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Indiana Coal Reserves, Mining and Leasing

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Deborah Brown
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Stephen B. Lovejoy and Deborah Brown, Department of Agricultural Economics

We, as a nation, are becoming increasingly aware of the importance of coal as an energy source. National leaders have expressed the need to expand our domestic production of coal in order to reduce our dependence upon foreign energy sources. The President's National Energy Plan entailed increasing America's coal production to 2 billion tons per year by 1990.

Such an increase would definitely require a major commitment by industry and government. Production of bituminous and lignite coals in the United States rose to 678.7 million tons in 1976, an increase of 4.7 percent over 1975. To meet the President's goal, yearly production would have to be tripled.

This would require bringing a dozen or more large new deep mines and a dozen or more new surface mines into production every year for the next ten years. A recent survey indicated that the coal industry presently has plans to expand their production by 644 million tons per year by 1987. However, this is still over 600 million tons per year short of the President's 1990 goal. While production may fall short of the goal, it would not be the result of inadequate reserves.

The U.S. has approximately 1.5 trillion tons of identified coal reserves with an estimated 1.3 trillion tons not identified. However, only about 438 billion tons are estimated to be recoverable with present technology and prices. Over 400 billion tons will provide energy for many decades even with greatly increased production, and new technology may allow for the recovery of a greater portion of the coal reserves.

Coal is only produced in 26 of the 50 states, with 10 states accounting for nearly 90 percent of the annual production in the United States. Although use and production of coal from the Western states is increasing, over 75 percent of total production still comes from mines in the Eastern states.

Many of these Eastern coal-producing states are instituting policies and programs designed to increase both consumption and production of coal. These measures are designed to decrease dependence upon foreign sources.

The Indiana Energy Development Board has been mandated to encourage utilization of the state's coal resources through promotion and research funding. Indiana is also participating in a coalition of states attempting to increase production of coal. Other legislation establishes tax deductions for coal conversion facilities (House Enrolled Act 1334). Some residents hope to make the state of Indiana energy self-sufficient.


Cooperative Extension Service, Purdue University, West Lafayette, Indiana 47907
While Indiana is not one of the largest coal-producing states, Indiana mines produced over 25 million tons of coal in 1976. This placed Indiana as the ninth largest coal-producing state in 1976. While this represents less than 4 percent of total U.S. production, Indiana has substantial coal reserves which could be utilized.

Many Indiana residents know little about the extent and location of coal reserves, different types of mining and their consequences, economic value of coal, typical coal lease provisions, and consequences of mining. Collectively, the residents of Indiana need to become better informed about coal before initiating more programs and policies. Landowners especially need information about the possibility of reserves underlying their land and the details of how to market their coal.

This publication is an initial attempt to distribute information concerning coal resources and mining in Indiana. It will outline the location of Indiana's coal reserves, patterns of production and consumption, alternative mining techniques and their potential consequences and what landowners should look for in a coal lease.

Production and Consumption in Indiana

Coal has been mined in Indiana since the early 1830s when small coal mines began operating along the Ohio River. The American Cannel Coal Co. was the first incorporated coal producer (1837), mining coal in Perry County. In 1837 and 1838, David Owen found small coal mines in Perry, Warrick, Pike, Sullivan, and Vigo counties.

3 The census of 1840 listed Indiana as producing 9,682 tons of coal per year. Production rose gradually until the early 1900s when production peaked at 30.7 million tons in 1918. However, production of coal in Indiana fell to 13.3 million tons in 1932 during the Depression. After 1932, production rose gradually until World War II when production peaked at 27.9 million tons (1944). Production again decreased during the fifties and sixties but began increasing in the 1970s to the present production level of 23-26 million tons per year.

In 1975, over 25 million tons of coal were produced in Indiana, yielding a value of nearly 282 million dollars. Over 90 percent of that was produced by strip mines, with 86 percent of total production coming from Warrick, Pike, Sullivan and Vermillion counties.

