

Research Memorandum No. 425

RECOVERY OF COAL WASTE

Legislative Research Commission
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MEMORANDUM

TO: Vic Hellard, Jr., Director

FROM: Mary Lynn Collins/Linda Kubala
Legislative Analysts

DATE: December 8, 1985

SUBJECT: House Resolution 167 Directive

House Resolution 167, which was passed by the 1984 General Assembly, directs the Interim Joint Committee on Agriculture and Natural Resources to gather information on the remaining or reprocessing of coal waste from old abandoned mine sites and to exchange information with other states and the federal government in an effort to develop policy initiatives that will encourage recovery of more coal waste. The purpose for this resolution was twofold. This state will profit not only from more reprocessing of coal waste, in terms of more resource recovery, but also from the reclamation of the coal waste sites, which will be accomplished once private industry recovers the coal.

This memorandum is a review of efforts being made at every level to encourage more coal waste reprocessing. The memorandum discusses current regulatory policy; attempts being made to make regulatory and statutory changes at both state and federal levels; activities of other coal-producing states; research currently being conducted on coal waste utilization; and finally, initiatives that have been undertaken by Kentucky, particularly the Interim Joint Committee on Agriculture and Natural Resources, to provide incentives to stimulate industry's interest in reprocessing and reclaiming coal waste sites.

MLC/LK/dlh

I. Introduction: The Problem

Coal waste is the rock, clay and other debris separated from coal at processing or preparation facilities. The coarse waste is discarded as "gob," while the fine waste is pumped with the water to settling ponds, and is called slurry or fines. Abandoned waste sites, some small, some covering 100 acres or more, are common in Kentucky coalfields. Coal waste sites are potentially a valuable resource because considerable amounts of coal are discarded by preparation plants along with the waste. Some of the older gob piles, particularly, contain large amounts of recoverable coal, since early operations tended to be inefficient by today's standards.

Coal waste sites can pose environmental hazards through water pollution, smoldering fires and landslides. These risks are greater at sites developed prior to the imposing of strict congressional standards on the disposal of coal waste, pursuant to the Surface Mining Control and Reclamation Act of 1977 (Public Law 95-87). In addition, unclaimed gob piles and slurry ponds are "eyesores" and in many cases take up valuable flat land.

For purposes of this report, reprocessing will refer only to the mining of coal waste. While the main focus of this report is on reprocessing, at times it will be necessary to refer to the broader term, remining. Remining refers to any surface mining operation that re-affects lands which were previously mined for coal. This would include not only coal waste sites, but also removal of coal remaining in pillars and high walls of old mine sites.

The state's Abandoned Mine Lands (AML) Program has identified many of the old coal refuse sites and has reclaimed some of these sites with funds authorized by Title IV of the 1977 Act. However, the funds available through this program are not sufficient to meet existing reclamation needs. Those coal waste sites that the Abandoned Mine Lands Program has identified as low priority will, in all likelihood, never be reclaimed with public money. Funding for the Abandoned Mine Lands Program is scheduled to expire in 1992. Thus, reprocessing and subsequent reclamation by private operators could enhance the state's efforts.

There has been considerable interest, particularly among smaller operators, in reprocessing existing gob piles and slurry ponds, but it has been suggested that there are disincentives built into the existing statutory and regulatory framework which prevent secondary coal recovery operations from being economically viable. Under the 1977 Surface Mining Act, no distinction is made between a coal waste recovery operation and any other surface mining activity, and full permitting is required of coal waste reprocessing sites. However, the two operations are different and much of the information required for a surface permit - such as prime farmland investigations and blasting

plans - are not necessarily applicable to coal reprocessing. The fundamental differences in site conditions of a prospective reprocessing operation and a site to be newly affected are never addressed in the permitting process. Unlike a site that has never been mined before, a reprocessing site is already disturbed, and often an environmental hazard. Current regulations require the reprocessor to restore the disturbed area to the condition it was in prior to the original mining operation, which took place long before the reprocessor came on site.

