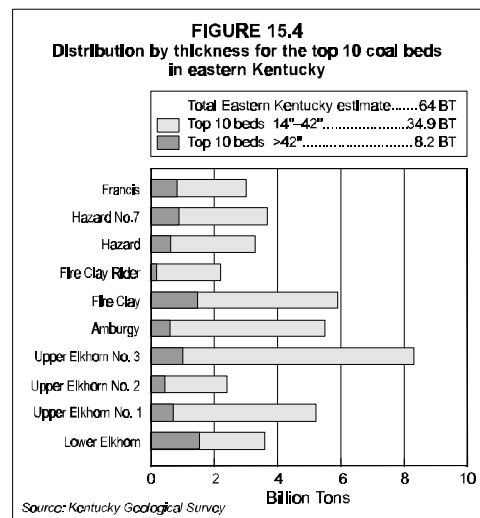
<sup>2</sup> See Geroyan, R.I., Teeters, D.D., Plis, M.N. (1994). *Economic impact analysis of the coal mining industry in Pike County, Kentucky*. U.S. Bureau of Mines, Coal Recoverability Series (Open-File Report 09-94). Also refer to Straus, C.M., Thompson, E.C., Haywood, C.F. (1996). *The effects of the Kentucky coal industry on the economy of the Commonwealth*. Lexington, KY: University of Kentucky Center for Business and Economic Research.

advantageous for eastern U.S. coal producers, as the resulting reduction in rail shipping rates has increased competition from the western United States. Over the long term, Kentucky's coal producers may have to seek alternative transportation methods or expand sales of coal for on-site generation of electricity for distribution to distant markets. The latter approach will require an established reserve base and technology for efficient and cost-effective transmission of electricity.

The impact of transportation costs is exacerbated by the low average sales price for steam coal. Low profit margins have forced companies to increase production and, at the same time, reduce employment of miners and support staff. Alternative marketing strategies to target higher profit margins have been successful for a few companies, but they require detailed knowledge of coal quality characteristics and typically result in low-volume contracts in the steel and chemical industries. Alternative markets do, however, have sales prices 2 to 10 times the value of steam coal. The advantage of this marketing strategy is that mining and transportation costs are reduced because fewer tons are required to generate an acceptable profit margin. Unfortunately, little information is known about these markets and whether they have the potential to reduce the current reliance on the steam coal market.

## Coal Resource Estimates

The basis of current estimates of Kentucky coal resources is the 1:24,000-scale geologic mapping conducted between 1960 and 1983 by the Kentucky Geological Survey and the U.S. Geological Survey. These maps and coal data represent the nation's most complete and accurate geographic and stratigraphic information about coal and have established Kentucky as a leader in coal-resource characterization. Estimates for 100 coal beds suggest original in-place resources of 64 billion tons (BT) for eastern Kentucky.<sup>3</sup> Western Kentucky has 33 coal beds that amount to 40 BT.<sup>4</sup> The larger eastern resource results from its greater area and number of coal beds. The resource estimates are categorized by bed thickness and, in some cases, overburden height, which are important factors in determining mining methods. In addition, resources are tabulated on the basis of proximity to points of coal thickness measurement. The distribution and characteristics of coal resources among individual coal beds and geographic areas are not uniform, and this has had a definite impact on coal production trends for specific areas. Kentucky's two coal fields are distinctly different in terms of the thickness and