The amount of in-state coal production is highly variable, depending upon prices, BTU and sulfur qualities, and labor costs and availability. In 1978, despite calls for increased production, only 23.1 million tons were produced, although preliminary figures for 1979 suggest that total production may top 26 million tons. Indiana's consumption of coal is considerably higher than production.

In 1971, Indiana consumed 38.6 million tons of coal. By 1978, this had increased to 43.6 million tons, and preliminary figures suggest that consumption of coal may have topped 50 million tons in 1979. The two major consumers of coal in Indiana are electric utilities and coke plants. In 1978, they consumed 38.5 million tons (88% of total consumption). Utilities obtained

5 Ibid.
6 Ibid.
8 USFM, op. cit.
9 USDQE, op. cit.
10 USDQE, op. cit.
about 52 percent of their coal from within the state, while coke plants utilized virtually no Indiana coal. Indiana coal is not competitive for coke plants because of specific metallurgical properties necessary for the coking process. From 1971 to 1978, Indiana's coal consumption increased from 38.6 to 43.6 million tons (13% increase). Even allowing for importation of coal for our coking plants, we would have to increase production by 40-50 percent to meet our present consumptive needs. Such an increase would require extraction from new coal beds. Therefore, the next section will explore the coal reserves in Indiana.

INDIANA COAL RESERVES

Coal is present in the southwest portion of Indiana (see Figure 1). The Illinois Basin has large coal reserves which extend from Indiana into Kentucky and Illinois. The coal-bearing rocks of the Illinois Basin consist mainly of

12. For a more complete description of the coal reserves in Indiana, see Wier (1973), reference 3.

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**Figure 1: The Illinois Coal Basin**

Source: From Charles E. Wier, Coal Resources of Indiana. Bloomington, Indiana: Geological Survey Bulletin 42-I, Department of Natural Resources.
shale and sandstone, but they also contain small amounts of limestone and coal. The entire coal-bearing rock section in Indiana contains less than 3 percent coal. These coal beds in the Illinois Basin dip 20-30 feet per mile toward the southwest, although they are not continuous or of uniform thickness. The coal deposits closer to the surface can be mined with surface techniques (see Figure 2).

Coal reserves in Indiana total over 33 billion tons, of which approximately 17.4 billion tons are currently estimated to be recoverable. These reserves are located in 20 southwestern counties with the seven counties in the extreme west containing over 80 percent of the state's recoverable reserves. However, as illustrated in Table 1, over 85 percent of Indiana's recoverable reserves are not amenable to surface mining. While experience with surface mining is common among Indiana's residents, few have experience with underground coal reserves and mining. Because of this lack of experience with underground reserves as well as the extent of underground reserves, the focus of the remainder of this publication will be narrowed to information specifically directed to underground reserves, mining, and leases.

In terms of reserves, three Indiana counties (Sullivan, Posey and Knox) contain over 50 percent of the underground recoverable reserves. With the addition of four other southwestern counties (Gibson, Vigo, Vanderburgh and Warrick) these counties account for over 90 percent of Indiana's underground recoverable reserves.

Methods of Underground Mining

Conventional mining represents the oldest of the mechanized production techniques. In conventional mining, the coal seam is undercut by an 11-foot chain saw protruding from the bottom of a self-propelled vehicle (see Figure 3). A drilling machine then drills holes at the top of the seam. The coal seam is then shattered by use of chemical explosives or compressed gas. A machine with steel arms then sweeps the coal onto a conveyor. The coal is then deposited into shuttle cars for transport out of the mine. This mining method accounts for approximately 32 percent of total underground production.