While the coal reprocessor faces the same permitting costs and requirements and must meet the same performance standards of a surface mine operator, the reprocessing operation involves different economic risks. It is difficult to determine in advance how much recoverable coal is in a gob pile or slurry pond. In addition to the uncertainty of the coal resource, the market for coal waste is limited and coal waste generally sells for less than newly-mined coal.

While there is support for reducing permitting requirements and performance standards for coal waste reprocessing, in order to encourage more private industry reclamation, there is the concern that too much relaxation of regulatory controls would be environmentally detrimental. When a mining area is reaffected there is potential for fires, refuse slides, increased acid mine drainage and erosion. Any change in the regulatory process must be made carefully, to ensure adequate environmental protection to those areas that will be affected.

II. Activity in Other States

Kentucky is not the only state that would like to see more secondary coal recovery from coal waste. The 1977 Surface Mining Control and Reclamation Act had a much greater effect on reprocessors of coal waste than on other small coal operators, since their market is more limited and their product usually sells for less. Several states have attempted to make changes in their programs in order to provide incentive to reprocess and reclaim old waste sites. The following is a summary of what these states have attempted.

Pennsylvania

Pennsylvania has been relatively successful in making changes in its regulatory program. In late 1983, the Pennsylvania Bituminous Coal Reclamation Operators Association petitioned the Pennsylvania Department of Environmental Resources to modify state regulations for the re-mining of coal waste. In a series of public hearings held last year on Pennsylvania's Reclamation program, the issue of mining areas previously affected by mining operations emerged. Most attention was focused on the perpetual liability a coal operator takes on for water quality at any site he mines. Many of the sites which could be re-mined have pre-existing polluted discharges - most were mined before current performance standards were in place. Many operators are

reluctant to take on a site previously affected by mining because they would also be buying the responsibility to treat the pre-existing pollution problems of the site.

Recognizing this barrier to re-mining, the Pennsylvania General Assembly passed legislation (Senate Bill 1309) that relaxed somewhat an operator's responsibility for pre-existing polluting discharge in the case of a re-mining operation. That bill, coupled with a set of recently proposed regulations, is now before the Environmental Protection Agency (EPA) and the Office of Surface Mining (OSM) under a major program amendment to that state's regulatory program. Both agencies have indicated they will approve the changes to Pennsylvania's program. Under the proposed amendment, an operator would be responsible for any discharge the operation impacts. But the operator would have limited liability for unencountered discharges. As long as the operator follows an approved plan, he would not be required to treat water from unencountered discharges - unless there is an aggravation of the discharges. In such a case, the operator would be required to restore the water quality only to the level that existed before the re-mining began. This change, it is felt, will generate new interest in re-mining in Pennsylvania.

West Virginia

According to a computer search done by the Interstate Mining Compact Commission (IMCC), West Virginia is the only state to have a special permitting procedure for the reprocessing of coal waste.¹ The West Virginia legislature, in 1981, mandated the development of an expedited permit for the re-mining of coal refuse and the Office for Surface Mining approved the proposed streamlined permit.

The special permitting procedure for West Virginia eliminates many of the requirements that do not apply to reprocessing of coal waste. The advantage of having specific regulations on the reprocessing of coal waste - in addition to any relaxing of requirements - is that small operators who may be interested in reprocessing have a much clearer idea of what regulatory requirements such an operation entails. Under the West Virginia regulation, the advertising period is shortened, less data is required on the hydrology of the site, and some performance standards are modified. Bonding requirements, however, are not reduced for coal waste reprocessing. West Virginia also has a very abbreviated permit for coal waste removal on a site smaller than two acres; under this agreement the operator must remove all the waste from the site. Despite the simple permit procedures, the West Virginia reclamation agency reports that only ten reprocessing permits have been issued in the state in the last three years.²

Maryland

Maryland has not relaxed standards or expedited its permit for reprocessors of coal waste, but this state does assist such operators in establishing a vegetation cover to meet reclamation standards. The state of

Maryland, through its Land Reclamation Committee, will pay up to fifty percent of the revegetation costs for an operator reining coal waste. Under this arrangement the operator usually buys the materials and the state supplies the labor, including forestry specialists. This solution eliminates some of the uncertainty of the costs involved in getting a ground cover established. The state's severance tax helps fund this operation.