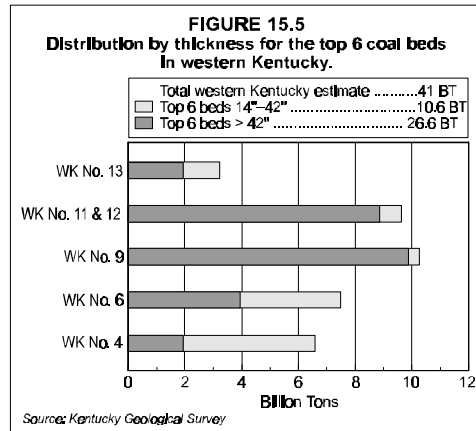


<sup>3</sup> Refer to: Brant, R.A. (1983). Coal resources of the Princess District, Kentucky: University of Kentucky Institute for Mining and Minerals Research, Energy Resource Series; Brant, R.A. (1983). Coal resources of the Southwestern District, Kentucky: University of Kentucky Institute for Mining and Minerals Research, Energy Resource Series; Brant, R.A., Chesnut, D.R., Frankie, W.T., Portig, E.R. (1983). Coal resources of the Big Sandy District, Kentucky: University of Kentucky Institute for Mining and Minerals Research, Energy Resource Series; Brant, R.A., Chesnut, D.R., Frankie, W.T., and Portig, E.R. (1983). Coal resources of the Hazard District, Kentucky: University of Kentucky Institute for Mining and Minerals Research, Energy Resource Series; Brant, R.A., Chesnut, D.R., Frankie, W.T., Portig, E.R. (1983). Coal resources of the Licking River District, Kentucky: University of Kentucky Institute for Mining and Minerals Research, Energy Resource Series; Brant, R.A., Chesnut, D.R., Portig, E.R., Smath, R.A., (1983). Coal resources of the Upper Cumberland District, Kentucky. (University of Kentucky Institute for Mining and Minerals Research, Energy Resource Series). Lexington, KY: University of Kentucky Institute for Mining and Minerals Research.

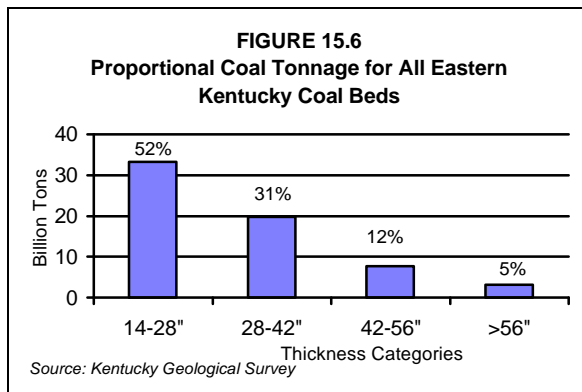
<sup>4</sup> Smith, G.E., Brant, R.A. (1978). *Western Kentucky coal resources*. (University of Kentucky Institute for Mining and Minerals Research Energy Resource Series). Lexington, KY: University of Kentucky Institute for Mining and Minerals Research.

quality of coal resources and their accessibility for mining. These factors will play an important role in future coal development.

Although Kentucky's potentially mineable beds are numerous, only a relatively few have significant coal resources. Further, these resources are not uniformly distributed throughout the coal fields. In eastern Kentucky, 25 percent of the original resource is associated with the Upper Elkhorn Nos. 1, 2, and 3 beds and 67 percent with the top 10 coal beds (Figure 15.4). In western Kentucky, 90 percent of the resource occurs within six coal beds (Figure 15.5). These 16 coal beds have also been the leading producers throughout the state's history. Not all areas of each coal field are favored with abundant coal. Of the 35 coal counties in eastern Kentucky, the southeastern 10 counties contain 75 percent of the resource, and Pike and Harlan Counties have 30 percent of the estimated coal. In western Kentucky, only 8 of the 17 coal counties have more than 1 BT, and 70 percent of the resource is located in four counties.



Eastern Kentucky has more resources in thin beds than does western Kentucky. In eastern Kentucky, more than 50 percent of the coal is estimated to be less than 28 inches thick. Only two beds are believed to contain more than 1 BT of coal with a thickness greater than 42 inches, the Lower Elkhorn and Fire Clay (Figure 15.4). The total amount of coal greater than 42 inches in thickness comprises only 17 percent of the entire estimate for eastern Kentucky (Figure 15.6), and much of this is associated with the top 10 beds. In contrast, only 5 percent of western Kentucky's estimate is less than 28 inches thick, and 69 percent is greater than 42 inches thick (Figure 15.7). All six of the commonly mined coals in western Kentucky contain more than 1 BT of resources (Figure 15.5). These differences in coal bed thickness in the coal fields are important because they have implications for the type of technology necessary to expand the economic resource base.



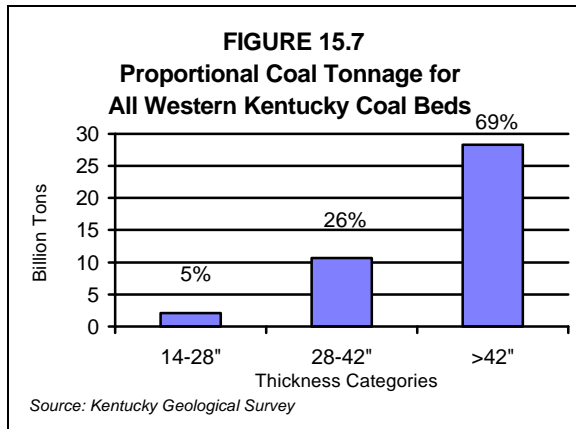
All coal mined in Kentucky is of bituminous rank, but other quality parameters of coal beds are different in the two coal fields. Western Kentucky coals tend to be of moderate to high sulfur content and moderate Btu value. Eastern Kentucky is believed to contain one of the largest resources of low-sulfur, high-Btu coal, although moderate- to high-sulfur coals are also mined. Ash contents vary greatly, and recent experience in eastern Kentucky suggests that the remaining resource will have higher levels of ash than that previously mined.