Continuous mining combines the various operations of conventional mining. Continuous mining machines dislodge the coal by use of a rotating

![Figure 2: Cross section of coalbeds](source: From Charles E. Wier, Coal Resources of Indiana. Bloomington, Indiana: Geological Survey Bulletin 42-1, Department of Natural Resources.)
Figure 3: Conventional and Continuous Mining Methods

### Table 1
Coal, reserves in Indiana by county, January 1, 1965,*

<table>
<thead>
<tr>
<th>County</th>
<th>Total reserves</th>
<th>Strippable reserves</th>
<th>Non Strippable reserves</th>
<th>Recoverable reserves</th>
<th>Strippable reserves</th>
<th>Non Strippable reserves</th>
<th>Total</th>
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*From Wier (1973:33). Additional information from Carr (1980) indicates that estimates of reserves have not been altered except to compensate for production from 1965 to present. Total production for the period January 1, 1965, to December 31, 1977, was 277,941 thousands of short tons, representing less than 2 percent of our recoverable reserves.

head, thereby eliminating the undercutting, drilling, and blasting. The machine also has arms which scoop the coal onto a conveyor belt for loading into shuttle cars. Over 60 percent of all U.S. coal mined underground is produced by continuous mining machines.

The third type of underground mining is referred to as longwall. Although longwall mining has been used quite infrequently in the United States, European countries have utilized it extensively. In longwall mining, corridors are driven into the coal seam and interconnected. Slices of coal from the longwall of the interconnections are mined by a cutter which makes passes while steel jacks hold up the roof (see Figure 4). The jacks holding up the roof are advanced with the shearer to make each new pass, while the roof collapses in the mined-out area where jacks have been removed. The advantages of longwall mining are (1) more of the coal reserves can be removed (coal pillars are not left standing) and (2) the subsidence problem is immediate and predictable. This method seems to be gaining popularity in the United States because of its increased productivity.

Surface mining in the United States has increasingly been seen as environmentally hazardous. Recent state and federal legislation has sought to insure adequate reclamation of surface-mined lands. Some interests suggest that underground mining represents less environmental damage, especially to our valuable land resources. However, underground mining is not without its problems, including both higher death rates for workers and environmental problems.

In some areas, underground mining can create water supply problems by disrupting aquifers and impacting water quality due to acid mine drainage. However, in Indiana this may not be a seri-
Figure 4: Longwall Mining Method

ous problem. Water wells into Pennsylvanian sediments often have low yields. In addition, they may have poor water quality which fails to meet U.S. Public Health Standards. While it appears that underground mining will not have extensive impacts upon water supplies in Indiana, landowners should be aware of any potential problems and investigate if appropriate.

Subsidence represents another potential problem resulting from underground mining. Subsidence is the result of the mine panel supports collapsing, thereby allowing the overburden to occupy the space vacated by the mining operation. This, of course, can create serious low areas and unevenness of terrain on the surface. Subsidence may alter drainage patterns, disrupt acquifers, and damage drains, roads, water and gas lines, and buildings. Subsidence or potential subsidence may discourage use of the land. Potential structural damage may preclude use of the land for buildings, and unevenness of the surface may discourage its use for agricultural production.

The danger of subsidence is a very real problem associated with underground mining. However, subsidence is a complex process which is affected by soil types, depth of mine, mining method and amount of coal recovered. The most common method for trying to prevent subsidence is to leave coal pillars in the mine to support the roof. However, this requires leaving considerable resources unmined (up to 60% of the available coal). Moreover, subsidence is a long-term process where the coal supports erode and collapse over time. Subsidence may occur within a few years or decades after mining.

Another strategy is to let subsidence occur but in a controlled manner. Longwall mining techniques allow the surface to subside quickly and more evenly in the mining area. By letting each section of the mine collapse during mining, subsidence is predictable and controlled. In addition, more of the coal reserves can be removed, making it an attractive technique for coal mining companies.

There are a variety of mining techniques, a multitude of soil types, overburden, etc., and several post-mining corrective measures which will influence whether subsidence occurs or the extent and severity of subsidence. These variations and techniques need to be examined in the context of a local area's geology, the mining techniques in use or proposed and possible post-mining corrective measures. Interested persons should contact the Coal Division, Indiana Geological Survey, Bloomington, for additional information.

The decision as to which reserves to mine and which mining method to utilize is usually made by the coal company. The residents of Indiana are concerned with the overall public good which may include increased coal production. However, an individual whose land overlies coal reserves is primarily concerned with protection of his/her surface rights and adequate compensation.