Instead of the competitive bidding system usually required in the case of reclamation contracts, Maryland's statutes allow for direct negotiation with operators reprocessing coal waste adjacent to an abandoned mine land site. Generally, an adjacent operator can reclaim a site more economically than the state can through bidding. Maryland, incidentally, has also done an inventory and analysis of its coal refuse sites.

Ohio

Ohio has not attempted to modify its regulatory program but does encourage the reprocessing of coal waste by requiring a written determination as to the reining feasibility of every reclamation project it undertakes. The information collected for this determination is made available to coal operators interested in reining a site.

It has also begun several projects designed to increase private participation in reclamation of abandoned mine lands through reining. The state's reclamation agency recently began an experimental program of contracting for the removal of coal from an abandoned mine site and sharing the profits from such operations. The state acts as an operator, negotiates with the mineral owner, puts out the bid for the coal removal and receives fifty-five percent of the proceeds from the sale of the coal. (Kentucky has done this on a limited basis.) Ohio sees this as a way to stretch its program funds and anticipates doing more coal removal projects in the future.

Ohio is now attempting to develop a project whereby the state's abandoned mine lands program would contract with an operator to remove the coal waste from an abandoned mine land site and to process the waste at a separate location. Under this plan, the operator would only be required to get a permit for the site where the coal would be processed. The actual coal removal would be under the authority of Title IV of the 1977 Surface Mine Act and would not require a permit. The state would then share in the proceeds of the sale of the coal. According to the staff in the Ohio Abandoned Mine Lands Program, the Office of Surface Mining has been receptive to this proposal.³

Arkansas

In an attempt to determine how permitting requirements might be reduced for the reprocessing of coal waste, Arkansas recently requested a special study by the research arm of the Office of Surface Mining, the Western Technical Center. After studying Arkansas' existing permitting procedures,

the Western Technical Center was very critical of Arkansas' permitting of gob piles.⁴ The study found sediment control plans inadequate and bonding information insufficient. The result of Arkansas' efforts to streamline its permitting process was a recommendation by the Office of Surface Mining to require more information rather than less.

Illinois

Citing the reduction of the secondary coal recovery industry in the state, Illinois, in 1984, approached the Office of Surface Mining with a proposal to revise its regulations. Illinois was proposing special permitting and performance standards for coal waste reprocessing. The Office of Surface Mining was not receptive to the proposed changes and expressed concern that the proposal would shorten the time for filing written objections and relax hydrology standards, and did not address the disposal of waste from the secondary recovery operation.⁵ The agency also indicated that any proposal for changes in performance standards must have regulations comparable to current ones and must address acid-forming and toxic-forming materials exposed, disturbed, or produced during the secondary recovery operation. The Illinois proposal was never formally submitted as a state program amendment and Illinois currently has no plan to pursue the issue as an individual state.

Interstate Mining Compact Commission

The interest of the coal-producing states in generating more reclamation through private industry reprocessing prompted the Interstate Mining Compact Commission (IMCC) to also consider the issue. In December 1983, the Commission, which represents seventeen coal-producing states, passed a resolution urging the Office of Surface Mining to provide the regulatory framework to promote resource recovery from previously affected areas to the maximum extent possible, in order to achieve much needed reclamation without expenditures from the Abandoned Mine Lands Fund.

The Interstate Mining Compact Commission later established a subcommittee of the Regulatory Protection and Standards Committee to address the issue of reprocessing. This subcommittee, made up of representatives from Illinois, Pennsylvania, Maryland, Arkansas, and Kentucky, met and exchanged information but concluded that direction from the Office of Surface Mining was needed. Therefore, at its December 4, 1984, meeting the Commission formally requested the Office of Surface Mining to provide necessary staff or a consultant to work with the states and other interest groups to hammer out a solution that would encourage more reprocessing while maintaining sufficient environmental controls.