## Coal Availability

A National Coal Council report outlined a number of weaknesses in traditional resource and reserve base estimates.<sup>5</sup> Foremost among these was a lack of accounting for regulatory and technological factors that limit resource development. The council concluded that the existing

<sup>5</sup> Blackmore, G., Ehrenreich, S.B. (1987). *Reserve data base report of the National Coal Council: Advisory report to the U.S. Department of Energy*. Arlington, VA: Author.

estimates overstate the amount of coal that can actually be mined. The factors that restrict mining include competing land uses (e.g., state and national parks, municipal areas, cemeteries, and streams) and geologic and engineering constraints (e.g., coal of insufficient thickness, unstable roof conditions, proximity to adjoining underground mines). In order to address these problems in the previous resource assessment methodology, a national coal availability program was established, and the Kentucky Geological Survey developed the original pilot project.<sup>6</sup>



Land-use (regulatory) restrictions may be locally important, but their impact on a regional scale is small in Kentucky. One reason is that the coal fields are in rural areas, and mineable coals tend to be remote from most competing land uses. Many of the restrictions that do apply have been dealt with to minimize loss of reserves. Technological limitations have a significant impact on mineability, and the principal factor is the inability to extract thin coal seams with available underground equipment. This is particularly true in

eastern Kentucky, where a large proportion of the resource is less than 28 inches thick. Western Kentucky has areas that may be too deep to mine or are too structurally complex, and there are some mine blocks with insufficient acreage for economic development. Both regions have some resources that have been sterilized due to mining of adjacent beds, but this is not a widespread problem. Together these technological limitations may affect more than 50 percent of the original resource.

## Directions for Future Coal Resource Studies

Future regional coal resource studies should consider the unequal distribution of coal resources and the effects of technological limitations on mining. Most of the state's coal resources are contained in a small number of beds, and these should be emphasized in new studies. There is evidence that reserves in several of the principal beds may be significantly diminished, and if this is true, new resources of comparable quality must be identified and characterized. The availability of coal for mining is greatly affected by the geological variability of the coal beds. The data necessary to document this variability are, for the most part, not publicly available for regional resource studies, and as a result the impact of technological limitations may be underestimated. An effort must be made to acquire sufficient data to define the limits of mining for specific coal bodies. Finally, public data concerning the quality of mineable coals, particularly trace element chemistry, are insufficient to prepare detailed estimates of coal quality for beds to be mined in the future. The latter information will be crucial for the successful development of Kentucky's remaining resources.

## Impacts of Regulation and Taxation

Regulations at the local, state and federal levels have an impact on the mining, transportation, and use of Kentucky coal. A number of regulatory and taxation issues are particularly important, and their future impact is uncertain: the effects of Clean Air Act Amendments on

<sup>6</sup> Eggleston, J.R., Carter, M.D., Cobb, J.C. (1990). *Coal resources available for development—A methodology and pilot study*. (U.S. Geological Survey Circular 1055). Washington, DC: U.S. Geological Survey.

demand for Kentucky coal; liability for unreclaimed surface mines; regulatory flexibility to permit changes in post-mine land use; and the outcome of changes in the state's workers' compensation law.

***The Clean Air Act Amendments of 1990.*** Title III of the Federal Clean Air Act Amendments of 1990 concerns hazardous air pollutants (HAPs). There are a total of 200 substances classified as hazardous air pollutants, and 11 of these occur in trace amounts in coal. Industrial companies generating these substances who are deemed to be "significant emitters" are required to use available technology to the fullest possible extent to reduce emission of HAPs. At the present time, coal-burning power plants are not considered to be significant emitters. However, a study has been under way by the federal Environmental Protection Agency (EPA) for a number of years to collect information to address this issue. A two-year extension is being sought to allow more data collection, particularly with respect to arsenic and mercury. At the time of the writing of this paper, no official position had been taken by the EPA with regard to additional regulation of coal burning.