Leasing Your Land for Coal Mining

A landowner generally possesses mineral rights which he can sell or lease independently of his surface rights. His sales strategy depends in part on the type of mineral.

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13. Landowners concerned about the potential impact upon water supplies should contact the Indiana Division of Water Resources or Indiana Geological Survey.

14. In conventional room and pillar mining, only portions of the roof collapse. Such subsidence creates severe unevenness on the surface and may damage overlying structures.

15. Additional information on coal leasing problems can be obtained from "Analysis of Alternative Approaches to Leasing Coal," Purdue University Station Bulletin No. 267 (December 1979), by Wallace E. Tyner.
A landowner with an oil pool under his back yard faces problems from "the law of capture"; he who pumps the oil out first, gets it. He who hesitates can have his oil pumped out from under him by a neighbor with land over the same oil pool. On the other hand, he doesn't have to lease his land in order to develop the oil. Once aware the oil is there, a landowner who can obtain financing can sink his own well.

A landowner with a coal seam under his back forty doesn't have to worry about his neighbor digging the coal out from underneath him. However, if he fails to lease his land while his neighbors lease theirs, a developer can mine the coal around him. Unless the landowner has a very large piece of land, it may never be economical to go back and develop his small plot. Landowners with coal on their land therefore may feel especially pressured to sign a lease if it appears that their neighbors are doing so.

Let us look at the lease from the standpoint of the landowner. The lessee also has legitimate interests. A coal lease is the project of a bargaining process, and the landowner must realize that he may have to compromise in the course of the negotiations. Coal leases can become quite complicated, and this publication is not intended as a substitute for legal advice. However, the discussion of some typical coal lease clauses illustrates a few of the problems a landowner with coal on his land should consider.16 Because much of the current leasing activity in Southwestern Indiana involves underground coal development, and not the strip mining with which Indiana residents are more familiar, the emphasis will be on coal leases for underground rather than strip mines.

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16. This approach is based extensively on that developed by N.G.P. Krausz and Patrick L. Duke in "Legal Aspects of Coal Leasing in Illinois," University of Illinois, Extension Circular 1121, Conversations with Donald L. Uchtmann, professor of Agricultural Law at the University of Illinois, also were of great assistance.

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THE GRANTING CLAUSES

CLAUSE: Lessor, for and in consideration of the sum of _______ Dollars ($_____) advance royalty in hand paid and the royalties to be paid by Lessee and the agreements to be performed by Lessee does hereby grant, lease and let exclusively unto Lessee, its successors and assigns all of the coal and other minerals which are reasonably removed in the coal mining process (the "coal") in and underlying the following described lands situated in _______ County, _______, to-wit:

CONTAINING_________ acres, more or less (hereinafter called the "premises").

The granting clauses transfer property rights and describe the nature of those rights. It is in the landowner's interest to define those rights as narrowly as possible. A lease of "minerals" or "coal and other minerals" gives the lessee rights to all minerals including gas and oil whether their presence is known or not. The wording of the above example is therefore too broad for the landowner. It is preferable, from the landowner's point of view, to lease "coal and the integral minerals of it," and if there is more than one coal seam, to specify which seam or seams are included in the lease.

The landowner will also want to specify whether the coal is to be surface (strip) mined or obtained via underground mining processes and perhaps to specify the type of underground mining process.

CLAUSE: The Lessor does lease, let, demise and grant unto the Lessee the exclusive right to explore and prospect for and to mine, by any method except strip mining...

Of underground processes, the landowner may wish to specify whether the longwall mining technique shall be used. This technique substitutes controlled
but certain land subsidence for an unknown subsidence pattern. Longwall mining permits a higher rate of coal recovery, but even controlled subsidence can impose costs which a landowner must consider when negotiating the size of the lease payment.

The landowner may want to specify the lessee's surface rights, perhaps even to specify a rental payment in addition to royalties for each surface use. Even underground mines involve some use of surface land. The lessee will need land for haulage roads, drains, and waste deposits. To illustrate the complexities of possible surface requirements, the mine entrance and its support facilities can vary from a requirement of roughly 1 acre for a shaft entrance to perhaps 5 acres for a slope or drift entrance. (This will vary from operator to operator.) If unspecified, the lessee would be able to use as much of the surface as "reasonably necessary for operations."