III. Activity at the Federal Level

Office for Surface Mining (OSM)

The states have been only partially successful in encouraging the Office of Surface Mining to address the reprocessing issue. The issue has been

discussed at conferences and an informal task force on remining has been established. The most promising action taken by federal agencies to date - perhaps in response to the request by the Interstate Mining Compact Commission - is their recent initiation of a project to develop strategies to encourage more remining. The stated objective of the project is to "develop a national strategy that promotes the reclamation of abandoned mine lands to obtain a maximum environmental improvement and resource recovery through remining."⁶

The Office of Surface Mining has hired a consultant for this project to visit the states and gather information on the various issues being raised on remining. That consultant visited Kentucky in October and met with representatives of the Natural Resources Cabinet, the legislature, and the industry. The consultant will be generating working papers on the issue and disseminating the papers to interested parties. These efforts could be the basis for dialogue between the states and the Office of Surface Mining on changing the current regulatory program as it relates to remining.

The Office of Surface Mining published guidelines for reclamation in 1980 (Federal Register, Volume 45, No. 46, p. 14810), directing states to consider the potential for coal recovery at any site designated for reclamation under the Abandoned Mine Lands Program. No guidance was provided, however, on how to incorporate resource recovery into the reclamation project.

Under the 1977 Surface Mining Act, coal may be removed from a site without a permit if the coal extraction is incidental to government construction, such as reclamation work by the Abandoned Mine Lands Program. Coal removal may then be contracted out and the state Abandoned Mine Lands agency may use any proceeds to offset the costs of reclamation.

In its regulation implementing this exemption from permitting (30 CFR Part 707), the Office of Surface Mining has interpreted the term "incidental" to mean "necessary in order to accomplish construction." Since coal removal without a permit under the Abandoned Mine Lands Program must be ruled necessary to the project's success, the exemption has been infrequently used. Many times the states have covered coal waste sites with topsoil and seeded the area to be reclaimed. The Office of Surface Mining is currently drafting a revision to Part 707, however, which would broaden the definition of "incidental" to allow for more coal removal in conjunction with state abandoned mine lands programs.

Congress

The need to encourage the coal industry to remine and then reclaim more of the nation's abandoned mine lands was recently addressed by the 99th Congress. Both the House and Senate have passed versions of the reauthorization of the Clean Water Act. The House version (House Resolution 8) contains an amendment, referred to as the Rahall amendment, which would provide for a modified permit for remining coal operations. Although the provisions are different, the Rahall amendment accomplishes the same end as the legislation passed by Pennsylvania (see page 4).

The Rahall amendment would allow the states to modify the effluent limitations for ph, iron and manganese for any pre-existing water discharge affected by the remining operation. The applicant for the modified remining permit would have to demonstrate that the proposed coal remining operation would result in the potential for improved water quality from the remining operation, and in no instance would the discharge levels of ph, iron, or manganese be allowed to exceed the levels being discharged before the remining began.

The Clean Water Act authorization is currently in a conference committee. It is likely that the Rahall amendment will be included in the final version of this Act, since it is a compromise measure worked out by coal representatives and environmental groups. This amendment does address what many in the industry believe to be the biggest disincentive to remining - water quality standards. Consequently, this one statutory change could significantly increase reprocessing of coal waste.

IV. Kentucky Initiatives

1982 General Assembly

The Kentucky House of Representatives expressed its interest in coal waste reprocessing in 1982 when it passed House Resolution 108, a resolution encouraging a demonstration project in coal refuse clean-up. The resolution directed the Cabinet of Natural Resources and Environmental Protection to explore the feasibility of developing a demonstration project involving new techniques for recovering coal from abandoned coal slurry ponds. Abandoned coal slurry ponds are one of the most costly problems of the state's Abandoned Mine Lands Program and it was felt that if economic coal recovery from slurry ponds could be demonstrated, private industry would be more inclined to reprocess and then reclaim those sites.