Some utilities are reportedly consuming coal with sulfur contents substantially below the regulated levels in order to exceed the requirements of the Clean Air Act and accumulate credits for sulfur dioxide emissions in the future. This trend, if it continues, may affect the long-term availability of low-sulfur, high-value coal in eastern Kentucky.

***Regulatory Issues Relating to Surface Mines.*** Most areas that were surface mined prior to the Federal Surface Mine Control and Reclamation Act of 1977 contain unreclaimed surface mines. Some companies are considering remining such areas because of increased capabilities for overburden removal. However, reclamation liabilities, and their associated costs, of the pre-existing mines will be a factor. It has been suggested that this has been a deterrent to development of a significant amount of reserves adjacent to these unreclaimed surface mines. The magnitude of this problem, however, has not been quantified on a statewide basis.

Post-mine land-use changes can greatly enhance the long-term economic development of the coal fields. This is particularly true in eastern Kentucky where flat land suitable for development is scarce. Examples of land-use changes include sport and wildlife sites, development areas for industry, government and residential facilities, airports, and agricultural uses. In Kentucky, all of these applications have proven to be successful alternatives to restoration of mine sites to the original slope of the land. Moreover, in many cases, they result in an environment that is more stable than pre-mine conditions. Design of the sites must be carefully planned to account for the physical and hydrologic conditions of the area. When this is accomplished, post-mine land uses help provide a means of sustaining local economies after mining has been completed.

***Workers' Compensation.*** The high costs of workers' compensation levees are cited by many coal companies as a major impediment to the mining industry in Kentucky. The state's assessment of this tax is reportedly significantly higher than that of surrounding states. Legislative changes in the workers' compensation law will also clearly affect the coal industry.

## Extraction and Processing Technology

***Underground Mining.*** Recent trends in coal production suggest that underground mining will be an increasingly important recovery method for Kentucky coal. Currently, about 60 percent of underground mines in the state use continuous mining systems. Longwall systems, which are more productive and efficient, account for less than 10 percent of production. Low usage of longwalls in western Kentucky is probably due to the high capital investment for the equipment, as well as lower sales prices for the higher sulfur coal. In eastern Kentucky, low usage is mainly a function of smaller mines and more variable and thinner coal beds. Another

method, highwall mining, requires surface access, but is actually a remote underground mining system. Highwall miners have had mixed success at Kentucky mines, but may be effective under proper geologic conditions. Each of these mining systems will have continued use in the future, but should be used with appropriate geologic and engineering planning.

The technological challenges for underground mining differ for the two coal fields. A substantial portion of western Kentucky's reserves are in beds greater than 42 inches thick, but at depths greater than 1,000 feet. Existing mining equipment is probably adequate to extract this resource, but ground control and mine planning methods should be enhanced to allow for safe mine development at greater depths. In contrast, thinner, more variable coal beds will be crucial in future coal mining in eastern Kentucky, where improvements in thin-seam and remote-mining technology will be important for converting resources into reserves.

**Surface Mining.** There is substantial evidence in both coal fields that extensive mining of surface reserves has affected production, but it is uncertain whether technological advances in surface mining equipment will have a major impact in the future. Regulatory constraints associated with surface mining are thought to have reduced the feasibility of mining some reserves. Few would want environmental standards relaxed, but flexibility in post-mine land use could have a beneficial effect on the coal fields.

**Coal Preparation Technology.** Some of the most important advances affecting coal marketing involve processing. Many modern preparation facilities are equipped with in-line analyzers that constantly monitor the quality of coal entering and leaving the plant. Sophisticated distribution systems permit the separation, by size and quality, of coal products destined for a variety of customers with specific needs. These methods are not without costs, and improvements in processing technology should focus on achieving cost efficiency. In particular, inexpensive pre-processing for ash removal from high-ash beds will be important in eastern Kentucky.

**Coal-Bed Methane Extraction.** Future potential may exist in Kentucky for extraction of methane gas from coal beds that could be used as an energy byproduct of the coal resource. Methane ( $\text{CH}_4$ ) is a naturally occurring gas associated with coal beds and has been economically recovered from coal in some coal basins. Significant commercial production of coal-bed methane occurs in Alabama and New Mexico. In areas adjoining the Eastern Kentucky Coal Field (i.e. Virginia), methane has long been extracted from coal beds prior to mining for safety reasons and there are current activities for commercial development. The possibility of coal-bed methane production in Kentucky is supported by the existence of some mines with histories of methane problems and successes of recent test holes.