CLAUSE: The unrestricted right to have and use the free and uninterrupted right of way into, over, under, across, and upon said leased coal and the surface and subsurface overlying the same, at such points and in such manner ... as may be necessary or convenient to the removal, processing, and marketing of said leased coal....

CLAUSE: The right to construct, maintain, and operate such drains and drainage ways as may be necessary or convenient to the operation, production, and marketing of said leased coal....

CLAUSE: The right to deposit anywhere upon the said surface, subsurface, or in the space remaining after the removal of any of said coal, such earth, rock, stones, slate, and "gob" material as may be produced in connection with the operations.

These particular versions of the granting clauses have been identified as "giving an unrestricted use of the surface that may be disadvantageous to the landowner" by University of Illinois Professor of Agricultural Law, N.G.P. Krausz.17

In addition to provision for surface use, the landowner may also wish to provide for ownership or removal of structures after the lease terminates. The lessee is normally given a reasonable period to remove pipe lines, telephone lines, towers, tanks, buildings, machinery and equipment. A lease can specify what is "reasonable" and thereby reduce the possibility of litigation over the term. The lease might also specify which if any equipment the lessee may leave.

The major damages done by underground coal mining are subsidence (as it damages drainage patterns, tile systems and structures), water contamination, and damages to crops. The federal Surface Mining Control and Reclamation Act (SMCRA) mandates state permit systems that include comprehensive performance standards for surface mining operations and for the surface effects of underground mining. Mine operators must demonstrate before they can obtain a mining permit that the land can be restored to a post-mining land use equal to or greater than the pre-mining use.18

To obtain a mining permit in Indiana, an underground mine operator, like a surface mine operator, must post a performance bond to indicate his ability to restore the surface to its pre-mine condition. This bond, which is supplemented by funds from the Indiana Department of Natural Resources Annual Operators Fund if the bond proves insufficient for restoration, is in effect through the mining and the reclamation processes. At the completion of the reclamation

17. Quoted from "Legal Aspects of Coal Leasing in Illinois," op. cit., p.3.
period, the bond is returned to the mine operator. A mine operator must also post proof that he has liability insurance coverage for each mining permit obtained in the amount of $300,000 per occurrence of property damage or $500,000 for all occurrences per permit. This liability insurance is also in effect only during the periods of mining and reclamation.

This means that if damage becomes evident after the reclamation period, the landowner would have to attempt to recover damages from the mine operator with a civil suit.

An extremely important granting clause is therefore that which specifies the mine operator's damage liability. A landowner must be particularly careful about waiving his right to collect for surface damages. Without a waiver, a mining company which damages the soil by removing its support is liable to the surface owner for damages regardless of the care exercised by the mining company. A carefully worded waiver of damages clause can be binding on future surface owners and can thereby reduce the resale value of the land.

The following clause, for example, may be too broad for the landowner's interest.

CLAUSE: The Lessor does hereby waive, release, and surrender any and all claims for damages, and also liability by reason of damages either to persons or property which may in any way be caused or occasioned at any time hereafter, directly or indirectly, by the mining and removing of coal or other minerals from said premises, or by the enjoyment of any of the rights and privileges hereby granted.

In Illinois, Dr. N.G.P. Krausz suggested that damages such as compaction from heavy machinery, interference from surface installations, and danger of livestock escaping when fences are removed can be foreseen and should be provided for within the coal lease.

The following clause defines one area of lessee responsibility.

CLAUSE: Said Lessee agrees to be responsible for any damage to growing crops on account of each exploration.

Waiving damages is not unreasonable if a landowner knows what is being waived and receives compensation for it. Part of the lease payment must be seen as the landowner's payment for bearing the risk that the existing legal system might not fully compensate him for loss arising from the mining operation. The landowner might try to estimate a best and a worst case of damages, and ask himself if the coal lease payments offered will give him enough compensation for bearing those risks.