The Cabinet, as directed by House Resolution 108, investigated methods of recovering the carbon from abandoned slurry ponds and reported to the Legislative Research Commission that the process, spherical agglomeration, developed by the National Research Council of Canada, appeared promising. This program involves the injection of oil into a water coal slurry mixture and mixing at high speeds. The oil affixes itself to the coal particles during the mixing. The coal is then segregated from the ash and water.

The Cabinet began negotiating with the University of Louisville for further study and application of the special agglomeration process but the arrangements were never finalized. Interest in spherical agglomeration continues in this state, however. During the summer of 1985, the Tennessee Valley Authority (TVA), the National Research Council of Canada, and COALTEK, a private corporation, demonstrated the process at a coal preparation plant near Morganfield, Kentucky.

1984 General Assembly

In addition to passing the resolution directing this study, the 1984 Kentucky General Assembly established a special fund to help cut the cost of remining coal waste or abandoned mines. Money from the Abandoned Mine Land Enhancement Fund is to be used to offset the cost of surety bonds for remining operations. After the first \$800,000 in mine fines and penalties are collected and placed in the state's general fund, any additional monies from fines or penalties collected are to go to the Abandoned Mine Land Enhancement Fund. The Enhancement Fund has just begun to accumulate monies, and regulations to implement the fund are currently being drafted by the Cabinet for Natural Resources and Environmental Protection.

1984-85 Interim Activity

The 1984-85 Interim Joint Committee on Agriculture and Natural Resources devoted a great deal of time to the coal waste issue. The Committee received periodic updates from the Cabinet for Natural Resources and Environmental Protection on the status of the Abandoned Mine Land Enhancement Fund and closely followed developments of the issue in other states and at the federal level.

On a tour of Western Kentucky, the committee had the chance to see first hand some of the problems - and opportunities - presented by gob piles and slurry ponds. They viewed an abandoned mine land site at Morton's Gap, Kentucky, which presents a continuing acid water problem. On the top of the site is a small lake from which acid water continuously drains. They also observed an abandoned mine land site which was being reclaimed as a wildlife area. That area, 5,400 acres of abandoned mine land, was purchased in 1977 by the Department of Fish and Wildlife Resources from the Peabody Coal Company. Peabody Coal Company retained the mineral rights and pays the department a one dollar per ton royalty for coal mined. Murray State University is developing a management plan for the wildlife area.

While in the Madisonville area, the the committee also toured the site of a large gob pile which the Southwind Mining Company was proposing, to reprocess and then reclaim. Company officials at the site indicated their frustrations at having to meet the same permitting and reclamation standards in the reprocessing of the gob pile as would be required in a new surface coal mining operation. A particular problem Southwind mentioned was the need to determine the actual amount and quality of coal on site before they began the expensive permitting process. The state regulatory program allows operators to mine up to 250 tons of coal without a permit, in order to make such determinations. The amount and quality of coal in a large gob pile, however, can vary from area to area. Southwind did not feel that the economic viability of the project could be determined by mining only 250 tons. Southwind eventually decided not to pursue the permit for this gob pile site.

On this same tour, the committee heard from Mr. Hal Bogart of the law firm of Brown, Todd, and Heyburn, who identified for the group four reasons there

is virtually no coal waste reprocessing in the state currently: (1) the high cost of bonding; (2) high performance standards which are not always applicable to reprocessing; (3) permitting delays; and (4) the lack of a well-established market for reprocessed coal waste. Mr. Bogart suggested a special permitting process for reprocessing operations and the creation of tax incentives.