**Directions For Future Technology.** New technologies are vital for the future extraction of Kentucky's coal resource. A detailed knowledge of the physical and chemical character of the beds that will be mined will be critical in the development of these resources. The value of sophisticated processing techniques is enhanced if the variability in quality of the feedstock can be predicted and controlled. Acquisition of this knowledge could be facilitated by cooperation among private industry, public agencies, and research institutes. Industry has extensive data and a solid understanding of mining and processing problems, but often lacks the financial resources to undertake detailed geologic and engineering studies and to invest in development of new technology. Public agencies and universities have expertise and technology that could be used in a cooperative effort with industry to address these issues.

## Summary

The Kentucky coal industry during fiscal year 1994–95 produced 162 million tons of coal with a gross value of \$3.9 billion.<sup>7</sup> Employment and revenue generated by industries supporting or servicing coal mining are vital to the coal-producing counties. The coal industry directly employed 24,133 miners earning \$942.8 million in wages and salaries in 1994<sup>8</sup>. All economic activity related to the coal industry generated \$544 million in state tax revenues, representing more than 11 percent of the fiscal year 1994–95 General Fund receipts of \$4.6 billion.<sup>9</sup> Of the \$544 million in state taxes, \$180 million were severance taxes. Under provisions of the Local Government Economic Assistance Fund established by the General Assembly in 1980, a portion of coal severance taxes is returned to counties.

The economic contribution to coal counties and the state economy and General Fund are clearly substantial. In order to ensure the long-term economic stability of these counties and continued state revenues from the coal industry, a careful assessment of factors affecting production should be undertaken. Historical trends are instructive—production rates have fluctuated as a result of changes in demand for coal, availability of reserves, access to transportation infrastructure, and development of new mining and processing technology. These factors will continue to affect the economic strength and competitiveness of the industry in the future.

Kentucky contains sufficient coal resources to support mining well into the future, but whether these resources can be economically mined at competitive coal prices will depend on other factors. Most of the resource base is associated with relatively few coal beds. Some of these coal beds have been extensively developed in specific areas, and this may affect employment demographics in the near future. The resources that remain are more likely to be thinner, of poorer quality, or more challenging in terms of mining conditions. At the same time, surface mining will continue to decline in importance relative to more costly underground methods.

Future mining of less accessible and more complex coals and highly sophisticated processing and utilization cannot be achieved without an improved understanding of Kentucky's coal resources. Knowledge of the geologic characteristics associated with thin and deep seams will be essential to develop the necessary technology to extract and process these resources. Detailed chemical characterization of coals will provide the data necessary to assist industry to develop strategies for compliance with future regulation of combustion emissions. Perhaps of greater importance, characterization will provide valuable information about new techniques required to further process coal for specialty, high-value markets and will help identify the coal reserves with the greatest potential for value-added processing.

Most of the coal mined in Kentucky is sold out of state for electric power generation. Recently, competition in this market has begun to shift from a regional to a national basis. This added competition has further depressed coal prices and resulted in low profit margins. Profitability has become increasingly dependent on producing larger quantities of coal. An alternative to this marketing strategy is to identify specialty uses of coal, existing and novel, which may generate significantly higher prices. While such efforts will not likely replace dependence on the steam coal market, they can be used to position companies for success in an increasingly competitive market and may also provide international market opportunities.

The coal resource base in Kentucky is substantial. It has supported extensive mining activity throughout this century and will support mining well into the future. The technology used to mine and process the resource, the commodities produced, and the markets pursued in the future will likely be different from those in the past. Over time, emphasis will likely shift toward mining thin coal beds and deeper coal deposits. Less emphasis will likely be placed on

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<sup>7</sup> Kentucky Coal Marketing and Export Council and the Kentucky Coal Association. (1995) *Kentucky coal facts, 1995–1996* (pocket guide). Also refer to Straus, et al.

<sup>8</sup> Oral communication, Kentucky Department of Employment Services.

<sup>9</sup> Straus, et al.

surface mining and more emphasis will be placed on underground mining. Coal may be viewed not only as a vital source of energy for electric power generation and combustion, but also as a valuable upgraded product that can be used in high-value, specialized markets in the chemical and other industries. As new market opportunities are identified and new technology employed in the mining and processing of coal, there should be significant opportunities to capture the full economic benefits of the substantial remaining coal resources in Kentucky.