One final comment on damages. It is well to remember that in order to pay civil suit damages, a company must have assets. A landowner may therefore prefer to deal with a well-established company. A landowner is further protected if the lease provides inducements to mine the coal in the reasonable future, since even well-established companies can change markedly over time, and subsidence can occur decades after the actual coal mining is completed.

19. Based on a conversation with Stephen Stafford, Reclamation Division, Indiana Department of Natural Resources. Mr. Stafford noted that the common reclamation period currently in use in Indiana is for five years after mining is completed.


22. While by no means an endorsement of these companies, or a condemnation of smaller companies, the 15 largest coal producers (tonnage) in the U.S. in 1977 were: Peabody Group, Consolidated, AMAX, Island Creek Group, Pittston, U.S. Steel, Arch Mineral, NERCO Group, Bethlehem Mine, Peter Kiewit, American Electric Power, Western Energy, Old Ben, North American, Pittsburg & Midway.
TERM OF LEASE CLAUSE

CLAUSE: If mining operations have not been commenced on the premises within 20 years from the date hereof, Lessee may further extend the term of this lease by paying to Lessor on or before the twentieth anniversary the sum of _____ per acre and thereafter the sum of _____ per acre each year until mining operations are commenced on the premises.

CLAUSE: Lessee may not terminate this lease unless it also terminates all leases in a mineral block of not less than ten contiguous sections. Except as otherwise provided, this lease shall remain in force for a term of forty years from the date hereof or until all recoverable coal has been mined, but in no event longer than twenty additional years.

The lessee needs a reasonable time frame to develop the coal and protection from continuing payments in case the coal becomes exhausted before the lease is up. The lessor needs to be able to maintain his flexibility. If the original lease is unfavorable or the market value of the mineral increases (which may well happen with coal), clauses giving the lessee an option to extend the lease for a total of 40-60 years are usually adverse to the landowner's interest.

If you are trying to judge a reasonable lease time you might consider the terms the State of Indiana asks for leasing coal on state land. The Indiana Code provides that:

Permits shall be for an initial period of five (5) years, automatically continued if commercial production and accompanying royalty payments are established by that time and for as long as production continues up to a maximum of fifty (50) years. If commercial production is not established within five (5) years from date of issuance, the permit shall be terminated.

The federal government demands similar guarantees of speedy production for its coal:

A coal lease shall be for a term of twenty years and for so long thereafter as coal is produced annually in commercial quantities from that lease. Any lease which is not producing in commercial quantities at the end of ten years shall be terminated.

COMPENSATION CLAUSE

CLAUSE: Lessee shall pay to Lessor as earned royalty for all coal actually mined and sold from the above described land _____% of the average monthly F.O.B. mine price but not less than _____c per ton of two thousand pounds for each and every ton of merchantable coal recovered, mined and sold from said land.

Types of Compensation

A landowner may be paid rent or royalties, bonus or some combination of the three. Rent is paid for the right to use the property; it is taxed as ordinary income. Royalties are payments which are based on the amount of coal produced. They are considered a share of the production and are taxed as capital gains. A bonus is a cash payment made when the lease is signed or in a series of payments over time. Cash bonus payments, when included in a royalty lease, are regarded as advance royalties, and are given the same tax consequences. A landowner should consult a CPA to insure his optimal tax structure when leasing coal.

Advance royalties are payments which will be subtracted from royalties based on actual production. For example, a lease might specify an advance royalty payment of $1,000 per year for ten years beginning the second year after the contract is signed. If any year after that year the royalty on actual production is greater than $1,000,

24. 30-USC-201-209.
the advance royalty is zero. However, if the royalty based on actual production is less than $1,000 any time during these ten years, the landlord still receives $1,000. The advance royalty, apart from tax advantages, is used as a technique to assure that the coal is actually produced. If the coal is not produced, past advance royalties will be reclassified as ordinary income and the landlord will be responsible for the additional taxes.

Royalties may be a fixed dollar sum to be paid on each ton of coal (specific royalty) or a percentage of the coal's market value (ad valorem royalty).