Cabinet for Natural Resources and Environmental Protection

Early in the interim the committee directed the Cabinet for Natural Resources and Environmental Protection to revise its regulations to encourage more coal recovery from gob piles and slurry ponds. In order to meet the committee's request for regulatory change, the Cabinet embarked on a research project which included actual site investigations and an evaluation of the applicability of current regulatory and permitting requirements to the reprocessing operation. Input was sought during the project from the industry, the federal Office of Surface Mining, and the environmental community.

In the Cabinet's interim report on the coal waste project, the Cabinet acknowledged that there were sections in the regulations which do not apply to reprocessing operations, but also questioned whether the state could develop special standards for reprocessing operations under the existing language of federal law. The Cabinet did conclude that forms for application and bond computation could be altered to address reprocessing operations specifically.⁷

Field investigations were conducted on abandoned refuse piles and slurry ponds at thirty-two different sites located throughout Kentucky's eastern and western coalfields, but only the results for six sites in Pike County were included in the Cabinet's interim report on the project.⁸ Of the six sites analyzed, all were contributing sediment to nearby streams and some were actively producing acid mine drainage. All the sites were being used for garbage disposal and none of the sites supported a full vegetative cover. One site visited was burning. Although no definitive conclusions were drawn in the report, since data was not available from all of the sites, there is evidence that the older sites (twenty years older or more) have stabilized with respect to acid formation and that redisturbance of these sites could lead to new acid production.

When the Cabinet began to experience a backlog on its permits, the coal waste recovery project was deferred, in order to free up staff time to review permits. Although the project is still not active, the Cabinet did present to the committee in October 1985, a draft of their plans for a special regulatory procedure for the reprocessing of coal waste.

The Cabinet's objective in its draft of a special regulation for secondary coal recovery is to remove some of the current regulatory disincentives and to provide more flexibility. Under the proposed regulation each reprocessing operation would be treated on an individual, site-specific basis. The most significant alternatives to the current regulatory system would be:

(1) adoption of a nondegradation/enhancement standard for water quality, with effluent limits to be set on an individual permit basis; perpetual water quality treatment of prior condition and excessive during-mining water treatment would be eliminated;

(2) placing a \$2,500/acre cap on bond amounts, subject to the \$10,000 minimum;

(3) reduced time for baseline water data collection from six months to three months.

The Cabinet has not, as of November 1985, begun the formal procedures of submitting the regulation to the state review process. Regulatory changes will also be subject to review and approval by both the Office of Surface Mining and the Environmental Protection Agency.

Waste Utilization Research

Mining regulations are not the only concerns of those interested in reprocessing coal waste, although they have received the bulk of recent attention. For reprocessing to be viable, the recovered material must command a price sufficient to warrant the costs of production and land reclamation. While coal from some abandoned gob piles in Kentucky can be sold profitably as steam coal, much of the recoverable coal has characteristics undesirable in that market. Such characteristics such as a high level of impurities, or a preponderance of very small particles called fines, reduce the market value of the coal.

The Institute for Mining and Minerals Research at the University of Kentucky and the Kentucky Center for Energy Research Laboratory have conducted several studies to test new users, and thus new markets, for coal wastes. The Institute for Mining and Minerals Research has sponsored eight seminars since 1975, focussing on utilization of coal waste and coal by-products.⁹ These seminars have included numerous presentations on new recovery technologies, techniques to recover and utilize coal fines, marketing strategies, and activities in other parts of the country. They have provided a forum for information exchange between those involved with different aspects of this industry.

Beginning in 1974, the Kentucky Energy Cabinet funded a series of studies on coal refuse utilization to analyze the chemical characteristics of selected waste sites, and test a number of non-traditional uses of the waste material.¹⁰ While the emphasis of these studies was on coal waste currently being generated, several older sites were sampled, and many of the findings are applicable to older abandoned sites as well. These studies found that coal waste performed quite well, technically, in a variety of non-traditional products. Most of the waste from Eastern Kentucky was found to have high concentrations of aluminous shales, a low calcium content and sufficient fuel to provide its own process heat. Potentially, this waste could be a significant source of aluminum. Controlled burning of waste (sintering) was found to produce a lightweight aggregate which performed well in concrete,

concrete blocks, and as a skid-resistant paving aggregate. Sintered refuse also performed well as a growing medium for container-grown plants.