Neither a specific royalty nor a flat initial payment of so many dollars per acre will capture an unanticipated increase in the price of coal from inflation, rising energy values, or technological advances. In contrast, a lease payment based on a percentage of the coal's actual market value will increase as coal's market value increases. Therefore, if you expect the price of coal to increase you might, other things equal, prefer an ad valorem royalty. However, if the lessee also expects coal prices to increase, he may require that you accept a smaller initial bonus payment in exchange for an ad valorem royalty. Additionally, if Indiana coal prices were to fall unexpectedly—perhaps because of new federal pollution standards—you might be better off with a specific royalty.

Choosing Among Different Payment Streams

When choosing between a higher initial payment and higher future payments the landowner must weigh the present value of different sums of money to him personally at different times in his life.

Everyone discounts future income. A dollar ten years from now is not worth as much to you as a dollar today. If you had a dollar today you could either spend it for current consumption or invest it for future income. To test your discount rate, ask yourself how much money you would lend someone in return for their promise to pay you $100 a year from now. What is $15 per year for twenty years worth to you? If you have a high discount rate (i.e., a strong preference for having the money now), it will be worth less to you than if you have a low discount rate. A person badly in need of cash, a person with a terrific investment opportunity, a person who anticipates much inflation, an elderly person with no desire to leave a large estate: all have high discount rates.

Suppose the landowner had a discount rate of 20 percent; he would have to receive annual payments of $256.25 per year for 20 years to equal the present value to him of a $1,250 coal lease payment made to him today. That is, he would have to receive payments of $5,125 over the life of the lease to equal the value to him—with his 20 percent discount rate—of $1,250 today. A person with a high discount rate will not only prefer a high initial payment over future payments totaling several times the initial payment. He will also prefer slightly larger payments over many years to a large but distant future royalty combined with slightly smaller payments over many years.

These calculations are easy to make. To calculate the present value $P$ of a lump sum $A$ to be paid in $n$ years when you have a discount rate of $i$, set $P = \frac{A}{(1 + i)^n}$

25. Suppose the landowner had received a flat fee of $1,250 per acre in 1970 and invested it in government bonds at 6 percent. Let's evaluate his position in 1980. The Consumer Price Index rose from 116.3 in January 1970 to 236.9 in February 1980. Even if he had reinvested his interest every year, his 1970 $1,250 would have shrunken to $1,101 at 1980 price levels.
For example, if you have a 20 percent discount rate, the present value to you of $30.00 twenty years from now is

\[ P = \frac{30}{(1 + .20)^{20}} = .7825 = 78c \]

To calculate the annual payment you—having a discount rate i—must receive for n years to equal a given present value, set

\[ a = \frac{\frac{1}{1+i}}{1 - (\frac{1}{1+i})^n} \times P \]

For example, to equal a present value \( P \) of 78 cents, if you have a 20 percent discount rate, you must receive annual payments for 20 years of

\[ a = \frac{.20}{1 - (\frac{1}{1.2})^{20}} \times .78 = \]

\[ .2054 \times .78 = .16 \]

If you do not wish to make your own calculations, you can consult interest tables. These are widely available in handbooks of mathematical tables such as Mathematical Tables from Handbook of Chemistry and Physics.

Current Compensation Rates

It is difficult to say exactly how much compensation Southwestern Indiana landowners currently (July 1980) may be able to obtain. An Illinois group recently obtained advance royalties of $1,350 per acre to be paid over a period of years with 7 percent interest. Another Illinois group sold coal rights outright to the Tennessee Valley Authority for $1,000/acre.\(^{26}\) You must consider that Illinois and Indiana are not identical with respect to the costs of production or the sale price of coal. In general, the largest differences in production costs come from differences in mine size and seam thickness. In 1974 the Department of the Interior estimated this relationship between size, seam thickness and production costs:

<table>
<thead>
<tr>
<th>Seam Thickness</th>
<th>Mine Size</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(million tons per year)</td>
</tr>
<tr>
<td>4 feet</td>
<td>$12.95</td>
</tr>
<tr>
<td>6 feet</td>
<td>11.87</td>
</tr>
</tbody>
</table>

\(^{26}\) Reported by Mr. William Johnson of Senator Lugar's office.

You must also consider that while Indiana coal has a high BTU content, it also has a high sulphur content which makes it less valuable. The size of the parcel also affects the landowner's bargaining position.

The size of a royalty percentage varies considerably. The state of Indiana currently demands a minimum royalty of 5 percent of market value for state-owned coal as well as a fixed fee per acre.\(^{27}\)

\(^{27}\) Indiana Code 14-3-2-6. The Code also states, "Nothing herein contained shall be construed to limit the authority of the department and the Governor to require additional covenants, terms and conditions in addition to those provided in this section."
The federal government currently demands 12-1/2 percent royalty for its coal on strip-mined lands but is permitted by law to ask for less for its coal which is recovered by underground mining. Federal regulations currently require a royalty for federally owned coal which is underground mined of 8 percent with a minimum of not less than 5 percent—and that only by a special application which can't be made until the coal operations have mined the lease for a year. 28

TERMINATION CLAUSE

CLAUSE: In case of default by Lessee in the payment of royalty or in the performance of any covenant in this lease, and if any such default shall continue sixty days after notice in writing by Lessor to Lessee at ________, specifying the nature of such default, then Lessor may, at his option, terminate this lease without process of law; provided however, that Lessee shall have the right for a period of six months after the date of termination to remove all property of Lessee, but shall not be obligated to do so.

A termination clause describes the conditions under which the lease can be ended. In the absence of a termination clause, a court may determine that certain breaches of a lease are insufficient to terminate the lease. 30

A termination clause often states certain conditions under which a party—usually the lessee—can end a lease. Exhaustion of the coal or the economic infeasibility of continuing production are common causes. A lease which does not specify such causes may be adverse to the landowner's interest, since the landowner then has no assurance that any coal mining will take place. 31

Summary

The evidence suggests that Indiana has substantial reserves of coal. Individual landowners must carefully calculate the potential costs of mining as well as the benefits. Collectively, we must compare the goal of increased coal production with other goals such as agricultural production.

28. 30- USC-201-209. "A lease shall require payment of royalty in such amount as the Secretary shall determine of not less than 12-1/2 per centum of the value of coal as defined by regulation, except the Secretary may determine a lesser amount in the case of coal recovered by underground mining operations."

29. Federal Coal Leasing Acts, Federal Register Vol. 44, No. 40, Thursday, July 19, 1979, p. 4264; Bureau of Land Management, Coal Management Final Rule Making circ. #2499; and 43 CFR Section 3473 3-2(a)(3). These references were provided by Mr. Donald Bieniwick of the Office of Coal Leasing, Policy Planning and Coordination, Bureau of Land Management, U.S. Department of the Interior, and Professor Donald L. Uchtmann, University of Illinois.


31. Ibid.
The information provided in this bulletin is an introduction to Indiana coal reserves, possible underground mining techniques, and coal leasing considerations. Individuals interested in further information should contact one or more of the following agencies:

Coal Division  
Indiana Geological Survey  
Bloomington, Indiana 47401  
Donald D. Carr, Head  
(812) 337-7785

Indiana Division of Water Resources  
Room 605, State Office Building  
Indianapolis, Indiana 46204  
(317) 232-4160

Division of Reclamation  
Department of Natural Resources  
309 W. Washington Street  
Indianapolis, Indiana 46204  
Stephen B. Stafford, Room 201  
(317) 232-1555

Indiana Bureau of Mines and Mining  
125 South 15th Street  
Terre Haute, Indiana 47807  
(812) 232-6406

Office of Surface Mining  
U.S. Department of the Interior  
Region III  
Federal Building  
46 East Ohio  
Indianapolis, Indiana 46204  
(317) 269-2600

Indiana Mining and Mineral Resources Research Institute  
GEOS Building  
Purdue University  
West Lafayette, Indiana 47907  
Don Levandowski, Director  
(317) 494-8171

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