A very promising use for the coal waste currently being produced is to burn it for onsite heat and power, and to produce electricity for sale. This can be done efficiently and cleanly using fluidized bed combustion technology. Kentucky and several neighboring states are pursuing research in this area. Fluidized bed combustion technology eventually could enhance the viability of remining abandoned waste sites by providing a market for lower-grade fuel.

V. Prospects for Change

At this time, there appear to be no active reprocessing operations in Kentucky. While some reprocessing operations retained permits during the interim period before Kentucky implemented its permanent regulations in 1983, none of these operations were transitional under the permanent program. According to the interim report issued by the Cabinet for Natural Resources and Environmental Protection on the coal waste project, only one site currently is permitted for reprocessing coal waste. The site permitted is a thirteen-acre gob pile in Floyd County at which a portable coal washer was being used in the recovery operation. That site is not active at this time.

The Cabinet has, however, noted increased interest in reprocessing. The Department for Surface Mining Reclamation and Enforcement reports that it has received a number of inquiries in recent months from companies interested in reprocessing. What is done at both the state and federal level concerning reprocessing permitting and performance requirements will have a significant impact on the decisions of these perspective operators or whether to reprocess coal waste.

Changes in remining requirements appear likely in the next twelve months. The Clean Water Act may be altered to allow different water quality standards for remining; the states are optimistic that the Office of Surface Mining will make further changes based on their consultant's report on remining. Once Kentucky's Abandoned Mine Land Enhancement Fund gets underway, there should be a clear indication whether bond reduction is sufficient incentive to generate more remining. Kentucky may very well be successful in winning federal approval from the Office of Surface Mining and the Environmental Protection Agency to make changes in its own regulatory program to encourage reprocessing of coal waste.

There does seem to be recognition at every level that there can be much gained from reclamation of abandoned sites by private industry via coal reprocessing and remining. The issue now seems to be how much the regulatory controls can be altered in order to encourage the industry's participation without creating significant risk to the environment.

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FOOTNOTES

1. Memorandum from Kenes Bowling, Executive Director of the Interstate Mining Compact Commission, 14 September 1985. This memorandum reported on the results of the COALEX computer search, State Inquiry Report - 15.
2. Phone interview with Bill Chambers, Assistant Chief of Reclamation, West Virginia Department of Natural Resources, 1 May 1985.
3. Phone interview with Robert Baker, Manager of Abandoned Mine Lands Section, Ohio Department of Natural Resources, 15 April 1985.
4. U.S. Office of Surface Mining, Western Technical Center, "Arkansas Coal Refuse (GOB) Pile Processing Special Study Report," May 1984, pp. 5-6.
5. Memorandum on Illinois' proposed secondary recovery regulation from William B. Schmidt, Assistant Director for Program Operations and Inspection, Office of Surface Mining, 25 July 1983.
6. Brent W. Blauch, Consultant to the U.S. Office of Surface Mining, "Strategy Development for Reclaiming by Remining," (Unpublished Report).
7. Kentucky Cabinet for Natural Resources and Environmental Protection, "Reprocessing of Coal Refuse in the Eastern and Western Kentucky Coalfields," Interim Report No. 1, 28 December 1984, pp. 20-21.
8. Kentucky Cabinet for Natural Resources and Environmental Protection, pp. 27-29.
9. Institute for Mining and Minerals Research, University of Kentucky, Proceedings: Coal Refuse Disposal and Utilization Seminar, 1975, 1976, 1977, 1978; Proceedings: Energy Resource Conference, 1978; Proceedings: Kentucky Coal By-Products Seminar, 1981, 1982.
10. Jerry Rose and Alan Bland, Utilization Potential of Kentucky Coal Refuse, University of Kentucky, Institute for Mining and Minerals Research, IMMR 83/090, October 1984.

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